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SEMIRATA | 2025
SEMINAR DAN RAPAT TAHUNAN PIMPINAN BADAN KERJASAMA PERGURUAN TINGGI NEGERI (BKS PTN)
WILAYAH BARAT BIDANG MATEMATIKA DAN ILMU PENGETAHUAN ALAM (MIPA)
The 8th International Conference of Science and Technology (ICST)
"Science and Artificial Intelligence for Life Resilience and Sustainable Development"
Pekanbaru, 18-20 Juli 2025
Supported by:
WIRALAB
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UNIVERSITAS PAHLAWAN

CONCEPT UNDERSTANDING AND PROBLEM SOLVING SKILLS IN LIGHT OF SOCIOMATHEMATICAL NORMS

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Background of Research

Mathematics is a fundamental discipline whose applications extend to various fields of life and the development of science. However, the results of international evaluations such as TIMSS and PISA show that the math skills of Indonesian students are still below standard. Although there are indications of improvement in some areas such as Riau Province and Kampar Regency, the overall level of numeracy mastery still needs to be improved. One of the reasons is the weak concept understanding and mathematical problem solving skills, which are important aspects in 21st century mathematics learning. Sociomathematical norms are rules of social interaction in mathematics classes that can encourage students to think critically, argue, and understand concepts more deeply. Based on this, this study aims to analyze the ability of concept understanding and problem solving in terms of sociomathematical norms that develop in the classroom.

Research Questions

How are students' conceptual understanding and mathematical problem-solving abilities viewed from the perspective of sociomathematical norms?

Research Objectives

To analyze students’ conceptual understanding and mathematical problem-solving abilities in terms of sociomathematical norms.

Significance of Study

Theoretical

- To broaden insights into the relationship between sociomathematical norms and students' conceptual understanding and mathematical problem-solving abilities.
- To provide a foundation for the development of learning theories centered on social interaction.

Practical

- To provide practical guidance for teachers in designing learning environments that support sociomathematical norms.
- To enhance students’ conceptual understanding and mathematical problem-solving abilities.
- To contribute to future research in the field of mathematics education.

Literature Review

A. Mathematics Instruction

Mathematics is the science of numbers, the relationships between numbers, and problem-solving procedures. It plays a crucial role in education by fostering logical, critical, and systematic thinking, as well as shaping students' character. Mathematics instruction is essential for developing higher-order thinking skills and preparing students to face real-world challenges.

B. Conceptual Understanding Ability

Conceptual understanding ability refers to an individual's capacity to comprehend and apply learned material, which facilitates the resolution of problems in mathematics learning. Indicators of this ability include: restating a concept in one's own words, classifying objects according to their attributes, providing examples and non-examples, utilizing specific procedures, and applying concepts to various contexts.

Literature Review

B. Problem-Solving Ability

Problem-solving is the core of mathematics learning. The problem-solving model used in this study is based on Polya's four stages: understanding the problem, devising a plan, carrying out the plan, and looking back. This ability is influenced by students' logical thinking skills, instructional strategies, motivation, and learning environment.

D. Sociomathematical Norms

Sociomathematical norms, which evolve from general social norms, are formed through interactions within the mathematics classroom. These norms encompass acceptable explanations, reasonable solutions, and efficiency in mathematical processes. The indicators include mathematical experience, mathematical explanations, mathematical differences, mathematical communication, mathematical effectiveness, and mathematical insight. Sociomathematical norms are essential for fostering a culture of mathematical thinking and enhancing problem-solving skills.

Methodology

Place & Time

This research was conducted at SMA Muhammadiyah Bangkinang Kota and was carried out from March to May 2025.

Type of Research

This research employs a **qualitative method** with a **descriptive design**

Population & Sample

Population : all students of class X-2 at Muhammadiyah Bangkinang Kota Senior High School (SMA).

Sample : Six students of class X-2 at SMA Muhammadiyah Bangkinang Kota (using purposive sampling technique).

Data

Data & Data Sources

- Primary Data
- Secondary Data

Instrument Validation

- Validity test
- Reliability test

Research Instruments

- Sociomathematical Norms Questionnaire
- Essay tesr
- Interview
- Documentation

Data Analysis Techniques

Data Collection

Data Analysis

Data Reduction

Research Results on Conceptual Understanding Ability

Description of Respondents' Responses to the Sociomathematical Norms Questionnaire

This study analyzed the sociomathematical norms of 32 students of class X IPA-3 SMA Muhammadiyah Bangkinang Kota using a 5-point Likert questionnaire, resulting in an average score of 76.385 (SD=11.281).

Table 4.1 Sociomathematical Norm Measurement Categories

Kategori	Rumus
Tinggi	$M + SD \leq Skor$
Sedang	$M - SD \leq Skor < M + SD$
Rendah	$Skor < M - SD$

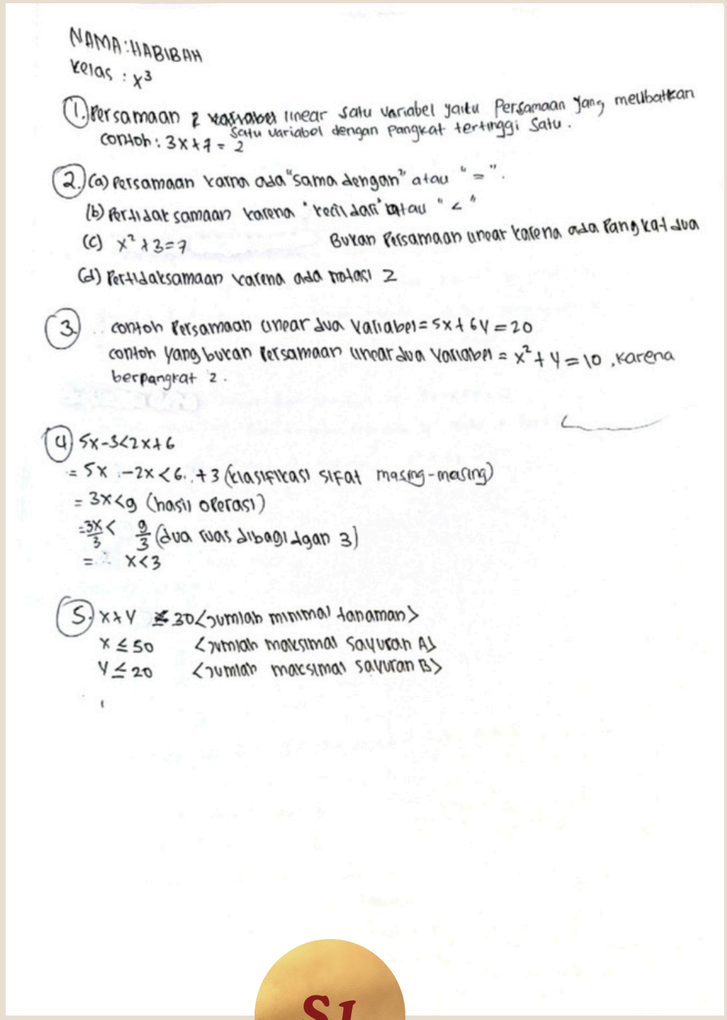
Table 4.2 Distribution of Sociomathematical Norm Levels

Kategori	Rumus	Frekuensi
Tinggi	$71{,}5 \leq Skor$	3
Sedang	$47{,}6 \leq Skor < 71{,}5$	26
Rendah	$Skor < 47{,}6$	3

Table 4.3 Research Subject Data

No.	Nama Siswa	Kategori	Kode	Skor
1.	BSN	Tinggi	S-1	85
2.	HB	Tinggi	S-2	85
3.	MA	Sedang	S-3	59
4.	SRA	Sedang	S-4	59
5.	IM	Rendah	S-5	37
6.	KA	Rendah	S-6	28

Student answers in the high sociomathematical norm category



NAMA : HABIBAH
Kelas : X3

1. Persamaan 2 variabel linear satu variabel yaitu persamaan yang melibatkan satu variabel dengan pangkat tertinggi satu.
   contoh : 3x + 7 = 2

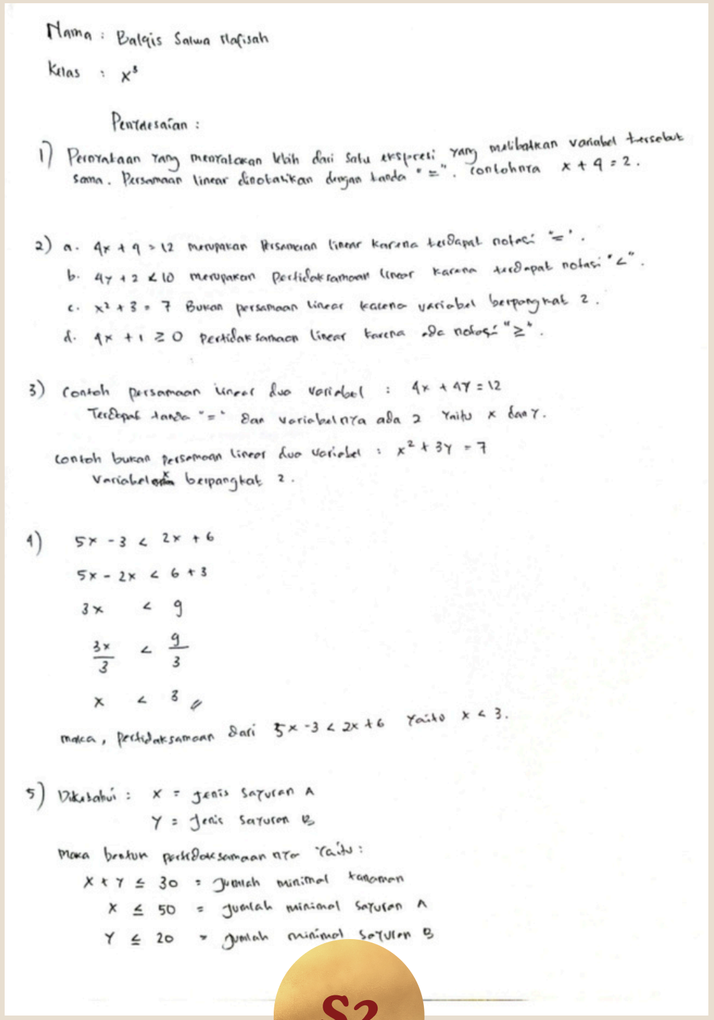
2. (a) Persamaan karna ada "sama dengan" atau "=".
   (b) Pertidaksamaan karena "kecil dari" atau "<"
   (c) $x^2 + 3 = 7$ Bukan Persamaan linear karena ada pangkat dua
   (d) Pertidaksamaan karena ada notasi ≥

3. contoh Persamaan linear dua Variabel = 5x + 6y = 20
   contoh yang bukan persamaan linear dua variabel = $x^2 + y = 10$, karena berpangkat 2.

4. 5x - 3 < 2x + 6
   = 5x - 2x < 6 + 3 (klasifikasi sifat masing-masing)
   = 3x < 9 (hasil operasi)
   = $\frac{3x}{3} < \frac{9}{3}$ (dua ruas dibagi dgn 3)
   = x < 3

5. x + y ≤ 30 <jumlah minimal tanaman>
   x ≤ 50 <jumlah maksimal sayuran A>
   y ≤ 20 <jumlah maksimal sayuran B>

S1



Nama : Balqis Salwa Nafisah
Kelas : X3

Pertanyaan :

1) Persamaan yang menyatakan lebih dari satu ekspresi yang melibatkan variabel tersebut sama. Persamaan linear dinotasikan dengan tanda "=". contohnya x + 9 = 2.

2) a. 4x + 9 = 12 merupakan Persamaan linear karena terdapat notasi "=".
   b. 4y + 2 ≤ 10 merupakan pertidaksamaan linear karena terdapat notasi "≤".
   c. $x^2 + 3 = 7$ Bukan persamaan linear karena variabel berpangkat 2.
   d. 4x + 1 ≥ 0 pertidaksamaan linear karena ada notasi "≥".

3) contoh persamaan linear dua variabel : 4x + 4y = 12
   Terdapat tanda "=" dan variabelnya ada 2 yaitu x dan y.
   contoh bukan persamaan linear dua variabel : $x^2 + 3y = 7$
   variabelnya berpangkat 2.

4) 5x - 3 < 2x + 6
   5x - 2x < 6 + 3
   3x < 9
   $\frac{3x}{3} < \frac{9}{3}$
   x < 3
   maka, pertidaksamaan dari 5x - 3 < 2x + 6 yaitu x < 3.

5) Diketahui : x = jenis sayuran A
   y = jenis sayuran B
   Maka bentuk pertidaksamaan nya yaitu :
   x + y ≤ 30 = jumlah minimal tanaman
   x ≤ 50 = jumlah minimal sayuran A
   y ≤ 20 = jumlah minimal sayuran B

S2

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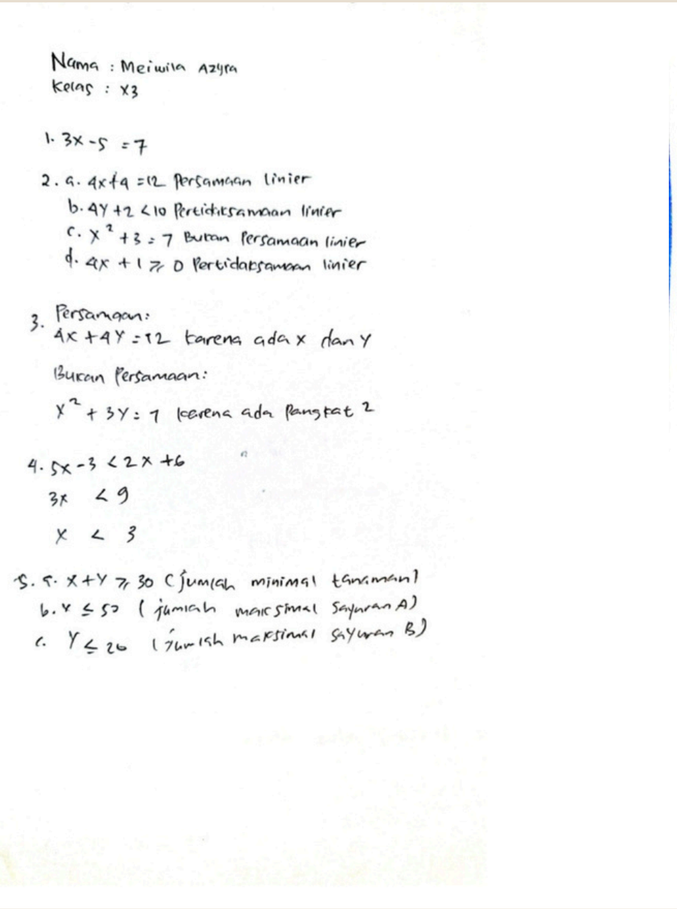
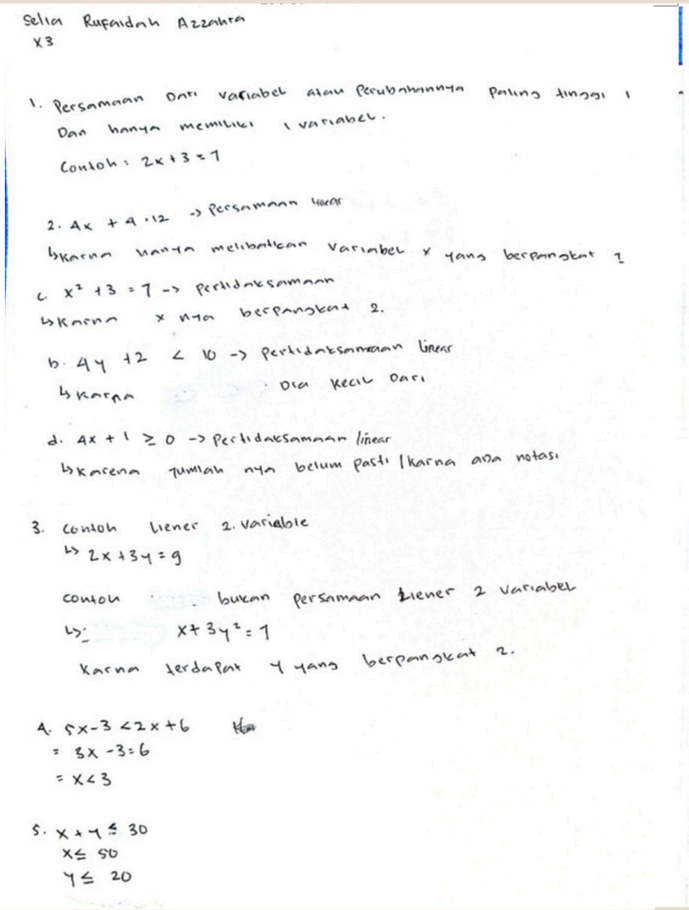
Student answers in the medium and low sociomathematical norm categories



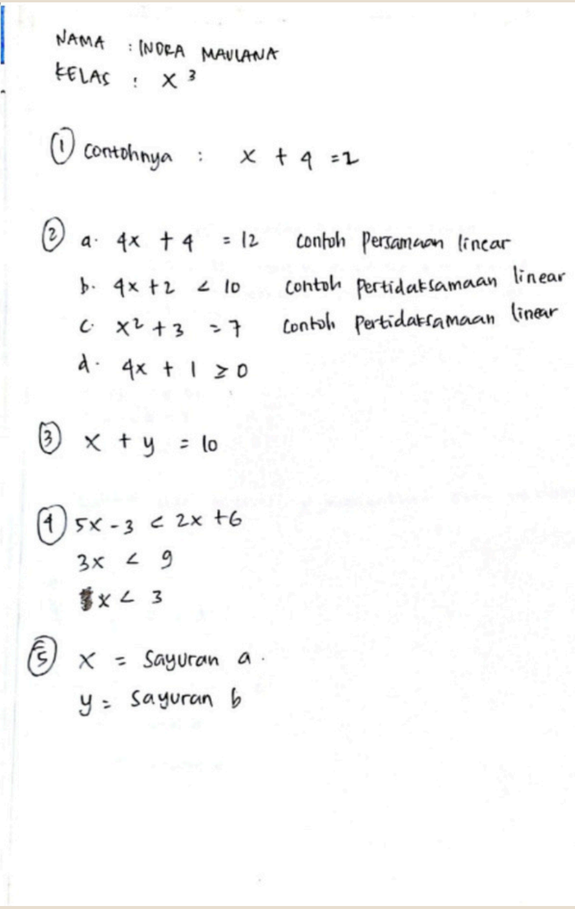
Nama : Meiwita Azyra
Kelas : X3

1. $3x - 5 = 7$
2. a. $4x + 4 = 12$ Persamaan linier
   b. $4y + 2 < 10$ Pertidaksamaan linier
   c. $x^2 + 3 = 7$ Bukan Persamaan linier
   d. $4x + 1 \geq 0$ Pertidaksamaan linier
3. Persamaan:
   $4x + 4y = 12$ karena ada x dan y
   Bukan Persamaan:
   $x^2 + 3y = 7$ karena ada pangkat 2
4. $5x - 3 < 2x + 6$
   $3x < 9$
   $x < 3$
5. a. $x + y \geq 30$ (jumlah minimal tanaman)
   b. $x \leq 50$ (jumlah maksimal sayuran A)
   c. $y \leq 20$ (jumlah maksimal sayuran B)



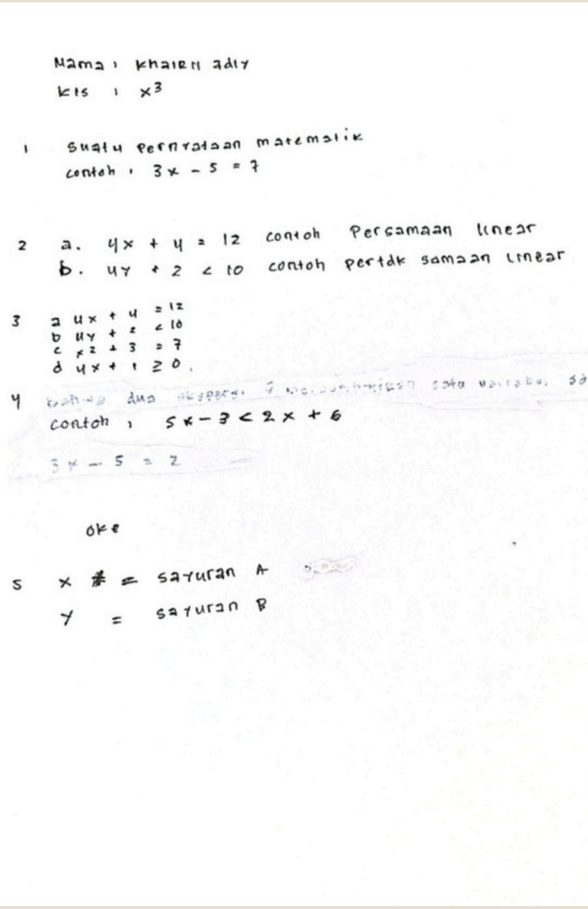
Selira Rufaidah Azzahra
X3

1. Persamaan dari variabel atau perubahannya paling tinggi 1 dan hanya memiliki 1 variabel.
   Contoh: $2x + 3 = 7$
2. $4x + 4 = 12$ -> persamaan linear
   karena hanya melibatkan variabel x yang berpangkat 1
   c. $x^2 + 3 = 7$ -> pertidaksamaan
   karena x nya berpangkat 2.
   b. $4y + 2 < 10$ -> pertidaksamaan linear
   karena ... dia kecil dari
   d. $4x + 1 \geq 0$ -> pertidaksamaan linear
   karena jumlah nya belum pasti karna ada notasi
3. contoh linear 2 variable
   $2x + 3y = 9$
   contoh ... bukan persamaan linear 2 variabel
   $x + 3y^2 = 7$
   karna terdapat y yang berpangkat 2.
4. $5x - 3 < 2x + 6$
   $= 3x - 3 = 6$
   $= x < 3$
5. $x + y \leq 30$
   $x \leq 50$
   $y \leq 20$



NAMA : INDRA MAULANA
KELAS : X 3

1. contohnya : $x + 4 = 2$
2. a. $4x + 4 = 12$ contoh Persamaan linear
   b. $4x + 2 < 10$ contoh pertidaksamaan linear
   c. $x^2 + 3 = 7$ contoh Pertidaksamaan linear
   d. $4x + 1 \geq 0$
3. $x + y = 10$
4. $5x - 3 < 2x + 6$
   $3x < 9$
   $x < 3$
5. x = Sayuran a
   y = Sayuran b



Nama : khairil adly
kls : X3

1. suatu pernyataan matematik
   contoh : $3x - 5 = 7$
2. a. $4x + 4 = 12$ contoh Persamaan linear
   b. $4x + 2 < 10$ contoh pertak samaan linear
3. a $4x + 4 = 12$
   b $4y + z < 10$
   c $x + 3 = 7$
   d $4x + 1 \geq 0$
4. contoh : $5x - 3 < 2x + 6$
   $3x - 5 = 2$
   oke
5. x # = sayuran A
   y = sayuran B

S3 S4 S5 S6

Research Results on Problem Solving Ability

Description of Respondents' Responses to the Sociomathematical Norms Questionnaire

This study analyzed the sociomathematical norms of 27 students of class X IPA-2 SMA Muhammadiyah Bangkinang Kota using a 5-point Likert questionnaire, resulting in an average score of 75.185 (SD=11.281).

Table 4.1 Sociomathematical Norm Measurement Categories

Kategori	Rumus
Tinggi	$x \geq \bar{x} + SD$
Sedang	$\bar{x} - SD \leq x < \bar{x} + SD$
Rendah	$x < \bar{x} - SD$

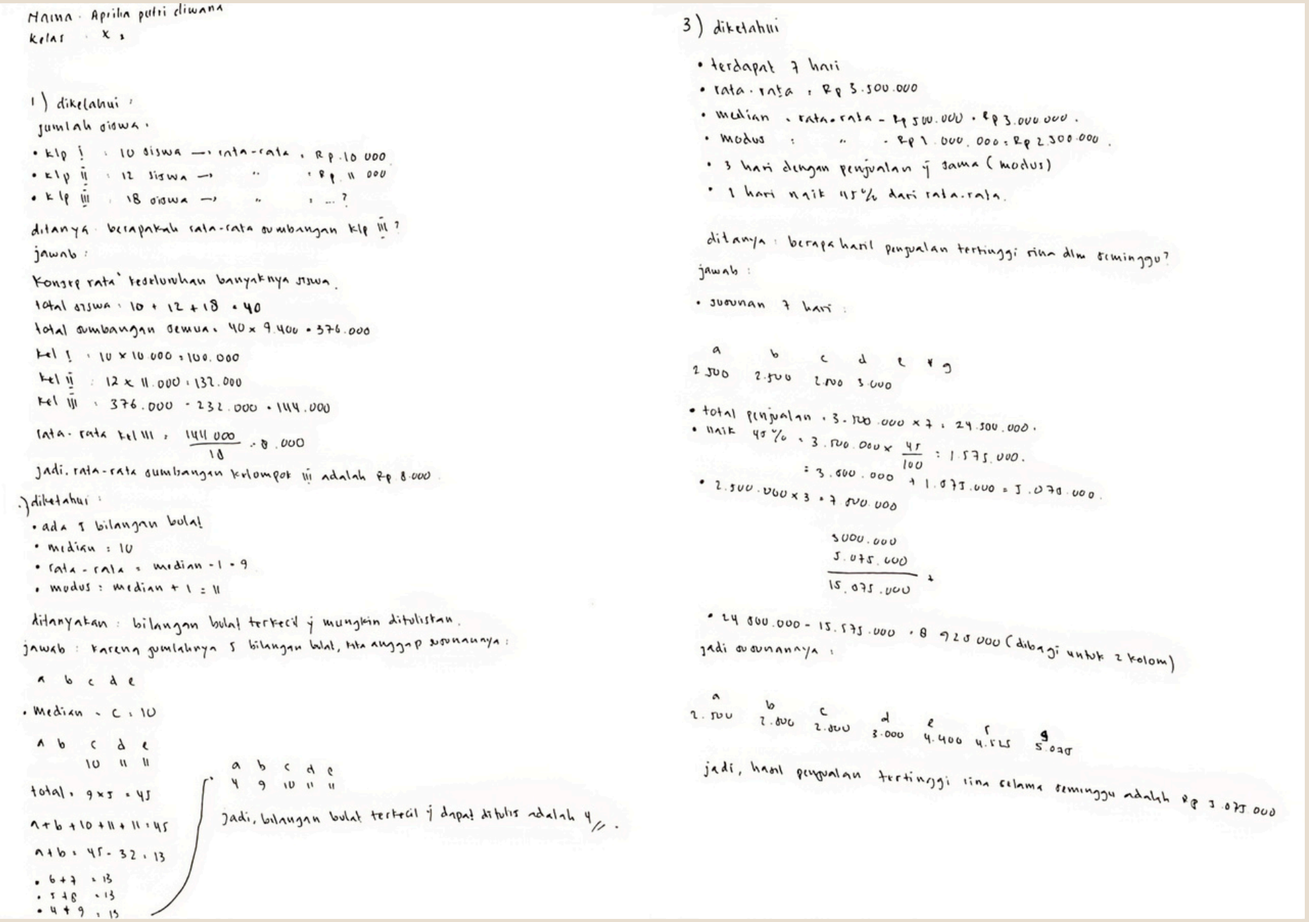
Table 4.2 Distribution of Sociomathematical Norm Levels

Kategori	Kriteria	Frekuensi
Tinggi	$x \geq 86.466$	2
Sedang	$63.904 \leq x < 86.466$	21
Rendah	$x \leq 63.904$	4

Table 4.3 Research Subject Data

No	Nama	Kode	Kategori
1	APD	T1	Tinggi
2	FKN	T2	Tinggi
3	FAS	S1	Sedang
4	SP	S2	Sedang
5	MA	R1	Rendah
6	NS	R2	Rendah

Student answers in the high sociomathematical norm category



Nama : Aprilia putri diswana
Kelas : X 3

1) diketahui :
jumlah siswa :
- klp I : 10 siswa → rata-rata : Rp.10.000
- klp II : 12 siswa → " : Rp.11.000
- klp III : 18 siswa → " : ... ?

ditanya berapakah rata-rata sumbangan klp III ?
jawab :
Konsep rata² tersebutkan banyaknya siswa.
total siswa : 10 + 12 + 18 = 40
total sumbangan semua : 40 x 9.400 = 376.000
kel I : 10 x 10.000 = 100.000
kel II : 12 x 11.000 = 132.000
kel III : 376.000 - 232.000 = 144.000
rata-rata kel III : $\frac{144.000}{18}$ = 8.000
Jadi, rata-rata sumbangan kelompok III adalah Rp 8.000

2) diketahui :
- ada 5 bilangan bulat
- median : 10
- rata-rata = median - 1 = 9
- modus : median + 1 = 11

ditanyakan : bilangan bulat terkecil yg mungkin dituliskan.
jawab : karena jumlahnya 5 bilangan bulat, kita anggap susunannya :

a b c d e
- Median = C = 10

a b c d e
10 11 11

total = 9 x 5 = 45
a+b+10+11+11 = 45
a+b = 45 - 32 = 13
- 6+7 = 13
- 5+18 = 13
- 4+9 = 13

a b c d e
4 9 10 11 11

Jadi, bilangan bulat terkecil yg dapat ditulis adalah 4 //.

3) diketahui
- terdapat 7 hari
- rata-rata : Rp 3.500.000
- median : rata-rata = Rp 500.000 = Rp 3.000.000
- modus : " = Rp 1.000.000 = Rp 2.500.000
- 3 hari dengan penjualan yg sama (modus)
- 1 hari naik 45% dari rata-rata

ditanya : berapa hasil penjualan tertinggi rina dlm seminggu?
jawab :
- susunan 7 hari :

a b c d e f g
2.500 2.500 2.500 3.000

- total penjualan = 3.500.000 x 7 = 24.500.000
- naik 45% = 3.500.000 x $\frac{45}{100}$ = 1.575.000
= 3.000.000 + 1.075.000 = 5.075.000
- 2.500.000 x 3 = 7.500.000

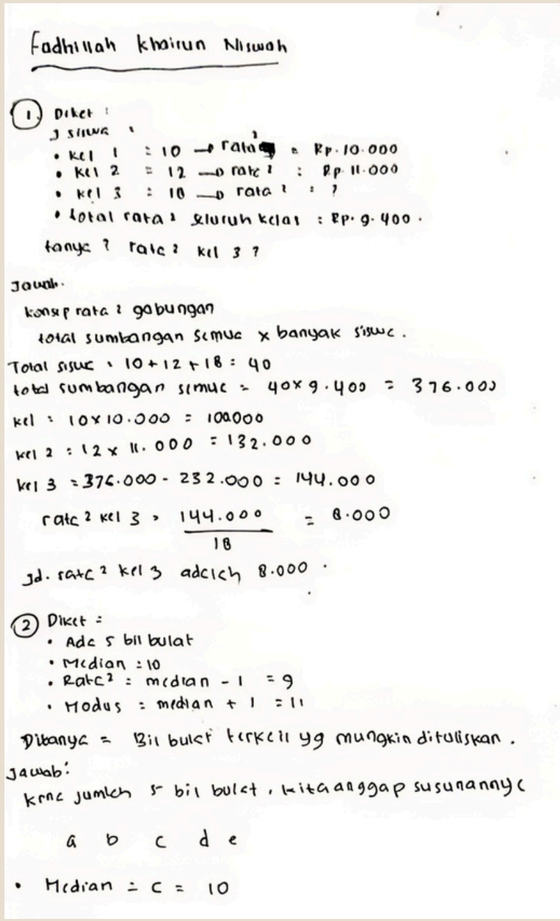
3000.000
5.075.000 +
15.075.000

- 24.000.000 - 15.575.000 = 8.925.000 (dibagi untuk 2 kolom)

jadi susunannya :

a b c d e f g
2.500 2.500 2.500 3.000 4.400 4.525 5.075

jadi, hasil penjualan tertinggi rina selama seminggu adalah Rp 5.075.000



Fadhillah khairun Niswah

1) Diket :
3 siswa
- kel 1 : 10 → rata² = Rp.10.000
- kel 2 : 12 → rata² : Rp 11.000
- kel 3 : 18 → rata² : ?
- total rata² seluruh kelas : Rp. 9.400.

tanya ? rata² kel 3 ?

Jawab.
konsp rata² : gabungan
total sumbangan semua x banyak siswa.
Total siswa = 10+12+18 = 40
total sumbangan semua = 40 x 9.400 = 376.000
kel 1 = 10 x 10.000 = 100000
kel 2 = 12 x 11.000 = 132.000
kel 3 = 376.000 - 232.000 = 144.000
rata² kel 3 = $\frac{144.000}{18}$ = 8.000
Jd. rata² kel 3 adalah 8.000.

2) Diket :
- Ada 5 bil bulat
- Median = 10
- Rata² = median - 1 = 9
- Modus = median + 1 = 11

Ditanya = Bil bulat terkecil yg mungkin ditulisakan.
Jawab:
krn jumlah 5 bil bulat, kita anggap susunannya

a b c d e
- Median = C = 10

a b c d e
10 11 11

total = 9 x 5 = 45
a+b+10+11+11 = 45
a+b = 45 - 32 = 13
- 6+7 = 13
- 5+18 = 13
- 4+9 = 13

a b c d e
4 9 10 11 11

Jd, bil bulat terkecil yg dpt ditulis adalah 4.

3) Diket :
- terdapat 7 hari
- Rata² = RP 3.500.000
- Median : Rata² - Rp.500.000 = Rp. 3.000.000
- Modus = " - Rp.1.000.000 = Rp. 2.500.000
- 3 hari dng penjualan yg sama (modus)
- 1 hari naik 45% dr rata² 2

Ditanya : hasil penjualan tertinggi rina dlm seminggu ?
Jawab :
- susunan 7 hari

a b c d e f g
2.500.000 2.500.000 2.500.000 3.000.000

- total = 3.500.000 x 7 = 24.000.000
- Naik 45% = 3.500.000 x $\frac{45}{100}$ = 1.575.000
= 3.500.000 + 1.575.000 = 5.075.000
- 2.500.000 x 3 = 7.500.000

3.000.000
5.075.000 +

- 24.000.000 - 15.575.000 = 15.575.000
8.925.000 (bagi 2 kolom)

Jd, susunannya.

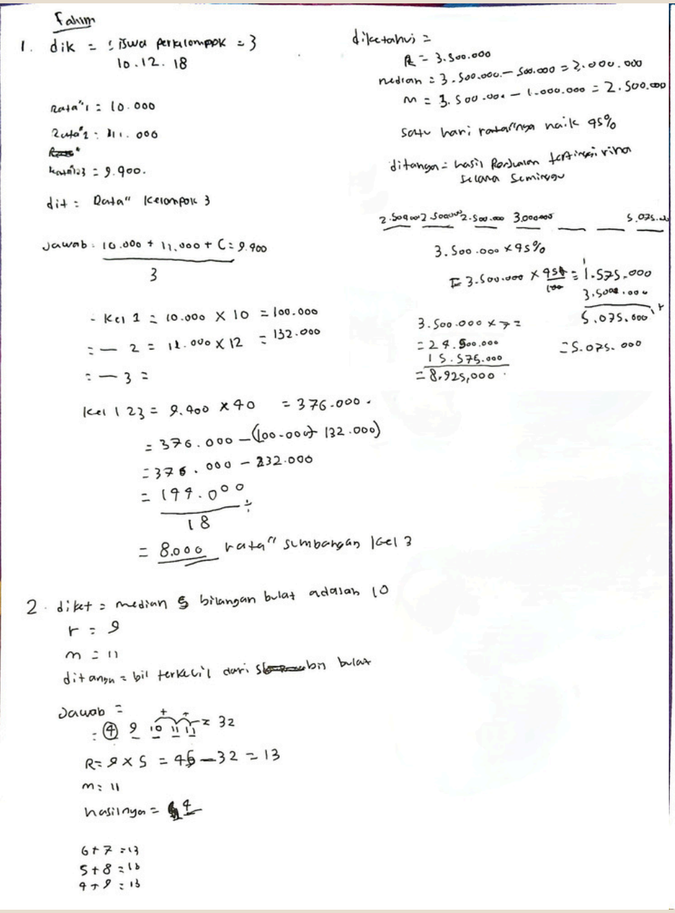
a b c d e f g
500.000 2.500.000 2.500.000 3.000.000 4.400.000 4.525.000 5.075

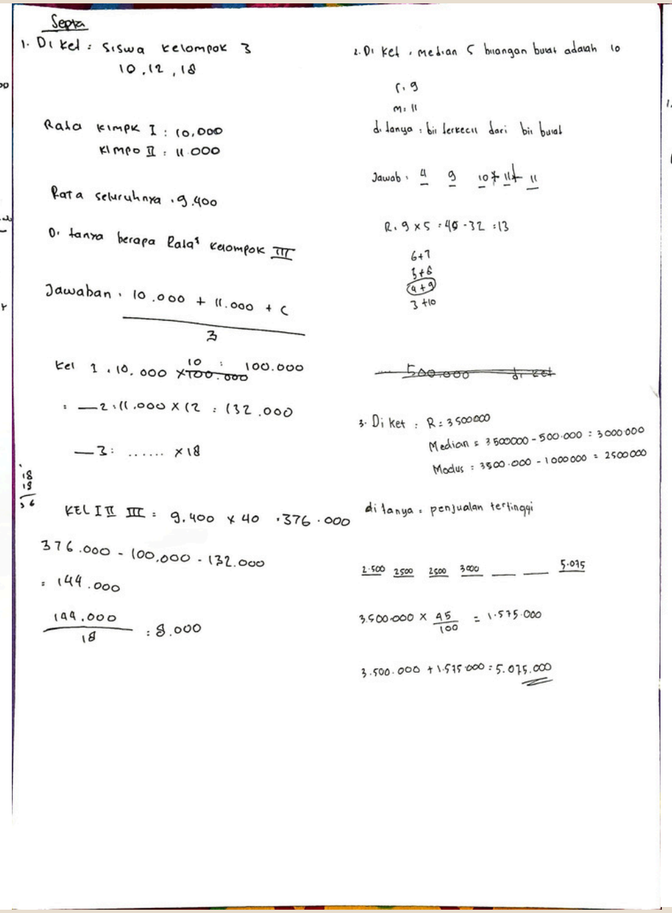
Jd, hasil tertinggi seminggu = Rp. 5.075.000

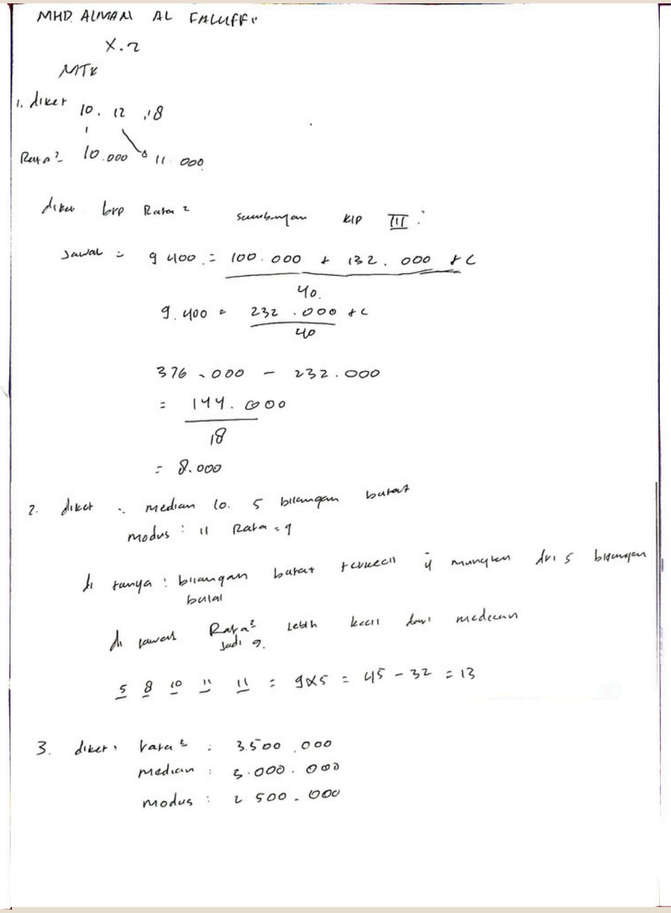
T1

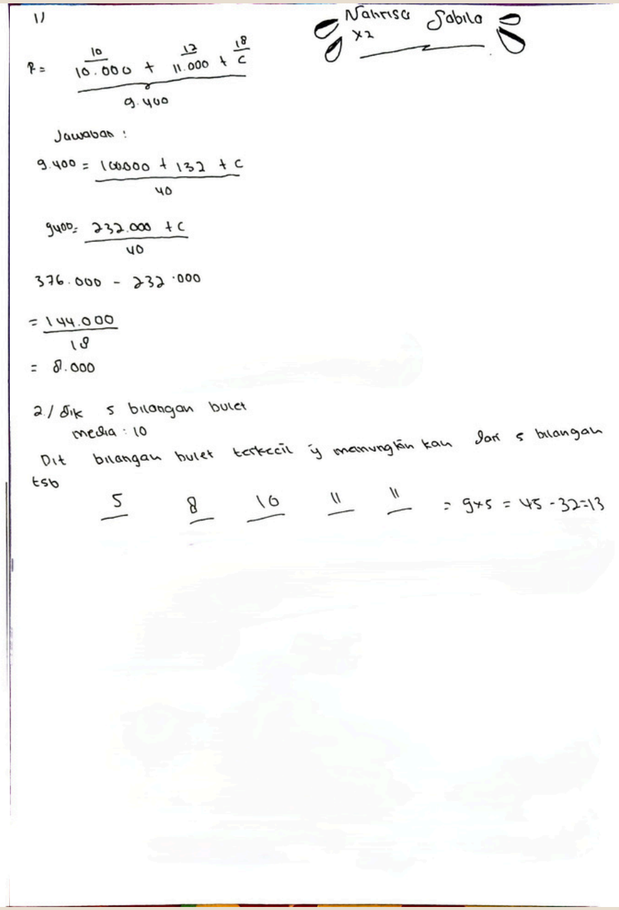
T2

Student answers in the medium and low sociomathematical norm categories









S1 S2 R1 R2

Description of Test and Interview Results

1. Students with high sociomathematical norms

Demonstrates excellent conceptual understanding.

- Able to explain concepts in one's own words
- Able to give reasons and compare solutions
- Able to provide relevant examples and non-examples
- Can use efficient procedures and relate concepts to real life situations

In terms of problem-solving, students were able to complete all stages well.

- Understanding the problem
- plan completion
- implement the plan
- review the results
- Their explanations during the interview were structured, coherent, and logical, reflecting strong mathematical communication skills.

2. Students with Medium Sociomathematical Norms

Demonstrates the ability to understand concepts quite well, but not yet consistently and comprehensively.

- Able to explain some concepts able to give reasons
- Be able to compare solutions and examples,
- Explanations are often incomplete or inefficient,
- Linking concepts to real life is also not accompanied by strong mathematical expressions.

The problem solving abilities of students in this category appear to be adequate on low to medium level questions, with the stages of understanding, planning and implementing the solution being carried out quite well. However, they had difficulty with more complex questions, especially in reviewing results and explaining their thinking processes systematically.

3.Students with Low Sociomathematical Norms

Demonstrates weak concept understanding abilities.

- Unable to explain concepts in his own language
- Unable to distinguish relevant concepts tend to just copy the solution form without understanding the procedure
- Their explanation of contextual experiences is also very limited.

Problem solving abilities are also relatively low. Difficulty understanding the problem Not able to plan the solution well Inability to carry out plans properly No, don't re-check Interviews revealed weak mathematical communication as well as irregularities in conveying thought processes.

Conclusion

This research shows that there is a significant positive correlation between sociomathematical norms and mathematics learning ability. In general, it can be concluded that the higher the sociomathematical norms that students have, the better their ability to understand concepts and solve problems. Meanwhile, students with low sociomathematical norms tend to have limitations in understanding and applying concepts, and are weak in problem solving strategies. solve mathematical problems logically, systematically and communicatively.

THANK YOU!

PROGRAM BOOK SEMIRATA 2025

The 8th International Conference of Science and Technology (ICST)

"Science and Artificial Intelligence for Life Resilience and Sustainable Development"

Pekanbaru, July, 18th-20th 2025

Organized by:
FMIPA - FKIP Universitas Riau

Supported by:

CONTENTS

ABOUT SEMIRATA AND THE 8TH ICST 2025

The rapid advancement of science and technology, along with global challenges in sustainability, calls for stronger academic collaboration and dissemination of scientific innovation. In response to this need, we are pleased to present the **Seminar Nasional Rapat Tahunan (Semirata) BKS Barat** and the **International Conference on Science and Technology (ICST)** as a joint platform for academics, researchers, and practitioners from Western Indonesia Higher Education Institutions (BKS PTN Barat) and international communities.

Semirata BKS Barat, initiated as a forum for academic exchange and institutional collaboration among Western Indonesia's public universities, has grown significantly over the years. It serves not only as a coordination meeting for scientific and educational development but also as a catalyst for multidisciplinary research and networking across institutions.

Meanwhile, the **International Conference on Science and Technology (ICST)** continues to be a pivotal venue for presenting cutting-edge research in the fields of science, engineering, and technology. With participants from various countries, ICST promotes the integration of scientific innovation into real-world applications, aiming to support global sustainable development.

Starting from this year, the integration of Semirata BKS Barat and ICST reflects our commitment to bridging national and international academic communities under a shared vision **"**Science and Technology for Sustainability and Regional Advancement**."** This collaborative platform invites researchers, educators, and professionals from diverse fields Natural Sciences, Engineering, Environmental Studies, and Education to present their work, engage in meaningful dialogue, and contribute to regional and global progress.

Scope:

1. Mathematics and Statistics
2. Physics and its Applications
3. Biology and Biodiversity
4. Computer Science
5. Information Systems
6. Biomaterial and Natural Product
7. Mathematics and Science Educations
8. Chemistry and Enviromental Science

WELCOME MESSAGE FROM THE RECTOR OF RIAU UNIVERSITY

Assalamualaikum Warahmatullahi Wabarakatuh,

With great pride, I extend a warm welcome to all participants and distinguished guests attending SEMIRATA, organized by the Faculty of Mathematics and Natural Sciences (FMIPA) and the Faculty of Education and Teacher Training (FKIP) of Universitas Riau. This event is a testament to our shared commitment to advancing knowledge and technology through cross-institutional collaboration.

SEMIRATA, which stands for the National Seminar on Research and Technology, has become an important platform for academics, researchers, and practitioners to exchange knowledge, experiences, and innovations in various fields. This event not only strengthens academic networks but also fosters the creation of creative solutions that can positively impact society.

I hope that through SEMIRATA, we can broaden our perspectives, deepen our understanding, and reinforce our commitment to building a better and sustainable educational world. May this event bring the greatest benefits to all of us and serve as the beginning of closer cooperation in the future.

Wishing you all the best as you participate in SEMIRATA. May it be a success and bring blessings to us all.

Wassalamualaikum Warahmatullahi Wabarakatuh.

Rector of Universitas Riau

Prof. Dr. Sri Indarti, S.E., M.Si.

WELCOMING MESSAGE FROM THE DEAN OF MATHEMATICS AND SCIENCES FACULTY

Assalamu'alaikum Warahmatullahi Wabarakatuh,

Peace and blessings be upon you all.

It is with great honor and pleasure that I welcome you to the SEMIRATA 2025 and the 8th International Conference of Science and Technology (ICST), hosted by the Faculty of Mathematics and Natural Sciences in collaboration with the Faculty of Education, Universitas Riau.

This annual gathering brings together distinguished scholars, researchers, practitioners, and students from SEMIRATA member institutions and beyond, fostering collaboration and the exchange of scientific ideas. This year's theme, "Science and Artificial Intelligence for Life Resilience and Sustainable Development" reflects our shared commitment to addressing global challenges through innovation and interdisciplinary research.

I extend my sincere appreciation to all keynote speakers, participants, and the organizing committee for their dedication and contributions. May this conference be a meaningful platform for academic growth, partnership, and impactful discoveries.

Welcome to SEMIRATA 2025. I wish you all a successful and inspiring conference.

Wassalamu'alaikum Warahmatullahi Wabarakatuh.

Dean, Faculty of Mathematics and Natural Sciences Riau University

Dr. Syamsudhuha, M.Sc.

WELCOMING MESSAGE FROM THE CHAIRPERSON OF SEMIRATA 2025

Assalamu'alaikum Warahmatullahi Wabarakatuh,

I would like to extend a warm welcome to all distinguished guests, keynote speakers, participants, and colleagues from various universities. It is an honor for us to host the **2025** SEMIRATA Annual Meeting and the 8th International Conference of Science and Technology (ICST) here at Universitas Riau**.**

This event is a collaborative platform that brings together experts, educators, researchers, and students from SEMIRATA member institutions and beyond. With the theme "Science and Artificial Intelligence for Life Resilience and Sustainable Development," this year's conference aims to address global issues through scientific innovation and interdisciplinary collaboration.

We believe that knowledge must transcend boundaries. Through this event, we encourage all participants to share ideas, engage in critical discussions, and establish meaningful academic networks. We are confident that this forum will contribute significantly to advancing science and technology in the region and globally.

I would like to express my sincere appreciation to all keynote speakers, authors, session chairs, participants, and especially the organizing teams—both academic and technical—for their hard work and commitment.

Enjoy the conference. May it inspire fruitful research, constructive dialogue, and enduring cooperation.

Wassalamu'alaikum Warahmatullahi Wabarakatuh.

Chairperson of the SEMIRATA 2025

Dr. Imran M., M.Sc.

WELCOMING MESSAGE FROM THE CHAIRPERSON OF THE SEMIRATA 2025 SEMINAR TEAM

Assalamualaikum Warahmatullahi Wabarakatuh,

It is with great honor and deep gratitude that I welcome all esteemed guests, participants, researchers, and academics from various institutions and countries to SEMIRATA 2025**,** in conjunction with The 8th International Conference of Science and Technology (ICST)**.** This annual gathering serves not only as a scientific forum but also as a momentum to strengthen collaboration, share knowledge, and respond to global challenges through the power of science and technology.

This year's theme, "Science and Artificial Intelligence for Life Resilience and Sustainable Development", reflects our shared vision to explore and integrate technological innovation in building a more sustainable and adaptive future. In this fast-changing era, collaboration across disciplines and institutions becomes essential. Therefore, this conference brings together scholars, educators, policymakers, and professionals to exchange insights and build networks that can lead to real-world impact.

I would like to extend my sincere appreciation to all parties involved in the success of this event, especially the organizing committee from the Faculty of Mathematics and Natural Sciences and the Faculty of Education, Universitas Riau. I also express gratitude to all contributors—reviewers, authors, panelists, and volunteers—who have dedicated their time and expertise.

May this conference bring meaningful outcomes, new collaborations, and academic contributions that benefit society and future generations.

Wassalamualaikum Warahmatullahi Wabarakatuh.

Chairperson of the SEMIRATA 2025 Seminar Team

Prof. Dr. Fitmawati, M.Si.

BIOGRAPHY OF KEYNOTE SPEAKERS

1. Prof. Brian Yuliarto, S.T., M.Eng., Ph.D.

Prof. Dr. Eng. Brian Yuliarto, S.T., M.Eng., Ph.D. is a distinguished Indonesian scientist, professor, and academic leader known for his groundbreaking work in nanotechnology, environmental sensing, and applied physics. As of 2025, he serves as the Minister of Higher Education, Science, and Technology (Mendiktisaintek) of the Republic of Indonesia.

Education

- Bachelor's Degree: Engineering Physics – Institut Teknologi Bandung (ITB), 1999
- Master of Engineering (M.Eng): Quantum Engineering and System Science – The University of Tokyo, Japan, 2002
- Ph.D. in Engineering: The University of Tokyo, Japan, 2005

Academic Career & Research

Prof. Brian Yuliarto, S.T., M.Eng., Ph.D., is a leading expert in nanomaterials and sensor technology at Institut Teknologi Bandung (ITB). After earning his Ph.D. in Quantum Engineering from the University of Tokyo and completing a postdoctoral fellowship at AIST Japan, he joined ITB in 2006. He leads the Advanced Functional Materials Laboratory, focusing on environmental sensors, biosensors, supercapacitors, and renewable energy technologies.

Research Focus

Prof. Brian's research focuses on:

- Nanomaterials and functional materials.
- Gas sensors and biosensors for early disease detection (e.g., cancer, dengue, hepatitis).
- Environmental sensing for hazardous pollutants.
- Energy materials and sustainability.

Leadership & Honors

- The Minister of Higher Education, Science, and Technology (from 2025).
- Vice Rector for Research and Innovation, Institut Teknologi Bandung (ITB) (2025–2029)
- Head of the Engineering Physics Study Program Director of the Advanced Functional Materials and Nanoscience Center at ITB Vice Rector for Research and Innovation at ITB (from 2025).
- Dean, Faculty of Industrial Technology, ITB (2020–2024).
- Habibie Prize 2024 in Engineering Sciences.
- Named among the Top 2% Scientists in the World (Stanford University ranking, 2022–2024).

- Best Researcher Award – ITB (2021).
- Outstanding Lecturer Award – ITB (2017).
- Ranked in the Top 150 Indonesian Scientists by the AD Scientific Index.
- Chairman of the Muhammadiyah Branch in Cibeunying Kaler, Bandung.
- Head of Strategic Collaboration for Muhammadiyah West Java.

Policy & Public Engagement

Prof. Brian Yuliarto, S.T., M.Eng., Ph.D., is actively involved in shaping national science and technology policy, particularly in advancing Indonesia's research and innovation ecosystem. As ITB's Vice Rector for Research and Innovation (2025–2029) and a former Dean, he has played a key role in promoting the commercialization of research, strengthening university-industry partnerships, and fostering interdisciplinary innovation. Beyond academia, Prof. Brian frequently engages with government agencies, the National Research and Innovation Agency (BRIN), and international partners to align scientific advancement with sustainable development goals.

Personal Contact

Full Name : Prof. Brian Yuliarto, S.T., M.Eng., Ph.D.
Affiliation : Faculty of Industrial Technology at Institut Teknologi Bandung (ITB)
Email : brian@itb.ac.id

2. Prof. Dr. Eng. Kuwat Triyana, M.Si.

Prof. Dr. Eng. Kuwat Triyana, M.Si., is a distinguished Indonesian physicist and academic leader, best known for inventing the GeNose C19 breath analyzer during the COVID-19 pandemic. He currently serves as a full professor and the Dean of the Faculty of Mathematics and Natural Sciences at Universitas Gadjah Mada (UGM).

Education

- Bachelor's Degree: Physics – Universitas Gadjah Mada (UGM), 1991
- Master of Science (M.Si.): Instrumentation and Material Physics – Institut Teknologi Bandung (ITB), 1997
- Doctor of Engineering (Ph.D.): Physics – Kyushu University, Japan, 2001

Academic Career & Research

Prof. Dr. Eng. Kuwat Triyana, M.Si. has been a faculty member in the Department of Physics at UGM since the early 1990s. He has conducted extensive research in materials physics, instrumentation, and sensor technologies. His notable innovations include nanofiber-based masks, electronic noses and tongues for halal authentication and food safety, and the GeNose C19 device for detecting COVID-19 through breath analysis.

Research Focus

Prof. Dr. Eng. Kuwat's research focuses on:

- Artificial Intelligence-Based Sensor Systems
- Advanced Sensor Materials
- Nanofiber Materials via Electrospinning
- Quartz Crystal Microbalance (QCM) Sensors
- Biomedical and Healthcare Applications
- Food Safety and Halal Authentication
- Environmental Monitoring
- Product Authentication and Anti-Counterfeiting
- IoT-Integrated Sensor Platforms
- Innovation and Research Commercialization

Leadership & Honors

- Appointed as a full Professor in Physics at UGM in October 2023.
- Delivered his inaugural professorship speech titled "Innovation in Artificial Intelligence-Based Sensor Systems and Its Downstream Challenges."
- Dean of the Faculty of Mathematics and Natural Sciences, UGM, since 2021.
- UGM Award 2020 for outstanding service and innovation through GeNose.
- Recognized by the Materials Research Society of Indonesia (MRS-id) for contributions to materials science.
- Acknowledged for leadership in research commercialization and technology transfer in Indonesia.

Policy & Public Engagement

Prof. Dr. Eng. Kuwat Triyana, M.Si. plays a pivotal role in bridging scientific research with public policy and community impact in Indonesia. Prof. Kuwat also engages in national policy dialogues related to innovation, halal certification, and technology commercialization, often collaborating with ministries, including the Ministry of Health, Ministry of Education and Culture, and BRIN. In addition, he is actively involved in the Institute for Halal Industry and Systems (IHIS) at UGM and collaborates with international institutions in Japan and Southeast Asia.

Personal & Contact

Full Name : Prof. Dr. Eng. Ir. Kuwat Triyana, M.Si.
Affiliation : Department of Physics, FMIPA UGM
Email : triyana@ugm.ac.id

3. Dr. Berry Juliandi, S.Si., M.Si.

Dr. Berry Juliandi, S.Si., M.Si., is a renowned Indonesian neuroscientist, academic, and science communicator. He currently serves as the Dean of the Faculty of Mathematics and Natural Sciences (FMIPA) at IPB University, as well as the Acting Director of Learning and Student Affairs at the Ministry of Higher Education, Science, and Technology.

Education

- B.Sc. in Biology: IPB University, 1996–2000
- M.Sc. in Zoology: IPB University, 2004–2007
- Ph.D. in Molecular Neuroscience: Nara Institute of Science and Technology, Japan, 2008–2011

Academic Career & Research

Dr. Berry joined IPB University in 2001 as a lecturer in physiology and animal behavior. He leads the Animal Stem Cell Laboratory at the Center for Natural Resources & Biotechnology (PPSH-IPB). He has served as a research fellow in Japan at Nara Institute and Kyushu University. He became an Associate Professor at IPB in 2022 and has been the Editor-in-Chief of HAYATI – Journal of Biosciences since 2014.

Research Focus

His research focuses on molecular neuroscience and stem cell biology. He is a pioneer in using reprogrammed stem cells to generate neurons for therapy of spinal cord injuries and osteoarthritis. He also investigates the use of Indonesian herbal compounds to enhance memory through neurogenesis in the hippocampus.

Leadership & Honors

- Dean of FMIPA, IPB University (2021–2025), elected as youngest dean in 20 years
- Acting Director, Learning and Student Affairs, Ministry of Higher Education, since 2025
- Former Secretary-General of Indonesian Young Academy of Sciences (ALMI), 2018–2020
- Kavli Frontiers of Science Fellow (2012, 2017)
- Awarded by the World Federation of Science Journalists in 2019

Policy & Public Engagement

Dr. Berry is an active advocate for scientific literacy and policy reform. He has campaigned against criminalization of foreign researchers in national legislation and promotes accurate science communication. He has represented Indonesia as a speaker at events such as

AppliedHE Xchange 2025, and he frequently delivers lectures and seminars at national universities, focusing on research innovation and higher education strategies.

Personal Contact

Full Name : Dr. Berry Juliandi, S.Si., M.Si.
Affiliation : Faculty of Mathematics and Natural Sciences (FMIPA) at IPB University
Email : bjuliandi@apps.ipb.ac.id

TECHNICAL GUIDELINES

GENERAL TECHNICAL GUIDELINES

BLENDED MEETING

All events in this conference, including the opening ceremony, keynote sessions, parallel sessions, and the closing ceremony, will be conducted in a blended format (in-person and online via ZOOM virtual meeting). Please refer to the appendix for the list of offline rooms and the ZOOM links for the parallel sessions.

ZOOM virtual meeting link:

Date	Sessions	ZOOM ID, Passcode, and Link	Operator
19th July 2025	Opening Ceremony, Keynote Session, and Closing Ceremony	ID: 827 0950 0036 Passcode: 814624 Link:https://my.unri.ac.id/zoomsemirata2025	Zulkarnain

OFFICIAL LANGUAGE

The official language of *The 8th International Conference of Science and Technology (ICST) SEMIRATA BKS PTN Barat Bidang MIPA 2025* is English.

All presentations, including question-and-answer (Q&A) sessions, must be delivered in English.

CERTIFICATES

The Only authors who present their papers will receive a “Presenter” certificate.

Participants who attend all conference sessions will receive a “Participant” certificate.

PARTICIPANT TECHNICAL GUIDELINES

A. Opening Session and Main Seminar Session

1. All participants can choose to attend the main seminar session in offline meeting or online meeting.
2. Please follow the guidelines for offline meeting:
    a. The main seminar session will be held in the **"Meeting Room" at the Theater Integrated Class Room, Universitas Riau**.
    b. The conference program, including the rundown and room assignments, can be found in the **Program Book & Abstract 2025**, which has been sent to your registered email.
    c. All participants are required to register before entering the main seminar room.
    d. Participants attending offline are expected to arrive on time according to the event rundown.
    e. The moderator will select questions to be delivered to each keynote speaker, from both online and offline participants.
    f. The moderator has full authority to manage and conduct the conference.
3. Please follow these guidelines for online attendance:
    a. The application used for this international conference is **ZOOM virtual meeting**. If you are using a mobile phone, please download the ZOOM app from the Playstore/Appstore. If you are using a computer, make sure to download the application from the following link: http://zoom.us/download/.
    b. The conference program, including the rundown and access links for online sessions, can be found in the **Program Book & Abstract 2025**, which has been sent to your registered email.
    c. After joining the ZOOM virtual meeting, all participants are required to register or fill in the attendance form through the Google Doc provided by the committee in the ZOOM chat room. Login access for all presenters will be opened 30 minutes before the opening ceremony begins.
    d. Participants attending online are expected to join the main seminar room on time.
    e. Please rename your ZOOM account using the following format according to the room code: **(Room Code_Abstract Code_Presenter's Name)**. Example: **Room1_Syafrizal_USK**.
    f. Please change your virtual background after join the **ZOOM virtual meeting.**
    g. You are requested not to activate your microphone during the conference.
    h. During the sessions, participants may ask questions to keynote speakers using the Q&A feature in the ZOOM chat box with the following format: **Name_Institution_Question**.
    i. The moderator will select three (3) questions to be addressed to each keynote speaker, from both online and offline participants.
    j. The moderator has full authority to manage and conduct the conference.

B. Guidelines for Parallel Sessions

1. Presenters may choose to participate in the conference either offline or online.
2. Presenters will be assisted by the committee in displaying their PowerPoint (PPT) slides. The PPT file must be submitted prior to the conference through the following link:
3. Online participants are required to join the breakout rooms Zoom corresponding to the scope assigned by the committee.
4. Guidelines for Offline Participants:
    a. All participants will be directed to the designated presentation rooms according to their respective scopes.
    b. Each scope in the parallel sessions will be attended by invited presenters. These presenters may deliver their presentations either online or offline.
    c. The schedule, presentation order, and room allocation for offline parallel sessions can be found in the Program Book and Abstract 2025.
    d. Offline parallel sessions are divided into three parts:
        Session I : Invited presenters
        Sessions II & III : All presenters
        A Q&A session will be conducted after Sessions II and III.
    e. Each presentation is allocated 10 minutes, inclusive of Q&A.
    f. The session will be fully moderated, including the selection of participants permitted to raise questions or comments.

5. Guidelines for Online Participants:
    a. Online participants are required to attend all conference events, including the Opening Ceremony, Keynote Sessions, Parallel Sessions, and Closing Ceremony. All events will take place via the Main Zoom Virtual Meeting, except for the parallel sessions.
    b. The Zoom meeting link can be accessed in the Program Book and Abstract 2025.
    c. During the parallel sessions, participants will be assigned to breakout rooms based on their respective scopes.
    d. Participants must rename their Zoom account according to the following format:
        Format : Room Name_Abstract Code_Your Name
        E.g. : Tempuk Manggis 1_Bio-On-01_Nur Ikhlas Syuhada
    e. Participants must turn on their video and use the official virtual background, after join the Zoom Virtual Meeting.

f. Participants who are not presenting are prohibited from turning on their microphone, except during the Q&A session and only when permitted by the moderator.
g. The schedule, presentation order, and breakout room assignments for online parallel sessions can be found in the Program Book and Abstract 2025.
h. Each scope in the online parallel sessions will also feature invited presenters, who may present either online or offline.
i. Online parallel sessions are divided into two parts:

   Session I : Invited presenters

   Session II : All presenters

   A Q&A session will follow each presentation.
j. Each presentation is allocated 10 minutes, including Q&A.
k. The session will be fully moderated, including the facilitation of discussion and selection of participants allowed to respond or ask questions.

FULL RUNDOWN OF THE 8TH ICST 2025

Sabtu, 19 Juli 2025 *Saturday, July 19, 2025*	
TIME (WIB)	**AGENDAS**
07.00 – 08.00	Registrasi Peserta *Participants' Registration*
08.00 – 08.05	**Pembukaan** *Opening Ceremony: MC Khairiyah (akan dikonfirmasi)*
08.05 – 08.15	Menyanyikan Lagu Indonesia Raya *Singing the Indonesian National Anthem, "Indonesia Raya"*
08.15 – 08.30	Penampilan Tari Tradisional" *Malay Traditional Dance Performance: "Tari Persembahan"*
08.30 – 08.40	Laporan Ketua Panitia *Committee Chairperson Report: Dr.Imran*
08.40 – 08.50	Sambutan Ketua BKS PTN Barat Bidang MIPA *Welcome speech by the Head of BKS PTN West Region: Prof. Dr. Dede Djuhana*
08.50 – 09.00	Sambutan Rektor, Universitas Riau, sekaligus membuka secara resmi kegiatan SEMIRATA 2025 *Welcome speech by the Rector, Universitas Riau: Prof. Dr. Sri Indarti, as well as officially opening the* SEMIRATA BKS PTN Barat Bidang MIPA 2025
09.00 – 09.10	*Do'a* *Prayer: Septriawan Gusta, SE Ak.*
09.10 – 09.30	*Sesi foto* *Photo session lead by MC*
	Pengumuman Hasil Kompetisi Mahasiswa *Announcement of Student Competition Results: Lead by Prof Nerry Sofianti*
	Rehat *Coffee Break*
09.30 – 10.15	Pembicara Utama 1 Keynote Speaker 1: Prof Brian Yuliarto, S.T., M.Eng., PhD. *Ministry of Higher Education, Sciences, and Technology - Indonesia*
10.15 – 11.00	Pembicara Utama 2 *Keynote Speaker 2: Prof. Dr. Ir. Kuwat Triyana, MSi.* *Presentation Title:*
11.00 – 11.45	Pembicara Utama 3 *Keynote Speaker 3: Prof. Dr. Berri Juliandi, MSi* *Presentation Title*
11.45 – 12.15	Penandatanganan MoU Kerjasama *Signing of MoU of Cooperation: Lead by Dr.Mayta Novaliza, Vice Dean FMIPA UNRI for Collaboration and Students Affairs*
12.15 – 13.30	Istirahat, Solat, dan Makan Siang *Break, Pray, and Lunch*
13:30 – 17.00	Rapat Tahunan Dekan MIPA BKS PTN Barat Bidang MIPA

	Annual Meeting: Deans of MIPA BKS PTN West Region of Indonesia, lead by Dr.Syamsudhuha
13:30 – 17.00	Rapat Tahunan Ketua Jurusan/Ketua Program Studi *Annual Meeting: Heads of Departments and Study Programs, lead by semua Kajur di lingkungan FMIPA*
13:30 – 17.00	Rapat Pengelola Jurnal *Annual Meeting: Journal Managers, lead by Aidil Fitriansyah, MIT*
13:30 – 17.00	Sesi Paralel *Parallel Sessions*
	Room 1: Scope: Mathematics and Statistics 1. *Invited Speaker:* Assoc. Prof. Dr. Adibah Shuib, FIMA. (online) *Presentation title:* Two Stage Optimization using Adapted Preferences and Competency Based Models of Modified Hungarian Method (MHM) and Binary Integer Goal Programming (BIGP) Models in Lecturer-to-Courses Assignment Problem *Lead by* Prof. Dr. M. D. H. Gamal, M.Sc. 2. Paralel session **Mathematics and Statistics**
	Room 2: Scope: Chemistry and Environmental Sciences 1. *Invited Speaker:* Assoc. Prof. Hanan Hasan, Ph.D. *Presentation title:* Engineering the Future of Food: The Role of Biotechnology in Global Sustainability *Lead by* Dr.Yuli Hariani, M.Sc. 2. Paralel session **Chemistry and Environmental Science**
	Room 3: Scope: Physics 1. *Invited Speaker:* Assoc. Prof. Dr. Marlia binti Morsin *Presentation title:* Gold Nanoparticles for Sensing Applications, Fungi Treatment and Vector Control *Lead by* Prof. Dr. Iwantono, M.Sc. 2. Paralel session **Physics and Its Applications**
	Room 4: Scope: Computer Sciences 1. *Invited Speaker:* Prof. Dr. Azlan bin Mohd Zain (online) *Presentation title:* The Role of Artificial Intelligence (AI) in Computer Vision *Presentation title:* *Lead by* Rahmad Kurniawan, PhD. 2. Paralel session **Computer Sciences**
	Room 5: Scope: Education; 1. *Invited Speaker:* Prof. Dr. M. Nasir, M.Kom. *Presentation title:* Design and Implementation Smart Learning Used Case-Based Learning Model to improved Student Learning Result *Lead by* Dr.Fakhruddin 2. Paralel session **Education**
	Room 6: Scope: Biology 1. Paralel session **Education**
17:00 17.30	**Penutupan** ***Closing Ceremony***

19.00-22.00	***Gala Dinner (sedang dikonfirmasi Jumat atau Sabtu malam?)***
19.00 - 19.15	Sambutan Dekan Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Riau *Welcome speech by the Dean of Faculty of Mathematics and Natural Sciences, Universitas Riau*
19.15 – 19.25	*Do'a* *Prayer*
19.30 –22.00	Makan malam *Dinner*
Ahad, 20 Juli 2025 - Karyawisata ***Sunday, July 20, 2025 - Field Trip***	
TIME (WIB)	**AGENDAS**
6:00-18.00	Karyawisata dengan tujuan sebagai berikut: *Field trip with the following destinations*: Istana Kerajaan Siak

THE SCHEDULE OF THE PARALEL SESSION

1. Offline Parallel Session

Saturday, July 19th, 2025
Scope: Mathematics and Statistics
Room: Bunga Cengkih 2
Time: 13.30-17.00 (GMT 7+)
Moderator: Aziza Maslih, M.Si.
Operator: Ayu Irwahyuni

No.	Presenter	Title of abstract	Time
1	Assoc. Prof. Dr. Adibah Shuib, FIMA.	Presentation title: Two Stage Optimization using Adapted Preferences and Competency Based Models of Modified Hungarian Method (MHM) and Binary Integer Goal Programming (BIGP) Models in Lecturer-to-Courses Assignment Problem	13.30-13.50
2	Pebrudal Zanu	Matrix Lebesgue Spaces and Their Properties	13.50-14.00
3	Dea Lestari	Application of Seemingly Unrelated Regression on Random Effect Model Toward Factors Affecting Poverty in Riau Province	14.00-14.10
4	Salwa Sahira	Application of the Expectation Maximization Algorithm for Estimating Missing Data in Latin Square Design	14.10-14.20
5	Tania Marsha Dhanisa	Application of the Long Short-Term Memory Method for Temperature Prediction in Pekanbaru City	14.20-14.30
6.	Tata	Truncated Spline Nonparametric Regression Model for Analyzing Determinants of Senior High School Dropout Rate in North Sumatra	14.30-14.40
7.	Molli Wahyuni	Kemampuan Pemahaman Konsep Dan Pemecahan Masalah Siswa Ditinjau Dari Norma Sosiomatematis	14.40-14.50
8.	Arnellis	Mathematics Digital Module Based on Project Based Learning Integrated EthnoHots	13.50-14.00
9	Ramadhani Fitri	Analisis konsep f-Derivasi pada Pseudo BG-aljabar	14.00-14.10

Saturday, July 19th, 2025
Scope: Chemistry and Environmental Science
Room: Tempuk Manggis 9
Time: 13.30-17.00 (GMT 7+)
Moderator: Dr. Yuli Hariani
Operator: Heralda Fawrin

No.	Presenter	Title of abstract	Time
1.	Assoc. Prof. Hanan Hasan, Ph.D.	Engineering the Future of Food: The Role of Biotechnology in Global Sustainability	13.30-13.50
2.	Mukhlis	Effectiveness of *Acacia crassicarpa* Bark for Pb (II) Adsorption from Aqueous Solution	13.50-14.00
3.	Sri Helianty	Unleashing the Potential of Laccase Enzymes: A Guide to Producing Laccase by Trichoderma via Solid State Fermentation	14.00-14.10
4.	Fadhil Maulana Harahap	Adsorption of lead (Pb) onto a prepared bio-adsorbent from white jabon fruit (*Anthocephalus cadamba* Miq.)	14.10-14.20
5.	Muzayyinul Arifun	Magnetic Covalent Triazine Framework for Dye adsorption	14.30-14.40
6.	Zikri Arafi	Analysis of Composition and Characteristics of Adulterated Fuel Using Flash Point, GC-MS, and Viscosity Methods	14.40-14.50
7.	Putri Ayu	The Effect of Adsorbate Concentration and Temperature on the Adsorption of Safranin-O Dye by White Jabon Fruit Biosorbent	14.50-15.00
8.	Frederika Olivia	The Effect of Dosage, pH, and Contact Time of White Jabon Fruit Powder (Anthocephalus cadamba Miq.) on the Adsorption of Indigo Carmine Dye	15.00-15.10
9.	Viola Egis Pratiwi	Effectiveness of White Jabon Fruit Powder (Anthocephalus cadamba Miq.) as a Biosorbent for the Adsorption of Basic Fuchsin Dye	15.10-15.20
10	Esther Angelita Gurning	Effectiveness of *Acacia crassicarpa* Bark for Pb(II) Adsorption from Aqueous Solution	15.20-15.30

Saturday, July 19th, 2025
Scope: Physics and its Applications
Room: Tempuk Manggis 6
Time: 13.30-17.00 (GMT 7+)
Moderator: Zulkarnain
Operator: Putri Adita Wulandari

No.	Presenter	Title of abstract	Time
1	Assoc. Prof. Dr. Marlia binti Morsin		13.30-13.50
2	Aldy Syahputra	Analisis Pengaruh Fps Kamera Terhadap Hasil Deteksi Tingkat Kematangan Tbs Kelapa Sawit Berdasarkan Intensitas Rgb	13.50-14.00
3	Mita Virdina	Intensitas Rgb Varietas Dura Dan Tenera Menggunakan Computer Vision	14.00-14.10
4	Ola Noviza	Penggunaan Sensor Ultrasonik Untuk Membedakan Tingkat Kematangan Tandan Buah Segar Kelapa Sawit Varietas Dura Dan Tenera	14.10-14.20
5	Yohana Christia Navili	Analisis Nilai RGB untuk Membedakan TBS Kelapa Sawit Normal dan Cacat.	14.20-14.30
6	Eza Tirta Sari	Environmentally Friendly Activated Carbon from Local Biomass Sources as Supercapacitor Electrode Material	14.30-14.40
7	Meiyuli Simanullang	Utilization of Acacia Shell Waste as a Basic Material for Porous Activated Carbon for Environmentally Friendly Supercapacitor Applications	14.40-14.50
8	Nasywa Nur Aini	Performance Evaluation of Mangrove Charcoal-Based Activated Carbon for Eco-Friendly Energy Storage Devices	14.50-15.00
9	Septia Nursyahar	Development of Supercapacitor Electrode Materials Based on Mangrove Charcoal: ZnCl2 Activation and Thermal Heating Approach	15.00-15.10
10	Rahmawati Munir	Band Gap Engineering of Eggshell-Based Photocatalyst: A Green Approach to Wastewater Treatment	15.10-15.20
11	Syahrul Humaidi	Structural Properties of Activated Carbon-Based Electrodes Synthesized from Bidara Seeds (*Ziziphus mauritiana*)	15.20-15.30
12	Farid Amanullah	Penghitungan Jumlah Buah pada Tandan Buah Segar Kelapa Sawit Menggunakan Program *Imagej*	15.30-15.40

Saturday, July 19th, 2025
Scope: Computational & Simulation
Room: Bunga Cengkih 5
Time: 13.30-17.00 (GMT 7+)
Moderator: Rahmad Kurniawan, Ph.D.
Operator: Chairun Nas

No.	Presenter	Title of abstract	Time
1	Prof. Dr. Azlan bin Mohd Zain	The Role of Artificial Intelligence (AI) in Computer Vision	13.30-13.50
2	Prof. Dr. M. Nasir, M.Kom.	Design and Implementation Smart Learning Used Case-Based Learning Model to improved Student Learning Result	13.50-14.10
3	Muhammad Arif Rahman	Penggunaan Sensor Load Cell Untuk Mengukur Massa Tandan Buah Segar Kelapa Sawit Secara Otomatis	14.10-14.20
4	Tulus Na Duma	Study of Thermal and Electrical Properties of Bulk and Wire MgB2 Superconducting Materials Using First-Principles Density Functional Theory	14.20-14.30
5	Afiqa Fadhya Nasywa	Implementation Of Clustering Methods to Identify Distinct Genomic Regions in Liberica Coffee Varieties	14.30-14.40
6	Fahira Putri Amanda	A Comparison of BM25 and SBERT Models for Presenting Relevant Online Product Reviews Based on User Keywords	14.40-14.50
7	M. Rizki	Chronic Renal Failure (CKD) Disease Prediction Using Website-Based Duo Output Neural Network Ensemble (Donne) Method	14.50-15.00

Saturday, July 19th, 2025
Scope: Computational & Simulation
Room: Bunga Cengkih 6
Time: 13.30-17.00 (GMT 7+)
Moderator: Khairul Fajri Ilahi

No.	Presenter	Title of abstract	Time
1	Prof. Dr. Azlan bin Mohd Zain	The Role of Artificial Intelligence (AI) in Computer Vision	13.30-13.50
2	Prof. Dr. M. Nasir, M.Kom.	Design and Implementation Smart Learning Used Case-Based Learning Model to improved Student Learning Result	13.50-14.10
3	Nabila Shelviyanti	Classification and Monitoring Well Performance Using the Random Forest Algorithm at PT. Pertamina Hulu Rokan	14.10-14.20
4	Tya Fannie Putri	Decision Support System for Selecting the Best Native Broiler Chikens Using TOPSIS Method	14.20-14.30
5	Wahyu	DC-UNet-Based Sentinel-1 Image Segmentation for Water Body Extraction in the Kampar River Basin	14.30-14.40
6	Windi Julianti	An Information Security Risk Management Analysis of the Hospital Information System (SIMRS) Using OCTAVE and FMEA at Bhayangkara Hospital Pekanbaru	14.40-14.50
7	Maulina Amizha Yunita	Strategic Planning for Hospital Information System Development Using Enterprise Architecture Planning (Eap): A Case Study of Pekanbaru Mental Hospital	14.50-15.00

Saturday, July 19th, 2025
Scope: Biology and Biodiversity & Mathematics and Science Educations
Room: Tempuk Manggis 1
Time: 13.30-17.00 (GMT 7+)
Moderator: Nur Ikhlas Syuhada, S.Pd., M.Si.
Operator: Ainul Mardiah

No.	Presenter	Title of abstract	Time
1	Afni Atika Marpaung	Trading Wild: The Diversity and Socioecological Dynamics of Wild Plants in Riau's Traditional Markets	13.30-13.40
2	Dimas Surya Ramadhan	Floral and Fruit Morphology and Phenology of Eboni (Diospyros celebica Bakh.) at the Cibinong Botanical Garden	13.40-13.50
3	Elli Indriana Putri	Floristic Study of Euphorbiaceae Family Based on Phytochemistry at Universitas Riau	13.50-14.00
4	Irfan Meihendra	Efek Pemberian Akrilamida terhadap Skoring Nekrosis Sel Tubulus Ginjal Tikus Putih Wistar (*Rattus Norvegicus* B.)	14.00-14.10
5	Rifky Alfarez	Species Diversity of Ants (Hymenoptera: Formicidae) in The Arboretum Ecosystem of Universitas Riau	14.10-14.20
6	Bambang Hariyadi	Jambi Tulo Enau Ethnoscience: Connecting Biology Learning with Local Traditions	14.20-14.40
7	Zuli Rodhiyah	Education and Promotion of the Reduce, Reuse, and Recycle (3R) Waste Management Site at Sinar Kenali, Jambi City as a Strategy for Waste Burden Reduction	14.40-14.50

2. Online Parallel Session

Saturday, July 19th, 2025
Scope: Biology and Biodiversity
Room: Tempuk Manggis 2
Link: https://my.unri.ac.id/zoomsemirata2025
Password:
Time: 13.30-17.00 (GMT 7+)
Moderator: Laila Ainur Rohmah

No.	Presenter	Title of Abstract	Time
1	Munifilia Ekasari	Unveiling Bioactive Potential: A Review on the Phytochemical Properties and Antioxidant Activity of Several Terrestrial Fern Species from the Depati Karo Jayo Tuo Forest, Jambi	13.30 - 13.40
2	Syafrizayanti	*Harnessing Landfill Microbial Potential: Geotrichum candidum Crude Lipase for PET Biodegradation*	13.40 - 13.50
3	Refilda	*Production of Fermented Plant Extract fromKepokBanana Peel and Its Potential as a Nutrient Sourcefor Hydroponic Pakchoi (Brassica rapa L.)*	13.50 – 14.00
4	Ahmad Zainur	Anti-cancer Potential Activity of Mangifera sumbawaensis Kosterm. Leaf Extract Through In Silico Studies	14.00 - 14.10
5	Corry Handayani	Maggots as a Modifier of Avocado Peel Biosorbent to Enhance the Adsorption Capacity of Indigo Carmine Dye	14.10 - 14.20
6	Febria Elvy Susanti	*Selection of Melastoma malabathricum from Five Medicinal Plants for Antibacterial Study: Bioactivity-Guided Screening and LC-MS Profiling*	14.20 - 14.30
7	Liska Chairani Harahap	Characterization and Identification of Macroscopic Fungi in the Secondary Forest of Sultan Syarif Hasyim Grand Forest Park	14.30 - 14.40

Saturday, July 19th, 2025
Scope: Biology and Biodiversity
Room: Tempuk Manggis 3
Link: https://my.unri.ac.id/zoomsemirata2025
Password:
Time: 13.30-17.00 (GMT 7+)
Moderator: Feni Andriani

No.	Presenter	Title of Abstract	Time
1	Yetria Rilda / Syukri	Comparative between The Synthesis of Zinc Oxide Nanoparticles (Zno Np) With Capping Agent Polyvinyl Alcohol Compounds (PVA) and Microalgae Spirulina platensis	13.30 - 13.40
2	Meyla Suhendra	Toxicological Study of Phanera semibifida (Roxb.) Benth. Extracts from Lingga Island Using the Brine Shrimp Lethality Test	13.40 - 13.50
3	Nur Rahma Rumata	Exploring The Neuroprotective Potential of p-Methoxycinnamic Acid: Insights from a Drosophila Model	13.50 – 14.00
4	Shasya Malika Zahra	*Growth of Free-range Chickens (Gallus gallus) Fed from Fermented Cassava Peel Flour (Manihot utilissima) and Noni Leaves (Morinda citrifolia L.)*	14.00 - 14.10
5	Pradnya Paramita	Analysis Of Genetic Diversity of Sago Population in Meranti Islands Based on Morphological Characteristics and Start Codon Targeted Polymorphism (SCoT) AND matK Marker	14.10 - 14.20
6	Armaini	The In Vitro Study on Conjugation Selenium Nanoparticles and Phycocyanin from Spirulina platensis as Anti-Inflammatory and Anti-Cancer.	14.20 - 14.30

Saturday, July 19th, 2025
Scope: Chemistry and Environmental Science
Room: Bunga Cengkih 1
Link: https://my.unri.ac.id/zoomsemirata2025
Password:
Time: 13.30-17.00 (GMT 7+)
Moderator: Muslim

Nbr.	Presenter	Title of Abstract	Time
1	Assoc. Prof. Hanan Hasan, Ph.D.	Engineering the Future of Food: The Role of Biotechnology in Global Sustainability	13.30-13.50
2	Evi Maryanti	Physicochemical Study of ZIF-67@ZnO MOFs Composites from Kalamansi (*Citrus microcarpa Bunge*) Peel Extract	13.50-14.00
3	Miftahul Khair	Halal Gelatin Production from Chicken Skin Collagen (Gallus gallus domesticus) using Waterbath and Microwave Extraction Methods	14.00-14.10
4	Prof. Rahmiana Zein, Ph.D	Adsorption of crystal violet dye using avocado seeds (Persea americana Mill.)	14.10-14.20
5	Rahmayeni	Green Synthesis of $MgFe_2O_4$ using Natural Iron Sand as a Fe Source: A Study on Structure, Morphology, Character, and Photocatalytic Performance	14.30-14.40
6	Zulhadjri	Structural and Surface Engineering of La^{3+}-Doped $ZnFe_2O_4$ and Its Hydroxyapatite Composite for Hazardous Pollutant Removal	14.40-14.50
7	Annur Valita Sindiani	Effect Of pH On the Malachite Green Transport in Polymer Inclusion Membranes (PIMs)	14.50-15.00
8	Arika Prasejati	Synthesis of Hydroxyapatite/Carboxymethyl Cellulose Composite as an Eco-Friendly Adsorbent for Crystal Violet	15.00-15.10
9	Edi Nasra	Synthesis Of Silica Xerogel from Durian Rind and Its Application in The Absorption of Pb2+ Ions	15.10-15.20
10	Lili Andriani	Chemical Modification of Eugenol with Secondary Amine: Synthesis and Structural Elucidation	15.20-15.30
11	Evi Maryanti	Characteristics of MOFs ZIF-67 Modified with Iron Sand from Kaur, Bengkulu	15.30-15.40

Saturday, July 19th, 2025
Scope: **Computational and Simulation**
Physics and Its Applicatios
Mathematics and Educational Science
Room: Bunga Cengkih 7
Link: https://my.unri.ac.id/zoomsemirata2025
Password:
Time: 13.30-17.00 (GMT 7+)
Moderator: Herlina

No.	Presenter	Title of Abstract	Time
1	Assoc. Prof. Dr. Marlia binti Morsin		13.30-13.50
2	Elistia Liza Namigo	Harnessing Remote Sensing and AI for Sustainable Geothermal Prospecting in Remote Volcanic Regions: A Case Study from Solok, Indonesia.	13.50-14.00
3	Moristanto	Coconut Supply Chain Analysis as Sustainable Aviation Fuel	14.00-14.10
4	Najmi Fadhila Atsari	Classification of Residential and Business Building Using Deep Learning	14.10-14.20
5	Nia Ivanka	Electricity Demand Prediction in Duri City Using an Artificial Neural Network	14.30-14.40
6	Herna	A Review of ZIF-8 Metal-Organic Framework for Photocatalytic Applications	14.40-14.50
7	Dian Milvita	Evaluation of Typical Dose Values on Posterior-Anterior (PA) and Anterior-Posterior (AP) Thorax Examination at Andalas University Hospital	14.50-15.00
8.	Devni Gusliza Sari	System Analysis of Data Management of Physics Laboratory of High School and Equivalent in Bengkalis Regency	15.00-15.10
9.	Aisyah Amini	Review Literatur Terstruktur: Inovasi Pembelajaran Matematika untuk Meningkatkan Berpikir Kreatif	15.10-15.20
10	Silvia Ariska Putri	Konstruksi Soft Graph Untuk Hasil Amalgamasi Graf Lintasan dengan Graf Kipas	15.20-15.30

Saturday, July 19th, 2025
Scope: Mathematics and Statistic
Room: Bunga Cengkih 4
Link: https://my.unri.ac.id/zoomsemirata2025
Password:
Time: 13.30-17.00 (GMT 7+)
Moderator: Gusrizal

No.	Presenter	Title of Abstract	Time
1	Assoc. Prof. Dr. Adibah Shuib, FIMA.	Presentation title: Two Stage Optimization using Adapted Preferences and Competency Based Models of Modified Hungarian Method (MHM) and Binary Integer Goal Programming (BIGP) Models in Lecturer-to-Courses Assignment Problem	13.30-13.50
2	Ahriyati	The Potential of Non-Linear Optimization in Decision Making	13.50-14.00
3	Syalam Ali Wira Dinata	Statistical Analysis of the Russia–Indonesia Strategic Partnership	14.00-14.10
4	Nafilah Arifah Siregar	Forecasting The Closing Price of Pt Bank Central Asia Tbk Using the Autoregressive Integrated Moving Average (Arima) Method	14.10-14.20
5	Nur Asyifa Khaylana Putri	Dynamical Analysis of A Mathematical Model for Bullying Behavior in Schools with Violence Factors	14.30-14.40
6	Tengku Irfan Wira Buana	Jackknife Resampling Approach for Outlier Detection in Linear Regression Models	14.40-14.50
7	Dina Khairani Nasution	Modular Version of Total Edge Irregularity Strength for Generalized Petersen Graph	14.50-15.00
8	Nanditya Syahmi Khan	The Total Vertex Irregularity Labeling for Neuron Graph	15.00-15.10
9	Luthfi Hadiyan Fajri	On N-Soft Hypergraph	15.10-15.20
10	Nunut D Situmorang	Application Of Autoregressive Integrated Moving Average (Arima) Model in Forecasting Indonesian Silver Prices	15.20-15.30
11	Taufiq Iskandar	Estimating the Value of π through Riemann Integration	15.30-15.40
12	Anne Mudya Yolanda	A Preliminary Study: Predicting Lung Cancer Subtype from Gene Expression Data Using Neural Networks	15.40-15.50

ABSTRACT OF ORAL PRESENTERS

Matrix Lebesgue Spaces and Their Properties

Pebrudal Zanu

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ABSTRACT

In this paper, we introduce matrix Lebesgue spaces and study their properties. We consider the inclusion properties among these spaces and prove that matrix Lebesgue spaces are also Banach spaces. Furthermore, we explore their duality and conclude by investigating the applications of matrix Lebesgue spaces.

Keywords: matrix Lebesgue spaces, inclusion properties, Banach spaces

Application of Seemingly Unrelated Regression on Random Effect Model Toward Factors Affecting Poverty in Riau Province

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ABSTRACT

Poverty is a serious problem in national development that has an impact on welfare in Indonesia. This condition occurs when individuals or groups cannot meet basic needs, both food and non-food measured by the poverty line. The purpose of this study was to analyze the factors that influence poverty in Riau Province, using Riau Province People's Welfare Statistics data from 2019 to 2023. The method applied was panel data regression analysis with the Seemingly Unrelated Regression (SUR) approach on the Random Effect Model (REM), which handles the problem of correlation between cross-section units. The results of the analysis showed that the application of the SUR model to REM increased the R^2 value from 55.62% to 70.05%, indicating that this model is better than the Fixed Effect Model (FEM) and Common Effect Model (CEM) in explaining the relationship between independent and dependent variables. In addition, the variables Non-Cash Food Assistance (BPNT), Family Welfare Card (KKS), and Human Development Index (IPM) were shown to have a significant effect on poverty in Riau Province.

Keywords: Poverty, Seemingly Unrelated Regression, Random Effect Model

Application of the Expectation Maximization Algorithm for Estimating Missing Data in Latin Square Design

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ABSTRACT

The Latin Square Design is an experimental design used to control two sources of variability while assessing treatment effects. In practical applications, however, missing data often occur and can compromise the validity of the analysis. This study aims to estimate missing values in a Latin Square Design using the Expectation Maximization algorithm. The results demonstrate that the algorithm converges to stable estimates that align with the distribution patterns of rows, columns, and treatments. After the missing data were estimated, the standard deviation ranged from 0.51 to 1.18, and the variance ranged from 0.26 to 1.39 across the factors. These results indicate that the estimates preserve the original data variation without significant distortion, making them suitable for subsequent analysis and supporting reliable conclusions. Overall, the study confirms the effectiveness of the Expectation Maximization algorithm in addressing missing data in Latin Square Designs.

Keywords: Keywords should be three to five relevant terms separated by commas and arranged in alphabetical order.

Application of the Long Short Term Memory Method for Temperature Prediction in Pekanbaru City

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ABSTRACT

The increase in temperature has reached a critical level, posing significant threats to human life and the environment. This issue serves as a serious warning, highlighting the urgency of raising awareness about the risks of global warming and climate change. One mitigation effort that can be implemented is the accurate prediction of air temperature to support decision-making and climate adaptation planning. This study aims to predict daily air temperature in Pekanbaru City using the Long Short-Term Memory (LSTM) method, a machine learning technique based on the Recurrent Neural Network (RNN) architecture that is effective for time series data. The data used in this study consists of daily climate data from January 1, 2020, to December 31, 2024, obtained from the official BMKG website (bmkg.go.id). The response variable is average temperature, while the predictor variables include average humidity, rainfall, sunshine duration, and average wind speed. The best model was achieved with a configuration of 70% training data, a learning rate of 0.001, 128 LSTM units, a batch size of 16, and 50 epochs, resulting in a loss function of 0.127, RMSE of 0.129, and MAPE of 2.4%. The temperature prediction for January 2025 shows a stable pattern within a reasonable range, indicating that the model is accurate and has potential as a tool for local-level climate change mitigation.

Keywords: Climate Change, Long Short Term Memory (LSTM), Temperature Prediction, Time Series.

Truncated Spline Nonparametric Regression Model for Analyzing Determinants of Senior High School Dropout Rate in North Sumatra

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ABSTRACT

Education has become a national priority in preparing for the Golden Generation 2045 through the implementation of a 12-year compulsory education program and substantial budget allocations. However, the issue of school dropout remains a significant challenge, particularly in North Sumatra Province, which recorded the highest number of high school dropouts nationally in 2023, totaling 1,263 students. This study aims to identify the determining factors influencing school dropout rate that can serve as a reference for efforts to reduce school dropout rate, especially in North Sumatra. The method used in this study is truncated spline nonparametric regression, with five predictor variables: percentage of the population living in poverty, population density, literacy rate, teacher-to-student ratio, and school-to-student ratio. The results show that the best model was obtained using two knot points, and two variables that significantly influenced the school dropout rate were population density and literacy rate. The developed model achieved a coefficient of determination (R^2) of 94,33%.

Keywords: Nonparametric Regression, School Dropout Rate, Truncated Spline.

Analisis konsep *f*-Derivasi pada *Pseudo BG*-aljabar

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ABSTRACT

A BG-algebra is defined as a non-empty set that includes a constant 0 and a binary operation which adheres to the following axioms: (□□G1), (□□G2), and (□□G3) for all. Pseudo BG algebra is a generalization of BG-algebra, which is an algebra that satisfies the following axioms: (pBG1), (pBG2), and (pBG3) for all. In pseudoBG algebra introduced an (l, r)-derivation, an (r, l)-derivation, and left derivation. This article aims to analyze and extend these concepts into a new framework called f derivation, which involves an endomorphism f defined on the pseudoBG-algebra. The study develops specific forms of derivations within pseud BG-algebras by introducing certain conditions that lead to the emergence of new types of f derivations. Through this approach, three main types of f-derivations in pseudoBG algebras are identified: (l, r)-f-derivation, (r, l)-f-derivation, and left f-derivation of type 1 and type 2. The results reveal several significant properties, including a formula for, the role of the special element 0, regularity in f-derivations, and the relationship between regular f-derivations and as the identity function. This study contributes to advancing the theory of pseudoBG-algebras and its potential applications in other algebraic structures.

Keywords:

Pseudo BG-algebra; (l, r)-f-derivation; (r, l)-f-derivation; left f-derivation; type 1 f derivation; type 2 f-derivation

Effectiveness of *Acacia crassicarpa* Bark for Pb(II) Adsorption from Aqueous Solution

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ABSTRACT

Heavy metal Pb(II) is a hazardous pollutant that has serious impacts on human health and the environment due to its toxic nature. One of the control approaches is the adsorption method using natural materials. This study evaluated the potential of *Acacia crassicarpa* bark powder as an adsorbent to reduce Pb(II) levels in water. The samples were processed through drying, grinding, sieving, and characterized using FTIR, SEM-EDX, and SAA. The adsorption test was carried out in batches and Pb(II) analysis was carried out using ICP-OES. FTIR characterization showed the presence of O–H, C=O, C–O, O–Mg, and O–Ca groups, as well as the emergence of new O–Pb peaks after adsorption. SEM showed surface morphology open pores before adsorption, then closed after adsorption. EDX identified the elements C, O, N, Mg, and Ca. The SAA results showed a surface area of 0.460 m^2/g with a dominance of mesopores. The optimum conditions were obtained at a dose of 0.8 g, pH 4, contact time 60 minutes, stirring speed 150 rpm, concentration 100 ppm, and temperature 50 °C, with an adsorption efficiency of 91.86% and a capacity of 5.6589 mg/g. The most appropriate kinetic model was PSO (R2 = 0.9892). The most appropriate isotherm model was Temkin (R^2 = 0.9508), indicating a chemisorption adsorption mechanism on heterogeneous surfaces. Thermodynamic parameters showed that the adsorption process was non-spontaneous ($\Delta G > 0$) at each temperature variation.

Keywords: *Acacia crassicarpa* bark, adsorption, chemisorption, natural adsorbent, Pb(II) removal

Unleashing the Potential of Laccase Enzymes: A Guide to Producing Laccase by Trichoderma via Solid State Fermentation

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ABSTRACT

This review of applications and potential of laccase enzymes across various industries, along with the challenges and limitations associated with their use. It discusses strategies for enhancing the stability and activity of laccases, emphasising the unique characteristics that render them versatile biocatalysts beneficial for both ecosystems and human health. Furthermore, it outlines current trends and opportunities in laccase research and development, explores the diversity of laccase substrates, and underscores the significance of SSF for the enzyme's potential contributions to green chemistry.

Keywords: Bioreactor, Laccase, Solid State Fermentation, *Trichoderma sp*.

Adsorption of lead (Pb) onto a prepared bio-adsorbent from white jabon fruit (*Anthocephalus cadamba* Miq.)

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ABSTRACT

This research aims to determine the adsorption capacity and efficiency of white jabon fruit biosorbent in a batch system against lead (II) ions under optimum conditions as well as the appropriate adsorption kinetics and adsorption isotherm models. The optimum biosorbent conditions were determined by optimizing pH (4, 6, 8 and 10), contact time (20, 30, 40 and 50 minutes) and adsorbate concentration (80, 100, 120 and 140 mg/L). The surface morphology of the biosorbent before and after activation with NaOH was analyzed using SEM-EDS, while the functional groups of the biosorbent before and after the biosorption process were analyzed using FTIR. Determination of adsorption capacity and efficiency was analyzed using AAS. The results of the characterization of biosorbents in adsorbing iodine and methylene blue based on SNI 06-3730-1995 show that the best ratio of biosorbent: NaOH activator to activate biosorbents is a ratio of 1:3 (w/w). SEM-EDS results show that the biosorbent before activation contains the elements C, O, Na, Mg, Si, Pb, Cl, K, Ca and Cr while activation only includes the elements C, O, Na and Cl. Optimum conditions occurred at pH 6, contact time 40 minutes and adsorbate concentration 140 mg/L with adsorption capacity and efficiency respectively 6.6385 mg/g and 99.977%. The kinetic model of the biosorbent adsorption process follows pseudo second order kinetics with a rate constant of 0.00235 g/mg min (R^2 = 0.9867) which indicates that the adsorption process involves a chemisorption mechanism. The adsorption isotherm model follows the Freundlich isotherm equation (R^2=0.9862) which indicates that adsorption occurs on a heterogeneous surface.

Keywords: biosorbent, lead (II), white jabon

Magnetic Covalent Triazine Framework for Dye adsorption

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ABSTRACT

Covalent triazine framework are known for its high surface area and porous properties that beneficial in adsorption application. This work aims to synthesize modified magnetic properties of CTFs that has high specific surface area as an adsorbent. The modified Ionothermal using combination of $FeCl_3$ as magnetic active material and $ZnCl_2$ as ion solvent. The Fe-CTFs was used to adsorb methylene blue (MB) dyes as synthetic pollutant in the aqueous media. The adsorption kinetics well fitted with pseudo-second-order. Maximum adsorption capacity (Q_{max}) of Fe-CFTS obtained is 19.99 mg/g. Isotherm of the FE-CTFs adsorption is in accordance to Langmuir model. the characterization of the Fe-CTFs was studied by various instruments such as (SEM, VSM, BET, FTIR, and XPS).

Keywords: Adsorption, CTF, Dyes, Magnetic

Analysis of Composition and Characteristics of Adulterated Fuel Using Flash Point, GC-MS, and Viscosity Methods

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ABSTRACT

Petroleum and natural gas are primary energy sources widely used in various sectors such as industry, transportation, and households. The heavy reliance on petroleum as a fuel source is one of the reasons behind its misuse for certain interests. One form of such misuse is fuel adulteration, which involves mixing commercial fuel with other substances to increase volume for greater profit. This study aims to determine the composition and characteristics of adulterated fuel. A qualitative method was employed using instruments such as a flash point tester, Gas Chromatography-Mass Spectrometry (GC-MS), and a viscometer. Flash point testing yielded results for adulterated fuel samples (Diesel, Pertalite, and Pertamax) of 74°C, 52°C, and 36°C, respectively. Meanwhile, the flash points of pure fuel samples (Diesel, Pertalite, and Pertamax) were 52°C, 25.5°C, and 29.5°C, respectively. Dynamic viscosity testing using a viscometer showed that the viscosity values of adulterated fuel samples (Diesel, Pertalite, and Pertamax) were 3.96 mPa.s, 4.225 mPa.s, and 10.16 mPa.s, respectively. In contrast, the viscosity of pure fuels (diesel, Pertalite, and Pertamax) were 0.07 mPa.s, 0.72 mPa.s, and 0.675 mPa.s, respectively. GC-MS analysis revealed that the adulterated Pertalite sample, at peak 2, contained toluene, a compound commonly found in diesel fuel. In the adulterated diesel sample, peak 18 showed the presence of (4aRS)-3,4,4a,5,6,7,8,8a-Octahydro-5,5,8a-trimethyl-spiro[naphthalene-2(1H)-2'-oxirane], an additive compound not typically found in standard diesel specifications. Conversely, the adulterated Pertamax sample, at peak 27, contained azulene, a compound generally used in cosmetics and skincare products. Based on the comparison with the pure fuel samples (blank), it can be concluded that the adulterated diesel was mixed with kerosene, while the adulterated Pertalite and Pertamax were mixed with diesel fuel.

Keywords: Dynamic Viscosity, flash point, GC-MS, Petroleum and Natural Gas

Pengaruh Konsentrasi Adsorbat Dan Suhu pada Penjerapan Zat Warna Safranin-O oleh Biosorben Buah Jabon Putih (*Anthocephalus cadamba* Miq.)

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ABSTRACT

The white jabon fruit (*Anthocephalus cadamba* Miq.) combined with humic acid extracted from peat water, is believed to hold potential as a biosorbent capable of removing various dyes, including Safranin-O. The optimal biosorption condition was achieved at an adsorbate concentration of 80 ppm and a temperature of 50°C, yielding an adsorption capacity of 20.0670 mg/g and an efficiency of 99.0017%. The adsorption process followed the Temkin isotherm model (R^2 = 0.9862) which indicates that adsorption occurs chemically. Thermodynamic analysis indicated a negative ΔG, positive ΔH and positive ΔS, suggesting that the adsorption process was spontaneous and was endothermic in nature.

Keywords: adsorption, safranin-o, isotherm, thermodynamic

PENGARUH DOSIS, pH DAN WAKTU KONTAK SERBUK BUAH JABON PUTIH (*Anthocephalus cadamba* Miq.) TERHADAP ADSORPSI ZAT WARNA INDIGO CARMINE

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ABSTRACT

The white jabon fruit (Anthocephalus cadamba Miq.) is one of the tropical plants with potential as a biosorbent for adsorbing various environmental pollutants, such as synthetic dyes, including Indigo carmine. The research conducted aims to determine the efficiency and adsorption capacity of the biosorbent powder from white jabon fruit towards the dye Indigo carmine, as well as to identify the appropriate adsorption kinetic model. The optimum conditions were found at a biosorbent dose of 0.4 g, the best solution pH of 2, and an optimum contact time of 45 minutes, with efficiencies and adsorption capacities of 80.47% and 2.0016 mg/g, respectively. The adsorption kinetic model that fits is the pseudo second order (R^2 = 0.947), indicating that the adsorption interaction occurs chemically.

Keywords: adsorbent, indigo carmine, kinetics

EFEKTIVITAS SERBUK BUAH JABON PUTIH (*Anthocephalus cadamba* Miq.) SEBAGAI BIOSORBEN DALAM MENJERAP ZAT WARNA *BASIC FUCHSIN*

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ABSTRACT

This study aims to evaluate the potential of white jabon fruit (*Anthocephalus cadamba* Miq.) has potential as a biosorbent for adsorption of Basic Fuchsin dye. The parameters studied include variations in biosorbent dosage, pH and contact time to determine the optimum adsorption and capacity. The results hsowed that optimum conditions were obtained at a biosorbent dose of 0.25 g, pH 6 and a contact time of 60 minute. Adsorption parameters were obtained at an optimum biosorbent dose of 0.25 g, optimum solution pH of pH 6 and optimum contact time of 60 minutes with an adsorption efficiency of 99.25% and adsorption capacity of 9.8978 mg/g. The adsorption kinetics model followed a pseudo second order model with R^2 of 0.9999 and a rate constant of 0.1209 g/mg.min.

Keywords: adsorption, basic fuchsin, biosorbent, kinetics

Effectiveness of *Acacia crassicarpa* Bark Powder for Pb(II) Adsorption from Aqueous Solution

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ABSTRACT

Heavy metal Pb(II) is a hazardous pollutant that has serious impacts on human health and the environment due to its toxic nature. One of the control approaches is the adsorption method using natural materials. This study evaluated the potential of *Acacia crassicarpa* bark powder as an adsorbent to reduce Pb(II) levels in water. The samples were processed through drying, grinding, sieving, and characterized using FTIR, SEM-EDX, and SAA. The adsorption test was carried out in batches and Pb(II) analysis was carried out using ICP-OES. FTIR characterization showed the presence of O–H, C=O, C–O, O–Mg, and O–Ca groups, as well as the emergence of new O–Pb peaks after adsorption. SEM showed surface morphology open pores before adsorption, then closed after adsorption. EDX identified the elements C, O, N, Mg, and Ca. The SAA results showed a surface area of 0.460 m^2/g with a dominance of mesopores. The optimum conditions were obtained at a dose of 0.8 g, pH 4, contact time 60 minutes, stirring speed 150 rpm, concentration 100 ppm, and temperature 50 °C, with an adsorption efficiency of 91.86% and a capacity of 5.6589 mg/g. The most appropriate kinetic model was PSO (R2 = 0.9892). The most appropriate isotherm model was Temkin (R^2 = 0.9508), indicating a chemisorption adsorption mechanism on heterogeneous surfaces. Thermodynamic parameters showed that the adsorption process was non-spontaneous ($\Delta G > 0$) at each temperature variation.

Keywords: *Acacia crassicarpa* bark, adsorption, chemisorption, lead, natural adsorbent

Analisis Pengaruh FPS Kamera terhadap Hasil Deteksi Tingkat Kematangan TBS Kelapa Sawit berdasarkan Intensitas RGB

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ABSTRACT

The advancement of digital imaging technology has made a significant contribution across various fields, including detection systems based on computer vision. One of the key factors influencing the quality of digital images is the camera's frame rate per second (FPS), which plays an essential role in determining image sharpness, especially when the object is in motion. This study aims to analyze the effect of varying camera FPS on the detection results of RGB intensity in fresh fruit bunches (FFB) of oil palm transported using a conveyor system. In this research, a computer vision system was designed and tested on five samples of oil palm FFB, each categorized as either ripe or unripe. The image acquisition process took place using two FPS variations, namely 10 fps and 39.55 fps, with the conveyor operating at a speed of 18.45 cm/s. The results showed that the highest RGB intensity for the ripe class was recorded at 39.55 fps, with the red channel value being higher than green and blue, where the average red value was 156.416. Meanwhile, for the unripe class, the highest RGB intensity was likewise observed at 39.55 fps, but was dominated by the blue channel, with an average blue value of 77.248, while the red and green values were relatively low. The relationship between camera FPS and RGB intensity indicates that the detection system developed is capable of identifying differences in the ripeness levels of oil palm FFB visually through variations in the dominant recorded colors.

Keywords: oil palm FFB, computer vision, frame rate, conveyor, RGB.

INTENSITAS RGB VARIETAS DURA DAN TENERA MENGGUNAKAN COMPUTER VISION

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ABSTRACT

The determination of fresh fruit bunch (FFB) varieties of oil palm, particularly Dura and Tenera, during the sorting and grading process at the palm oil mill is crucial. The proportion of Dura FFBs is limited to only 25% of the total intake due to their lower oil content. Currently, the sorting process between Dura and Tenera varieties is still carried out manually by cutting into the fruit to observe shell thickness. This method is destructive and inefficient. Automated sorting methods based on imaging using digital cameras and image processing have been widely developed. This study aims to identify oil palm varieties non-destructively using computer vision and RGB intensity analysis of FFB images. The FFB image dataset was collected and analyzed using the Python programming language and OpenCV for RGB color feature extraction. The results of the study show a significant difference in RGB intensity between the Dura and Tenera varieties, which can be used as a parameter for computer-based classification. This technology has the potential to be implemented in automated sorting systems in the palm oil industry.

Keywords: RGB, computer vision, oil palm, Dura, Tenera, color extraction

PENGGUNAAN SENSOR ULTRASONIK UNTUK MEMBEDAKAN TINGKAT KEMATANGAN TANDAN BUAH SEGAR KELAPA SAWIT VARIETAS DURA DAN TENERA

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ABSTRACT

Determining the ripeness level of oil palm fresh fruit bunches (FFB) is a crucial factor in ensuring the quality and quantity of palm oil production. Traditional methods, which are often subjective, are still widely used but have limitations in terms of consistency and efficiency. This study aims to apply a non destructive method using the LV-MaxSonar-EZ MB1010 ultrasonic sensor to distinguish the ripeness levels of Dura and Tenera oil palm FFB varieties. The research was conducted by measuring the voltage values reflected by FFB samples moving on a conveyor. The system consists of an ultrasonic sensor, arduino UNO, jumper wires, USB cable, and a laptop for data acquisition. The output voltage was measured in real time using the PLX-DAQ application and Excel, with the sensor positioned 5 cm from the sample. The results showed that unripe FFB produced higher voltage values compared to ripe FFB for both Dura and Tenera varieties. The average voltage for ripe Dura was 13.4 mV, and for unripe Dura was 17.34 mV, while ripe Tenera produced 32.13 mV and unripe Tenera 35.74 mV. The relationship between voltage values, ripeness levels, and varieties indicates that voltage measurements can non-destructively identify the ripeness level and variety of oil palm FFB.

Keywords: oil palm FFB, ripeness level, ultrasonic sensor, Dura and Tenera.

Analisis Nilai RGB untuk Membedakan TBS Kelapa Sawit Normal dan Cacat

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ABSTRACT

Accurate sorting of oil palm fresh fruit bunches (FFB) is essential to ensure the quality of palm oil production. Normal FFB is characterized by intact and fully ripened fruit, whereas defective FFB exhibits physical conditions such as empty bunches, rot, elongated stalks, or excessive spines. One approach that can be applied in the sorting process is the analysis of surface color characteristics using RGB intensity values. RGB values allow surface color differences in FFB to be recognized quantitatively, thereby supporting the automated separation of normal and defective fruits. This study aims to identify normal and defective FFB by analyzing RGB intensity as a surface color parameter using a computer vision approach. Image acquisition was conducted using an RGB camera, and RGB values were extracted from three random points on each image and averaged using Python. The analysis showed that the empty bunch class had the highest RGB intensity, indicating a brighter surface with higher light reflection. In contrast, normal FFB had lower and more balanced RGB values, indicating a darker and more homogeneous surface. These findings demonstrate that RGB intensity can be used as an effective quantitative indicator in computer vision-based automated sorting systems to improve the efficiency and accuracy of FFB classification.

Keywords: Oil palm FFB, RGB intensity, automated sorting, image processing, computer vision, fruit quality.

Environmentally Friendly Activated Carbon from Local Biomass Sources as Supercapacitor Electrode Material

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ABSTRACT

Supercapacitors are promising energy storage devices because they have advantages in terms of high specific power, fast charging time, and good cycle stability. In an effort to develop environmentally friendly electrode materials, this study uses mangrove charcoal as the raw material for biomass-based activated carbon. The synthesis process was carried out through chemical activation using 1 M KOH solution, followed by a carbonization process at a temperature of 600°C, and ended with physical activation at a temperature of 800°C. This process produces activated carbon with a pore structure that supports electrochemical charge storage. Physical characterization shows that the obtained carbon has a density of 0.56 g/cm³, which is important to ensure effective density and contact between electrode particles. Electrochemical performance tests were carried out using the cyclic voltammetry (CV) technique, which produced a rectangular CV curve approaching ideal, indicating the dominance of the electrostatic capacitance mechanism. The maximum specific capacitance obtained reached 88 F/g at a scan rate of 1 mV/s. These results indicate that activated carbon from mangrove charcoal has physical and electrochemical characteristics suitable for use as a symmetrical supercapacitor electrode material and has the potential to be an alternative energy material that is sustainable and economically valuable.

Keywords: Local Biomass, Activated carbon, Electrode material, Supercapacitor

Utilization of Acacia Shell Waste as a Basic Material for Porous Activated Carbon for Environmentally Friendly Supercapacitor Applications

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ABSTRACT

Utilization of biomass waste as a source of functional material for energy storage systems is an important focus in the development of environmentally friendly and sustainable technologies. In this study, acacia shell waste as plantation waste is processed into activated carbon through an integrated chemical and physical activation process. The process begins with chemical activation using 1 M KOH solution, carbonization in a nitrogen gas atmosphere (N_2) from a temperature of 30-600°C, then further thermal activation is carried out in a CO2 gas atmosphere from a temperature of 600-850°C. This method aims to produce activated carbon with high porosity and increase the accessibility of electrolyte ions. Activated carbon from acacia shell waste produces quite large porosity with a density shrinkage percentage reaching 32%. Electrochemical characterization was carried out in a two-electrode configuration using 1 M H_2SO_4 electrolyte at a scan rate of 1 mV/s. The test results show that the activated carbon produced has a specific capacitance of 121 F/g with energy density and power density of 17 Wh/kg and 87 W/kg, indicating competitive electrochemical performance as a supercapacitor electrode material. This finding proves that acacia shell waste has high potential to be developed as a base material for high-performance activated carbon, while providing solutions to waste management issues and future energy material needs.

Keywords: activated carbon, acacia shell, chemical-physical activation, supercapacitor, sustainable energy.

Performance Evaluation of Mangrove Charcoal-Based Activated Carbon for Eco-Friendly Energy Storage Devices

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ABSTRACT

Activated carbon derived from biomass is one of the leading candidates in the development of supercapacitor electrode materials due to its abundant availability, low cost, and environmentally friendly properties. In this study, mangrove charcoal was used as a base material to produce activated carbon through a combination of chemical and physical activation. Chemical activation was carried out using 1 M KOH solution, then the sample was carbonized at a temperature of 600°C and continued with physical activation at a temperature of 850°C. This process aims to improve the quality of the carbon structure and its conductivity. The results of physical characterization showed that the activated carbon obtained had a density of 0.65 g/cm^3, which contributed to the stability and efficiency of the electrode preparation. Electrochemical performance evaluation was carried out using the cyclic voltammetry (CV) technique in a 3 M Na_2SO_4 electrolyte solution, which showed a curve resembling a symmetrical quadrilateral shape, reflecting good capacitive behavior and fast ion response. The highest specific capacitance achieved was 79 F/g at a scan rate of 1 mV/s. These findings indicate that activated carbon from mangrove charcoal has high potential to be developed as an electrode material in efficient and sustainable symmetrical supercapacitors.

Keywords: Mangrove charcoal, Biomass, Activated carbon, Supercapacitor

Development of Supercapacitor Electrode Materials Based on Mangrove Charcoal: ZnCl2 Activation and Thermal Heating Approach

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ABSTRACT

Conversion of plantation biomass waste into high-performance energy storage materials is a strategic approach in supporting the development of sustainable energy systems. This study utilizes mangrove charcoal as a precursor for the synthesis of activated carbon through a dual activation method, namely chemical and physical activation. The process begins with chemical activation using 1 M zinc chloride (ZnCl2) solution, followed by pyrolysis in a nitrogen gas atmosphere (N_2) at a temperature of 600°C, then reheated at a temperature of 850°C for physical activation. This series of processes is designed to form activated carbon materials that have high porosity and efficient ion diffusion pathways. Physical characterization shows the formation of a fairly large porosity of mangrove charcoal activated carbon from the pyrolysis results reaching 27%. Electrochemical characterization was carried out using a two-electrode system in a 1 M H_2SO_4 electrolyte solution. The test results using the cyclic voltammetry method at a voltage of 0-1 V showed that the activated carbon produced had a specific capacitance of 110 F/g with a specific energy of 14 Wh/kg and a specific power of 73 W/kg, indicating competitive performance as a supercapacitor electrode material. These findings indicate that mangrove charcoal has great potential as a sustainable carbon source that can be economically processed into functional electrode materials for next-generation energy storage technologies.

Keywords: activated carbon, mangrove charcoal, ZnCl2 activation, supercapacitor, biomass, sustainable energy storage.

Band Gap Engineering of Eggshell-Based Photocatalyst: A Green Approach to Wastewater Treatment

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ABSTRACT

This study presents the development and characterization of an eco-friendly photocatalyst derived from eggshell waste for wastewater treatment applications. The calcium carbonate-rich eggshell (ES) material was calcined and combined with titanium dioxide (TiO_2) via the solid-state dispersion method to modify its optical properties, particularly the band gap. UV–Vis spectroscopy and Tauc plot analysis indicated a reduction in band gap energy from 3.27 eV for pure TiO_2 to 3.25 eV in the ES/TiO_2 composite, and further down to 2.45 eV in aqueous conditions, suggesting improved visible-light absorption. Structural analysis using X-ray diffraction (XRD) confirmed the retention of the anatase phase of TiO_2, while morphological evaluation via scanning electron microscopy with energy-dispersive X-ray spectroscopy (SEM-EDX) verified the successful integration of TiO_2 onto the eggshell matrix. Photocatalytic performance was evaluated using methylene blue (MB) degradation, achieving up to 95.6% efficiency after 24 hours. Furthermore, significant reductions in chemical oxygen demand (COD) values demonstrated the material's effectiveness in degrading organic pollutants. These findings confirm that band gap engineering through eggshell-based compositing not only enhances photocatalytic efficiency but also promotes sustainable valorization of biowaste for environmental remediation purposes.

Keywords: Photocatalyst, Eggshell, Titanium dioxide, Band gap, Wastewater, Material engineering.

Structural Properties of Activated Carbon-Based Electrodes Synthesized from Bidara Seeds (*Ziziphus mauritiana*)

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ABSTRACT

In this study, activated carbon was successfully synthesized from bidara seed biomass through a controlled carbonization process. The primary objective of the research was to investigate the structural properties of the resulting activated carbon, to identify features that could be modified to enhance electrode performance. To achieve this, carbonization was carried out at three different temperatures: 400°C, 500°C, and 600°C. The structural characterization involved two key techniques: X-ray Diffraction (XRD), used to examine the crystalline structure and detect any changes in crystal order, and Fourier Transform Infrared. Spectroscopy (FTIR), used to identify the presence and variation of functional groups on the material's surface. The results showed that at the highest carbonization temperature of 600°C, there was a notable reduction in both dislocation density and microstrain within the crystal structure, with dislocation recorded at 19186 × 10−3 nm−2 and microstrain at 864.03 × 10−6. These reductions are significant because they contribute to a more ordered carbon structure, which can facilitate faster ion diffusion a key factor in improving the efficiency of energy storage systems such as supercapacitors or batteries. Additionally, FTIR analysis revealed that the functional group spectra changed progressively with increasing temperature. A significant shift and transformation in the intensity and position of hydroxyl (–OH) and carbonyl (C=O) groups were observed. These oxygen-containing functional groups are known to play an essential role in enhancing the electrical conductivity and electrochemical activity of the electrode material by improving surface interactions and electron transfer mechanisms. Therefore, the findings of this study highlight the importance of temperature control in the carbonization process and suggest that future work should focus on the targeted modification of functional groups and crystal defects. This would further maximize the electrochemical potential of activated carbon-based electrodes derived from sustainable biomass sources like bidara seeds.

Keywords: crystal defects, Dislocation, Electrode, Micro Strain, Structural Properties

Penghitungan Jumlah Buah pada Tandan Buah Segar Kelapa Sawit Menggunakan Program *Imagej*

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ABSTRACT

This study aims to apply ImageJ software as an alternative method for counting the number of fruits on fresh fruit bunches (TBS) of Dura oil palm using digital image analysis. Images were acquired using a CMOS camera with a high-contrast background, followed by scale calibration, segmentation, and particle counting using built-in ImageJ functions without algorithm modification. The digital results were compared with manual counting. The digital method produced consistent patterns similar to manual counting, with small and uniform differences across samples. These discrepancies are likely due to variations in object-to-camera distance affecting scale accuracy. This approach serves as an alternative for semi-automatic fruit counting, not as a fully automated system.

Keywords: Oil palm, FFB (TBS), ImageJ, computer vision, fruit counting

Penggunaan Sensor *Load Cell* untuk Mengukur Massa Tandan Buah Segar Kelapa Sawit Secara Otomatis

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ABSTRACT

The automatic determination of fresh fruit bunch (FFB) mass is essential in the sorting and grading process of oil palm FFBs at palm oil mills utilizing conveyor systems. In this sorting process, FFBs with smaller masses, such as those weighing less than 5 kg, need to be separated. In this study, an automatic system based on a load cell was designed and tested on 10 oil palm FFBs. The system consists of a load cell mass sensor, Arduino UNO, jumper wires, a USB cable, and a laptop for data acquisition. The results show that the mass detection system using a load cell sensor demonstrates relatively high accuracy compared to conventional weighing devices. The smallest FFB mass detected automatically was 3,171.2 grams, and the largest was 22,293.2 grams. Manually, the smallest detected mass was 3,300 grams, and the largest was 22,500 grams. The correlation between the mass values obtained using the automatic and manual methods indicates that the automatic detection system using the load cell sensor provides satisfactory accuracy and can be reliably implemented for mass-based FFB sorting.

Keywords: oil palm FFB, mass detection system, load cell sensor, automation

Study of Thermal and Electrical Properties of Bulk and Wire MgB2 Superconducting Materials Using First-Principles Density Functional Theory

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ABSTRACT

Magnesium diboride (MgB2) has emerged as a widely studied superconducting material due to its relatively high critical temperature (Tc = 39 K). This study aims to analyze the thermal and electrical properties of MgB2 based on both database information and experimental data from synthesized bulk and wire samples, using a first-principles computational approach via Density Functional Theory (DFT). The crystal structure data for the bulk and wire samples were obtained from previous experimental synthesis and characterized using X-ray diffraction (XRD). A comparative analysis was conducted between the crystal structure from the materials database and the experimental XRD results for the bulk and wire samples. The crystal structures from the database, as well as those obtained experimentally from the synthesized bulk and wire samples, were used to simulate the thermal and electrical properties of MgB2 using the Quantum ESPRESSO (QE) and BoltzTrap (BT) software packages. The simulation results show slight variations in Fermi energy, with values of 7.664 eV for the wire, 7.813 eV for the database, and 7.811 eV for the bulk structure. Calculations using BoltzTrap indicate that the bulk structure exhibits better thermoelectric properties and thermal conductivity, with values of 0.43 W/mK at 150 K and 0.5 W/mK at 20 K, respectively. In contrast, the wire structure shows the highest electrical conductivity, measured at 1.43 1/ Ω.ms at 10 K. These findings suggest that each MgB2 structure offers distinct advantages, where the wire structure is more favorable for charge transport applications, while the bulk structure is more efficient for thermoelectric performance.

Keywords: First-Principles Density Functional Theory; MgB2; Quantum ESPRESSO; BoltzTrap;

Implementation Of Clustering Methods to Identify Distinct Genomic Regions in Liberica Coffee Varieties

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ABSTRACT

Liberica coffee (Coffea liberica) is a type of coffee that can be grown in peatland and is resistant to disease. The Ministry of Agriculture has introduced two superior varieties of Liberica coffee: Liberoid Meranti 1 (Lim 1) and Liberoid Meranti 2 (Lim 2). Currently, Lim 1 and Lim 2 can only be distinguished when the plants are two years old based on fruit size. Therefore, a DNA-based identification method is needed for young plants. This study aims to identify genomic regions that differentiate Lim 1 from Lim 2, as well as differences between Liberica and Robusta species. It utilizes Single Nucleotide Polymorphisms (SNP), a type of genetic mutation involving a single base change. The mutation data is stored in a VCF file containing 3,766,805 SNP records. K-Means clustering is applied to group genomic regions based on genetic variation patterns. The best clusters are determined using the Silhouette Coefficient, which indicates that k=5 is the optimal number. Visualization with Boxplots shows that Cluster 2 successfully identifies genomic regions distinguishing Liberica from Robusta, while Cluster 3 effectively groups regions differentiating Lim 1 from Lim 2.

Keywords: DNA, Genome, K-Means Clustering, Liberica Coffee, Mutation.

A Comparison of BM25 and SBERT Models for Presenting Relevant Online Product Reviews Based on User Keywords

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ABSTRACT

Online product reviews have become a critical factor in consumer purchasing decisions. However, the sheer volume of this user-generated content often makes it difficult for potential buyers to find the most relevant information efficiently. This study conducts a comparative analysis of two prominent information retrieval models, BM25 and Sentence-BERT (SBERT), to determine their effectiveness in retrieving relevant reviews based on user-provided keywords. The methodology utilized a dataset of 4,915 electronics reviews from Amazon. Following data preprocessing, both the statistical, term-frequency-based BM25 and the transformer-based SBERT, which leverages semantic embeddings, were implemented. Performance was evaluated using precision, recall, and F1-score. Results show that BM25 achieved 66% precision, 100% recall, and a 79% F1-score, whereas SBERT demonstrated superior performance with 74% precision, 100% recall, and an 85% F1-score. While both models identified all relevant documents, SBERT's higher precision underscores its superiority in delivering more accurate results. This study concludes that SBERT is significantly better suited for developing search systems that retrieve the most pertinent product reviews, ultimately enhancing the user experience.

Keywords: BM25, Information Retrieval, Product Reviews, SBERT, Search Relevance

Chronic Renal Failure (CKD) Disease Prediction Using Website-Based Duo Output Neural Network Ensemble (Donne) Method

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ABSTRACT

Chronic Kidney Disease (CKD) is one of the degenerative diseases that has seen a significant increase and has a major impact on the quality of life of those affected. Early detection of CKD is crucial for reducing the risk of complications and improving patient prognosis. This study aims to develop a CKD prediction system using the Duo Output Neural Network Ensemble (DONNE) method. The research data were collected from outpatient medical records at Arifin Achmad General Hospital in Riau Province, with a total of 397 samples. The DONNE method combines multiple artificial neural network models to produce more accurate and robust predictions. Three experiments were conducted to evaluate the model's performance, with the first experiment using a configuration of 10 Models, 50 Epoch s, and a Batch Size of 32 yielding the best results. This experiment achieved an accuracy of 97.79%, Recall of 89.83%, Precision of 98.15%, and an F1-score of 93.81%. These results indicate that the DONNE method is capable of providing better predictions than traditional methods. The developed system is expected to become an effective and easily accessible diagnostic tool to assist medical personnel in early decision-making.

Keywords: Artificial Neural Network, Chronic Kidney Failure, DONNE, Early Detection, Ensemble Learning.

Strategic Planning for Hospital Information System Development Using Enterprise Architecture Planning (Eap): A Case Study of Pekanbaru Mental Hospital

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ABSTRACT

The development of information technology requires hospitals to have an integrated information system to improve service quality and operational efficiency. This research aims to plan the information system development strategy at the Pekanbaru Mental Hospital using the Enterprise Architecture Planning (EAP) approach. The EAP method was chosen because it is able to harmonize business needs, operational processes, and technology infrastructure in a comprehensive and structured manner. The planning process is carried out through the stages of identifying the vision and mission of the organization, mapping business architecture, data, applications, and technology. The results showed that the current information system, based on SIMRS, still faced challenges of data integration and efficiency. The proposed design includes seven main applications, such as Patient Registration Application, Electronic Medical Record (RME), and Psychosocial Rehabilitation Application, with a phased implementation plan over 18 months. The data architecture is designed to integrate clinical data, billing, and automated notifications, supporting the target of 95% patient satisfaction by 2025. This research is expected to be the foundation for the development of integrated information systems in the mental health sector.

Keywords: Strategic Planning, Information System, Hospital, Enterprise Architecture, EAP

Classification and Monitoring Well Performance Using the Random Forest Algorithm at PT. Pertamina Hulu Rokan

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ABSTRACT

Manual monitoring of oil well performance has limitations in efficiency and accuracy when dealing with field condition changes. This study applies the Random Forest algorithm to build a well performance classification model based on historical data. The dataset consists of 259,923 records from well compliance tests in the X Field of WK Rokan, containing technical parameters such as total oil, fluid, water ratio, and production efficiency. The model's performance was evaluated using accuracy, precision, recall, and f1-score metrics to classify well conditions into three categories: declining, stable, and improving. The best experiment was achieved using a 90:10 data split, with an accuracy of 92.57%, precision of 96.09% (stable), 89.61% (improving), and 86.17% (declining), recall of 93.84% (stable), 93.16% (improving), and 88.46% (declining), and f1-score of 94.95% (stable), 91.35% (improving), and 87.30% (declining). The model was also implemented to predict new data and generate technical recommendations based on the classification results.

Keywords: Classification, Historical Data, Monitoring, Oil Well Performance, Random Forest

Decision Support System for Selecting the Best Native Broiler Chikens Using TOPSIS Method

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ABSTRACT

Animal husbandry in Indonesia especially native broiler chickens continues to grow rapidly in line with the increasing demand for nutritious food consumption. The selection of optimal native broiler chickens is a challenge for farmers because many factors need to be taken into account. This research aims to develop a web-based decision support system using the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method that can help farmers in selecting the best native broiler chickens. The TOPSIS method was chosen because of its ability to solve multicriteria decision making by providing objective and measurable recommendations based on the closeness of alternatives to the ideal solution. This system was built using PHP programming language and MySQL database also designed using Unified Modeling Language (UML) which includes use case diagram, activity diagram, sequence diagram, and class diagram. The calculation results show that Ayam Elba (A10) has the highest preference value of 0,8145 and Ayam Joper (A14) has the lowest preference value of 0,2993 from 15 alternatives analyzed. This system is expected to provide objective and efficient recommendations in supporting the decision making of native broiler breeders.

Keywords: Decision Support System, Native Broiler Chickens, TOPSIS.

DC-UNet-Based Sentinel-1 Image Segmentation for Water Body Extraction in the Kampar River Basin

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ABSTRACT

Land use changes and climatic influences significantly affect the dynamics of surface water in the Kampar River Basin (DAS Kampar). This study aims to extract water body areas using a segmentation-based radar image approach. Sentinel-1 imagery was acquired via the Sentinel-hub API and underwent several pre-processing steps: backscatter coefficient (σ^0) calculation, orthorectification, dB conversion, false-color composition (VV, VH, and VV/VH ratio), and min-max normalization. Samples were selected based on land cover diversity and seasonal variations. Data labelling was performed using the LabelMe software, and the dataset was split into 70% for training, 20% for validation, and 10% for testing. The segmentation method employed a Dual Channel UNet (DC-UNet) model specifically designed to process dual polarization inputs simultaneously. Model training included experiments with varying epochs (25, 50, 75, and 100). Evaluation results indicate that the model achieved high accuracy in delineating water bodies, with 99.17% test accuracy, 91.41% F1-score, and 91.57% Dice coefficient. These findings highlight the potential of DC-UNet for remote sensing-based surface water monitoring and suggest its applicability for hydrological resource management in dynamic watershed regions.

Keywords: DC-UNet, Kampar river basin, remote sensing, Sentinel-1, water body

An Information Security Risk Management Analysis of the Hospital Information System (SIMRS) Using OCTAVE and FMEA at Bhayangkara Hospital Pekanbaru

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ABSTRACT

The Hospital Management Information System (SIMRS) is an application that supports various essential processes in the operational services of Bhayangkara Hospital Pekanbaru. However, in practice, SIMRS still faces several issues, such as server downtime and network connectivity disruptions. These problems have not been addressed in a structured manner due to the absence of a dedicated risk management document. Therefore, this study aims to identify and evaluate various risks associated with SIMRS and to provide control recommendations to minimize potential problems. The method used for risk identification is OCTAVE, while risk assessment is conducted using FMEA. The research was carried out in four stages: planning, data collection, analysis, and recommendation. The results of the study identified 11 risks with 16 Potential Failure Modes (PFMs). Based on the FMEA assessment, there was 1 Potential Failure Mode with a high-risk level, 9 with a medium-risk level, and 6 with a low-risk level. Mitigation recommendations were formulated based on the controls outlined in ISO 27001:2022 and are expected to serve as a reference for future SIMRS asset security management.

Kata Kunci: FMEA, ISO 27001:2022, OCTAVE, SIMRS.

Trading Wild: The Diversity and Socioecological Dynamics of Wild Plants in Riau's Traditional Markets

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ABSTRACT

Wild plants have historically supported human livelihoods by providing food, medicine, and cultural materials. However, globalization, socio-economic shifts, and land-use changes have reduced their use and public awareness. In Riau, Sumatra—a bioculturally rich region facing rapid habitat loss from palm oil expansion—wild plant diversity and traditional knowledge are under threat. This study investigates the diversity, distribution, and cultural relevance of wild plants sold in traditional markets across 10 districts in Riau. Data was collected from October 2023 to September 2024 through semi-structured interviews with vendors and buyers and analyzed using the Relative Frequency of Citation (RFC) and Canonical Correspondence Analysis (CCA). A total of 167 wild plants and 5 fungi species from 131 genera and 66 families were recorded. Zingiberaceae was the most represented family. Most species are used for food and medicine, with leaves and fruits as the most sold parts. Flowers, typically sold as mixed bundles, serve spiritual purposes. CCA identified three distinct market groups: agroforestry area, urban, and forest area, shaped by elevation and market size. The findings highlight traditional markets as key spaces for sustaining ethnobotanical knowledge amid environmental change and call for conservation and policy measures to protect wild plants and the cultural heritage they represent.

Keywords: economic plants, local knowledge, useful plants

Floral and Fruit Morphology and Phenology of Eboni (*Diospyros celebica* Bakh.) at the Cibinong Botanical Garden

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ABSTRACT

Studying the phenology of *Diospyros celebica* is essential to determine the growth phases influenced by environmental conditions, thereby providing data to support its conservation efforts. This research aims to determine the phenology and morphology of flowering and fertilization of D. *celebica*, as well as updating the status of D. *celebica* collection data at the Cibinong Botanical Garden. The research was conducted through observations, sampling, and analysis using ImageJ' software. The results showed that there were differences in flowering period between the male and female D. *celebica*. Male flowers of D. *celebica* took approximately 18 days to bloom, while female flowers took 26 days until they become fruit ovules. The fruit development period of D. *celebica* occurs for 18 weeks. Morphologically, *D. celebica* has urceolate shaped flowers and ovoid fruits. The results of the period and phenology obtained are influenced by the surrounding environment (climate). Based on the results of this study, it can be concluded that D. *celebica* is a dioecious tree, the period of flower development is different in each sex and takes up to 18 weeks to develop into mature fruit, both of which are affected by climatic conditions.

Keywords: *Diospyros celebica*, Flower, Fruit, Morphology, Phenology

Floristic Study of Euphorbiaceae Family based on Phytochemistry at Riau University

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ABSTRACT

Euphorbiaceae is one of the angiosperms, including diverse flowering plants and a wide distribution. This family is widely used as medicinal plants, plays a role in industry, medicine, and agriculture and contributes to biodiversity in the plant world. This study aims to identify the diversity of plants from the Euphorbiaceae family based on phytochemical content in the Riau University area. Sampling was done by exploration method. Samples were identified based on phytochemical tests. The results showed that in the Euphorbiaceae family there were 14 genus, 24 species and 29 plant collections. The genus of the Euphorbiaceae family found are Acalypha, Aleurites, Blumeodendron, Cnidoscolus, Condiaeum, Endospermum, Euphorbia, Excoecaria, Hevea, Homalanthus, Jatropha, Macaranga, Mallotus, and Manihot. All plant species were identified as containing chemical compounds such as alkaloids, flavonoids, saponins, and tannins, while most contained steroids and terpenoids found in several plant species. These results indicate the potential of plants of the Euphorbiaceae family as medicinal plants.

Keywords: Euphorbiaceae, Diversity, Phytochemical test, Riau University.

Efek Pemberian Akrilamida terhadap Skoring Nekrosis Sel Tubulus Ginjal Tikus Putih Wistar (*Rattus Norvegicus* B.)

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ABSTRACT

Acrylamide is a harmful chemical compound that forms in food due to high-heating processes, especially in foods that contain carbohydrates and proteins. These compounds are toxic, carcinogenic, and neurotoxic, and can trigger kidney damage. This study aimed to determine the effect of acrylamide administration on the scoring of renal tubule cells in white Wistar rats (*Rattus norvegicus* B.). The study method was conducted with treatment groups P0 (control), P1 (2.5 µg/kg BW), P2 (5 µg/kg BW), and P3 (10 µg/kg BW). Kidney preparations were made after 14 days of treatment and microscopically observed using hematoxylin-Eosine staining. The results showed that the P0 group (control) had a score of 1 (mild), P1 with a score of 2 (moderate), P2 with a score of 3 (severe), and P3 with a score of 3 (severe). Acrylamide causes necrosis of renal tubule cells especially at high doses. This study provides an understanding of the risks of consuming foods containing acrylamide to kidney health.

Keywords: Acrylamide, necrosis, renal tubules, Wistar white rats, histopathology

Species Diversity of Ants (Hymenoptera: Formicidae) in the Arboretum Ecosystem of Riau University

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ABSTRACT

Ant Diversity in arboretum habitats reflects complex ecological dynamics the diversity of ants in arboretum habitats reveals intricate and compelling ecological dynamics. Arboretum, with their varied vegetation structure and characteristic canopy stratification, offer a range of microhabitats that significantly support species variation. The presence of tall trees, shrubs, and leaf litter layers creates distinct microclimatic conditions that influence the distribution, abundance, and interpopulation interactions of ants. This study aims to identify ant species diversity within the arboretum habitat at Universitas Riau. Research was conducted from November to March 2024 using pitfall traps with a total 150 cups distributed across five plots to collect data. The findings recorded 462 individuals from 24 species. In addition to species identification, the study also measured various environmental parameters, such as canopy cover and leaf litter thickness.

Keywords: Ant, Arboretum, Diversity, Habitat, University of Riau.

Unveiling Bioactive Potential: A Review on the Phytochemical Properties and Antioxidant Activity of Several Terrestrial Fern Species from the Depati Karo Jayo Tuo Forest, Jambi

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ABSTRACT

Ferns (Pteridophytes) are an abundant component of biodiversity in forests, including the Depati Karo Jayo Tuo Customary Forest in Jambi. However, their potential as a source of natural antioxidants has not been comprehensively explored. This systematic review aims to synthesize the existing scientific literature on the phytochemical content and antioxidant activity of various terrestrial fern species from 11 families relevant to the flora found in the Depati Karo Jayo Tuo Customary Forest. The methodology involved a literature search across electronic databases, with inclusion criteria focusing on primary studies that reported phytochemical data and quantitative antioxidant assay results. A detailed analysis was conducted using a taxonomic representative approach to ensure broad coverage. The results reveal that tested species from 10 of the reviewed families possess phytochemicals that establish them as a highly promising source of natural antioxidants. In contrast, no phytochemical or antioxidant data were found for *Christensenia aesculifolia* (family Marattiaceae), highlighting a significant research gap. Despite these promising findings, the current body of knowledge is predominantly based on data from populations outside the focal research area. Therefore, primary research on the fern species within the Depati Karo Jayo Tuo Customary Forest is a critical step to validate their antioxidant potential.

Keywords: Potential, Phytochemicals, Antioxidant, Terrestrial Ferns

Harnessing Landfill Microbial Potential: *Geotrichum candidum* Crude Lipase for PET Biodegradation

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ABSTRACT

Plastic waste, particularly polyethylene terephthalate (PET), poses a serious global environmental challenge due to its resistance to natural degradation. In this study, a fungal isolate identified as *Geotrichum candidum* was obtained from landfill soil and demonstrated significant potential in PET biodegradation. The fungus produced crude lipase with notable lipolytic activity, as indicated by the formation of clear zones on selective media. The enzyme extract exhibited a stable protein yield averaging 2.992 mg/mL. When applied to PET samples over a 30-day incubation period, the crude lipase induced measurable degradation, with weight loss ranging from 5.9% to 6.4%. FTIR analysis confirmed chemical structural changes in PET, notably the cleavage of ester bonds, while SEM observations revealed surface damage such as cracks and pores. These results highlight the biodegradation capability of *G. candidum* lipase and its promising role as an eco-friendly solution for PET plastic pollution.

Keywords: PET biodegradation, crude lipase, *Geotrichum candidum*.

Production of Fermented Plant Extract fromKepokBanana Peel and Its Potential as a Nutrient Sourcefor Hydroponic Pakchoi (*Brassica rapa* L.)

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ABSTRACT

Fermented plant extract (FPE) is a type of liquid organic fertilizer produced fromfruit or vegetable waste through a fermentation process aided by microbial activators. This study aimed to produce and analyze FPE from kepok banana (Musa paradisiaca) peels using Effective Microorganisms-4 (EM4), palm sugar solution, and water. The FPEwas prepared from 250 g of banana peel with varying EM4 volumes (T0 = 0 mL, T1= 25 mL, T2 = 50 mL, T3 = 100 mL), using 100 mL of 1 kg/L palmsugar solutionina total volume of 1000 mL. Parameters analyzed included pH, electrical conductivity (EC), total dissolved solids (TDS), and macro- and micronutrient content, measuredusing potentiometry, refractometry, UV-Vis spectrophotometry, Kjeldahl, and AtomicAbsorption Spectrophotometry (AAS). The resulting FPE was applied to pakchoi (*Brassica rapa* L.) grown hydroponically to evaluate its effectiveness as a natural nutrient solution, compared to a negative control (water) and a commercial nutrient solution (AB Mix) as a positive control. The highest EC, TDS, Fe, Cu, and nitrogen(N) levels were found in T3, with values of 8,528 µS/cm, 4,267 mg/L, 5.14 mg/L, 0.17 mg/L, and 0.015%, respectively. Meanwhile, T2 showed the highest pH, phosphorus (P), potassium (K), zinc (Zn), manganese (Mn), and organic carbon levels. FPE T2 at 6% concentration (pH 6) yielded the best growth response in pakchoi, with4.77 cm plant height and 12 leaves. These results suggest that FPE derived frombanana peels has potential as an alternative liquid fertilizer in hydroponic systems.

Keywords: Banana peel, FPE, hydroponics, organic fertilizer, pakchoi.

Anti-cancer Potential Activity of *Mangifera sumbawaensis* Kosterm. Leaf Extract Through in Silico Studies

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ABSTRACT

Mangifera sumbawaensis is an endemic wild mango from Sumbawa Island. Wild mangoes have many biological activities including anticancer agents. In silico can be used to reveal the potency of wild mangoes as anticancer agent. The aim of this study are to (1) identify secondary metabolites from *M. sumbawaensis* leaves extract based on LC-MS/MS, (2) investigate anticancer activity of *M. sumbawaensis* leaves based on protein-compound interaction with in silico approach. Leaves of *M. sumbawaensis* are macerated with etanol 70% (1:10) for 72 hours. Compounds of *M. sumbawaensis* leaves extract are annotated with LC-MS/MS. Annotated compounds are analyzed for revealing anticancer activity using PASS and molecular docking to Bcl-2, Bcl-xL, and Mcl-1 and *drug-likeness* activity using SwissADME. This study shows 15 compounds are annotated from *M. sumbawaensis* leaves extract. Eight compounds correlated with anticancer activity based on PASS analysis. Echinenone, mangiferin and quercetin have the highest binding affinity to protein targets. Eight compounds interact with at least one amino acid target on protein targets. Drug-likeness analysis shows mangiferin and echinenone did not meet the optimal criteria of Lipinski's rule of five. This research suggests that the ethanol leaves extract of *M. sumbawaensis* have potency as an anticancer agent through the inihibition of anti-apoptotic protein.

Keywords: Drug-likeness, metabolomics, molecular docking, wild mango

Maggots as a Modifier of Avocado Peel Biosorbent to Enhance the Adsorption Capacity of Indigo Carmine Dye

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ABSTRACT

The increased discharge of synthetic dyes, such as indigo carmine, into aquatic ecosystems presents serious environmental concerns due to their toxicity and resistance to biodegradation. While several dye removal methods exist, they are often complex, expensive, and exhibit low adsorption capacities. In this study, avocado peel (*Persea americana* Mill.), an abundant agricultural waste, was utilized as a biosorbent. To enhance its adsorption efficiency, the peel was modified with maggot powder. This study aimed to evaluate the effectiveness of maggot-modified avocado peel in adsorbing indigo carmine dye. Optimal adsorption conditions were determined by examining the effects of pH, initial dye concentration, contact time, and biosorbent heating. The avocado peel was washed, dried, sieved (≤36 μm), and activated using HNO_3. It was then mixed with dried and sieved maggot powder at a 1:1 ratio, combined with 75 mL of 96% ethanol, and sonicated for 15 minutes. The mixture was filtered and aerated for 24 hours. Batch adsorption experiments were conducted, and the process was analyzed using kinetic, isotherm, and thermodynamic models. Results showed that the optimal conditions were at pH 2, dye concentration of 1,100 mg/L, contact time of 90 minutes, and heating at 90°C, yielding a maximum adsorption capacity of 79.39 mg/g. The adsorption followed the Freundlich isotherm model, suggesting multilayer adsorption on heterogeneous surfaces, and pseudo-second-order kinetics, indicating chemisorption. Thermodynamic parameters confirmed that the adsorption was spontaneous and exothermic, negative entropy indicates that the system becomes more ordered. Overall, avocado peel-modified maggot offers a sustainable, eco-friendly, and low-cost solution for treating dye-containing wastewater.

Keywords: Avocado peel; Adsorption; Maggot; Isotherm; Thermodynamics

Selection of *Melastoma malabathricum* from Five Medicinal Plants for Antibacterial Study: Bioactivity-Guided Screening and LC-MS Profiling

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ABSTRACT

The growing threat of antibiotic resistance has renewed interest in medicinal plants as sources of bioactive secondary metabolites with therapeutic potential, particularly as natural antibacterial agents. This study aimed to evaluate the phytochemical composition, extract yield, and antibacterial activity of five medicinal plant species: *Cassia alata*, *Phyllanthus niruri*, *Andrographis paniculata*, *Melastoma malabathricum*, and *Artocarpus heterophyllus*. Each sample (100 g dried material) was extracted by maceration using methanol as the solvent. The highest yield was obtained from *P. niruri* (7.04%) and the lowest from *A. heterophyllus* (2.27%). Phytochemical screening revealed the presence of flavonoids, phenolics, steroids, and alkaloids in all samples, while saponins and coumarins were only detected in some species. Antibacterial activity against methicillin-resistant *Staphylococcus aureus*, assessed by the disc diffusion method, showed the highest inhibition zone in *P. niruri* (13.54 mm), followed by *C. alata*, *M. malabathricum*, *A. paniculata*, and *A. heterophyllus*. Due to its promising activity and rich metabolite profile, *M. malabathricum* was selected for further investigation. Methanol extracts of its root, stem, leaf, and flower showed yields ranging from 5.15% to 12.18%. Leaf extract was further fractionated using solvents of increasing polarity (hexane, ethyl acetate, methanol). The methanol fraction exhibited the highest antibacterial activity against *S. aureus* (12.96 mm) and *Escherichia coli* (5.71 mm). LC-MS analysis identified bioactive compounds such as quercetin, kaempferol, ellagic acid, and ursolic acid. These findings support the potential of *M. malabathricum* methanol leaf extract as a promising natural antibacterial agent and a candidate for phytopharmaceutical development.

Keywords: antibacterial, LC-MS, maceration, *Melastoma malabathricum*, phytochemical.

Characterization and Identification of Macroscopic Fungi in the Secondary Forest of Sultan Syarif Hasyim Grand Forest Park

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ABSTRACT

Fungi are forest floor-dwelling organisms that obtain their energy by absorbing nutrients from the weathering process. Macroscopic fungi are fungi whose body size is relatively large and have fruiting bodies, can be seen with the naked eye, can be held by hand, and are striking in shape. Fungi have a role in ecological aspects as decomposers and economic aspects can be utilized as food and medicine. This study aims to determine the types of macroscopic fungi of the Basidiomycota phylum found in the Secondary Forest of the Sultan Syarif Hasyim Grand Forest Park. The method used in this research is exploration. Morphological characteristics observed refer to identification books, applications and websites. Based on the results of the identification of macroscopic fungal species in the Sultan Syarif Hasyim Forest Park, Riau Province, there are 10 types of macroscopic fungi, namely Microporus xanthopus, Trametes pubescens, Trametes sp., Ganoderma brownie, Phellinus robiniae, sp., Ischoderma resinosum, Crepidotus sp., Clavulina cinnerea, Russula fragilis and unknown species. Most of the fungi live on rotten wood.

Keywords: macroscopic fungi, Basidiomycota, exploration, secondary forest, sultan syarif hasyim high forest park.

COMPARATIVE BETWEEN THE SYNTHESIS OF ZINC OXIDE NANOPARTICLES (ZnONP) WITH CAPPING AGENT POLYVINYL ALCOHOL COMPOUNDS (PVA) AND MICROALGAE *Spirulina platensis*

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ABSTRACT

ZnO nanopartikel (ZnO-NP) dapat dimodifikasi morfologinya dengan mengontrol kondisi proses fisiko-kimia dari metoda Sol-gel-hidrotermal. ZnO-NP digunakan untuk mencegah infeksi *Staphylococcus epidermidis* yang menyebabkan jerawat, infeksi kulit, dan saluran kemih, dan ginjal. Pada penelitian ini sintesis ZnO nanopartikel (ZnO
NP) dibandingkan antara *Capping agent* kimia dan biogenik, untuk mengoptimalkan pembentukan morfologi ZnO NP dengan pola dimensi terstruktur, keseragaman ukuran homogen. *Capping agent* kimia digunakan Polivinil Alkohol (PVA) dan biogenic digunakan *Spirulina palentesis*. Keduanya diuji secara in vitro terhadap *Staphylococcus epidermidis*. Analisis FT-IR menunjukkan intensitas pada angka gelombang 3743,19 - 3392,67 cm^{-1} adalah gugus (O-H), 1640 - 1635 cm^{-1} (N-H), 1400 – 1395 cm^{-1} (CH_3), 1077 – 1060 cm^{-1} (C-N) dan 584 – 401 cm^{-1} (Zn-O) yang diidentikkan gugus fungsi dari *capping agent*. Analisis UV-Vis untuk memprediksi bahwa pembentukan ZnO-NP berukuran nano berdasarkan sifat optiknya pada daerah serapan $\lambda \leq$ 400 nm. Analisis XRD menunjukkan intensitas $2\theta = 31{,}74°$; 34,37° ; 36,18° adalah ZnO *wurzite* sesuai standar ICSD 36-1451. Perbedaan jenis *capping agent* antara PVA dan *S. palentesis* menghasilkan perbedaan ukuran kristal 28,63 nm dan 22,76 nm. Pola SEM-EDX dari PVA berbentuk *spheric* dan *S. platensis* berbentuk *rods*, masing-masing memiliki komposisi unsur Zn, O, C dan N. Kami mengusulkan bahwa ZnO-NPs yang dihasilkan dari sumber alami lebih disukai daripada kimia sebagai zat antibakteri yang disebabkan oleh infeksi *Staphylococcus epidermidis*.
***Kata Kunci*:** ZnO, *Capping agent*, PVA, *Spirulina Platensis*, *Staphylococcus epidermidis*

Toxicological Study of Phanera semibifida (Roxb.) Benth. Extracts from Lingga Island Using the Brine Shrimp Lethality Test

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ABSTRACT

Indonesian people use plants as medicine because they are considered to have fewer side effects. *Phanera semibifida* (Roxb.) is a climbing plant that the Lingga island community has used to make therapeutic drugs, which have the potential to be a medicinal plant. This research aims to identify toxicity capability (BSLT) and biological potential from Lingga Island's *P. semibifida*. The BSLT test was conducted on stems and leaves extract using five different solvents. The result showed that the stems extract has better activity than the leaves extract across all solvents. The Ethanol extract has antimicrobial potential, and the ethyl acetate extract is most toxic and shows anticancer properties.

Keywords: Anticancer potential, Lingga Island, *Phanera Semibifida*, Toxicity test

Exploring The Neuroprotective Potential of p Methoxycinnamic Acid: Insights from a *Drosophila* Model

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ABSTRACT

p-Methoxycinnamic acid (p-MCA), a bioactive compound that is also present in *Kaempferia galanga*, exhibits neuroprotective properties attributed to its antioxidant and anti-inflammatory effects. This study aimed to investigate the neuroprotective potential of p-MCA in an *in vivo* Alzheimer's disease (AD) model using *Drosophila melanogaster*, complemented by *in silico* molecular docking and dynamics simulations to elucidate its molecular interactions. Toxicity assays established that 10 mM $AlCl_3$ induced neurodegenerative symptoms without significantly compromising fly survival, providing a suitable model for AD. Survival analyses demonstrated that treatment with p-MCA at 0.1 mM and 0.01 mM significantly extended lifespan in $AlCl_3$-exposed flies. Behavioral assays assessing locomotor activity (negative geotaxis) and cognitive function (phototaxis) revealed marked improvements following p-MCA administration. Gene expression analysis indicated upregulation of antioxidant genes (*sod1*, *hsp22*) and the anti-aging gene *srl*, suggesting mitigation of oxidative stress and neurodegeneration. Computational studies further supported these results, revealing a strong bindiqx232ng affinity of p-MCA to acetylcholinesterase (AChE) with a Gibbs free energy of –7.2 kcal/mol, comparable to the known inhibitor Donepezil, indicating potential AChE inhibition. These findings collectively suggest that p-MCA exerts neuroprotective effects via multiple mechanisms, including oxidative stress reduction and mitochondrial protection. Thus, p-MCA holds promise as a therapeutic candidate for neurodegenerative diseases, and further research is warranted.

Keywords: p-Methoxycinnamic acid, neuroprotection, Alzheimer's disease, *Drosophila melanogaster*, molecular docking.

Growth of Free-range Chickens (*Gallus gallus*) Fed from Fermented Cassava Peel Flour (*Manihot utilissima*) and Noni Leaves (*Morinda citrifolia* L.)

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ABSTRACT

Alternative feed from local fermented raw materials has been widely used to replace commercial feed. One of them is the use of fermented cassava peel flour and noni leaves. This study aims to determine the effect of fermenting cassava peel flour and noni leaf flour as a substitute for alternative feed on the growth of free-range chickens in the form of weight gain, feed consumption, feed conversion and protein consumption. This study used a Complete Random Design with 5 treatments and 5 replicates, and 4 treatments, namely P0 (100% basal feed), P1 (20% feed material+80% basal feed), P2 (50% feed + 50% basal feed), P3 (80% feed + 20% basal feed), P4 (100% feed material). The result data was analyzed with Anova and Duncan's follow up test test. The results of this study showed that all treatments had a real and different effect on body weight gain, feed consumption, feed conversion and protein consumption. In the P1 treatment, the average body weight gain was highest of 27,13 g/head/day, the highest feed consumption was 53,55 g/head/day, feed conversion was 2,61, the highest protein consumption was 5,30 g/head/day, and the highest protein consumption ratio in the P2 treatment was 0,21. Cassava peel flour fermented feed and noni leaf flour can be used as an alternative feed that can increase the growth of free range chickens.

Keywords: Free Range Chicken, Fermentation, Cassava, Noni, Growth

Analysis of Genetic Diversity of Sago Population in Meranti Islands based on Morphological Characteristics and Start Codon Targeted Polymorphism (SCoT) AND matK Marker

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ABSTRACT

Sago is an iconic agricultural commodity of the Meranti islands region. Sago plantations covers 40,386 hectares. The varied production results and morphological differences in the sago populations indicate a high genetic diversity. This research aims to identify sago plants in Meranti Islands and classify them based on similarities in morphological traits and DNA analysis. DNA analysis is conducted through the SCoT and MatK markers. The stages of the research include sample collection, total DNA isolation, total DNA electrophoresis, total DNA amplification with SCoT and MatK primers, and data analysis. The research results show that based on morphological traits, the sago populations in the Meranti Islands consist of 3 groups, namely: BB, TB, BJ. The dendrogram resulting from the binary data analysis of SCoT using the UPGMA method and analysis of MatK using BLAST on Genebank indicates that these three groups are distinct and have different similarity coefficients. The BB group has a higher similarity coefficient with the BJ group compared to the TB group. There is no high genetic variation within the group due to the vegetative propagation of sago.

Keywords: Sago, ScoT, MatK, DNA Markers

The In Vitro Study on Conjugation of Selenium Nanoparticles and Phycocyanin from Spirulina platensis as Anti-cancer and Anti-inflammatory

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ABSTRACT

Phycocyanin is the major bioactive compound in Spirulina platensis. These microalgae can absorb and convert selenium (Se) from their environment into selenoproteins in the form of selenocysteine, which has high bioavailability and strong antioxidant activity. The conjugation of selenium nanoparticles and phycocyanin in this study aims to increase the bioactivity of phycocyanin as an anti-inflammatory and anti-cancer in vitro. Biosynthesis of selenium nanoparticles using phycocyanin extract from Spirulina platensis culture supplemented with Na_2SeO_3 to produce SeNP-Phycocyanin. The biological effect of SeNP-phycocyanin on 4T1 breast cancer cells was evaluated using the MTT assay and the anti-inflammatory assay of SeNP-F, which measures the stability of erythrocyte cell membranes and cell hemolysis. The study results in an increase in the antioxidant activity of SeNP-Phycocyanin with an IC50 value of 35.68 mg/l compared to the phycocyanin IC50 value of 78.58 mg/L. The anti-cancer activity test of SeNP-Phycocyanin's ability to inhibit the growth of 4T1 cancer cells showed an increased IC50 value of 56.494 mg/L compared to Phycocyanin, with an IC50 value of 319.89 mg/L. The results of the anti-inflammatory test showed an increase in red blood cell membrane stability of 50% at a phycocyanin concentration of 56.93 mg/L and a decrease in red blood cell hemolysis of 50% at a phycocyanin concentration of 56.77 mg/L. Thus, phycocyanin conjugation with selenium nanoparticles enhances bioactivity and increases anti-cancer and anti-inflammatory potential.

Keywords: Nanoparticle-Selenium, Phycocyanin, anti-cancer, anti-inflammatory.

Physicochemical Study of ZIF-67@ZnO MOFs Composites from Kalamansi (*Citrus microcarpa Bunge*) Peel Extract

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ABSTRACT

Metal-organic frameworks (MOFs), specifically ZIF-67, have been successfully combined with ZnO using the solvothermal method. ZnO was synthesized through a low-temperature hydrothermal method using extracts from kalamansi orange peel, with variations in the mass of ZnO added of 0.03 g, 0.05 g, and 0.07 g. FTIR characterization identified the presence of stretching vibrations from Co-N and C-N bonds. FTIR characterization identified the presence of stretching vibrations of Co-N and C-N bonds, as well as bending vibrations of aromatic C=N groups and aromatic C-H sp3 rings. XRD analysis showed the characteristic diffraction pattern of ZIF-67, and the addition of ZnO slightly reduced its crystallinity. SEM analysis showed that ZIF-67 has a dodecahedral morphology with a smooth surface and uniform particles, with an average particle size of 411 nm. After the addition of ZnO, the particles still maintain a dodecahedral shape, but with a more variable size, averaging 495 nm. EDS analysis confirmed the presence of the constituent elements of ZIF-67 as C, N, O, and Co, while ZnO consists of C, O, and Zn.

Keywords: Composite, MOFs ZIF-67, *Citrus microcarpa Bunge*, ZnO

Halal Gelatin Production from Chicken Skin Collagen (Gallus gallus domesticus) using Waterbath and Microwave Extraction Methods

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ABSTRACT

Gelatin is a multifunctional polymer produced by hydrolysis of collagen from skin, bone, and connective tissue containing amino acids. The increasing demand for halal gelatin is driving research into alternatives, including gelatin from chicken skin. This study aims to explore the method of extracting chicken skin gelatin using a technique using a waterbath (65°C, 10, 20, and 30 minutes) and microwave (200 W, 1, 3, 5, 7, and 10 minutes). Analysis of proximate content are the yield test, ash content, moisture content, acidity (pH), and viscosity. The resulting gelatin characterization was carried out using spectroscopy FTIR, spectrophotometer UV-Vis, electrophoresis SDS-PAGE, and SEM instruments. Optimal gelatin extraction with a 200W microwave for 10 minutes resulted in a yield of 21.19%. The resulting gelatin has a moisture content of 13-16%, ash content of 3.2- 4.2%, pH 4, and viscosity of 2.2-3.3 cP. Spectroscopy FTIR analysis showed characteristic functional clusters of proteins, while spectrophotometer UV-Vis indicated the presence of chromophore clusters. Electrophoresis SDS-PAGE shows polypeptide fragments with molecular weights of 49,4 kDa; 29,4 kDa; and 25 kDa. SEM shows a tight and regular surface structure without cavities.

Keywords: Chicken Skin, Gelatin, Halal, Microwave.

Adsorption of crystal violet dye using avocado seeds (*Persea americana* Mill.)

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ABSTRACT

The development of the textile industry has produced a number of pollutants, such as crystal violet (CV) dye, which cause serious environmental problems. Biosorption is a technique utilizing chemical and physical interactions to remove synthetic dyes. Avocado seeds have the potential to be used as biosorbent because it contain active compounds such as cellulose, hemicellulose, lignin, etc. These compounds contain hydroxyl, carbonyl, and carboxyl groups that can be used as biosorbent materials. This study investigated the ability of avocado seeds to remove crystal violet dye. The pHpzc value obtained was 6,1. The optimum conditions for crystal violet dye adsorption were identified are at pH 7, initial concentration 1100 mg/L, contact time 60 minutes, and biosorbent heating temperature 25°C. Under these optimum conditions, the avocado seed biosorbent resulted in a maximum adsorption capacity of 97,66 mg/g for crystal violet dye. Applying these optimum conditions to laboratory waste showed a removal efficiency of 93,43% (qe = 7,58 mg/g). The crystal violet adsorption process followed the Langmuir isotherm model (R^2 = 0,9591), indicating the formation of a monolayer. The adsorption kinetics model followed the pseudo second order model (R^2 = 0,9924), indicating the occurrence of chemical interaction. Thermodynamic adsorption studies showed that the adsorption process was spontaneous, exothermic, and with increased disorder. Characterization using Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy - Energy Dispersive X-ray (SEM-EDX), X-ray Fluorescence (XRF), and Thermogravimetric Analysis (TGA) confirmed the presence of both physical and chemical adsorption mechanisms.

Keywords: Adsorption, avocado seed, crystal violet, batch method, biomass

Green Synthesis of $MgFe_2O_4$ using Natural Iron Sand as a Fe Source: A Study on Structure, Morphology, Character, and Photocatalytic Performance

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$MgFe_2O_4$ nanoparticles were synthesized via the coprecipitation method using iron sand from Kata Pariaman Beach as the iron (Fe) source. The influence of pH on the crystal structure, morphology, optical, magnetic, electrical properties, and catalytic activity of the material was systematically investigated by varying the pH during synthesis. X-ray diffraction (XRD) analysis confirmed that all synthesized ferrite samples possessed a cubic crystal structure. Fourier Transform Infrared (FTIR) spectroscopy revealed dominant absorption bands in the range of 400–600 cm^{-1}, corresponding to the characteristic vibrations of tetrahedral and octahedral sites in the $MgFe_2O_4$ spinel lattice. Scanning Electron Microscopy (SEM) analysis indicated that the samples exhibited a homogeneous granular morphology. The band gap energy of the samples ranged from 1.8 to 1.9 eV, suggesting strong absorption in the visible light region. Magnetic measurements showed that the samples exhibited superparamagnetic behavior, as evidenced by the shape of the hysteresis curves. The dielectric constant of the $MgFe_2O_4$ samples increased with increasing pH during synthesis. Furthermore, the samples demonstrated excellent photocatalytic activity on the degradation of Congo red dye under sunlight irradiation.

Keywords: Iron sand, MgFe2O4, magnetic, Congo red, photodegradation

Structural and Surface Engineering of La^{3+}-Doped $ZnFe_2O_4$ and Its Hydroxyapatite Composite for Hazardous Pollutant Removal

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ABSTRACT

The removal of hazardous pollutants such as heavy metals and synthetic dyes from wastewater demands the development of multifunctional, efficient, and environmentally friendly materials. In this study, structural and surface engineering of $ZnFe_2O_4$ was carried out through La^{3+} ion doping and compositing with natural hydroxyapatite (HAp) to enhance photocatalytic and adsorptive performance via a synergistic mechanism. The synthesis was performed using a green hydrothermal method, employing *Uncaria gambir Roxb.* leaf extract as a capping agent and shell waste as a calcium source. La^{3+} doping modified the $ZnFe_2O_4$ crystal structure from a normal spinel toward a partially inverse configuration, refined the particle morphology into a more uniform and finer form, and tuned the magnetic behavior from paramagnetic to superparamagnetic. Additionally, electronic structural changes induced by doping resulted in band gap narrowing, promoting enhanced visible light absorption and improving photocatalytic reactivity. The incorporation of HAp increased the specific surface area and introduced additional active sites, which collectively boosted pollutant removal efficiency through both adsorption and photodegradation pathways. This integrated approach demonstrates strong potential in designing smart and sustainable materials for efficient wastewater treatment under natural light exposure.

Keywords: Green synthesis, hydroxyapatite, La^{3+} doping, photocatalysi, $ZnFe_2O_4$

Effect Of pH On The Malachite Green Transport In Polymer Inclusion Membranes (PIMs)

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ABSTRACT

The large amounts of untreated wastewater, resulting in disruption of clean water quality in the textile industry is the most prominent sector because it contributes the most of the liquid waste. Malchite green (MG) is a controversial compound because it can harm the immune system, reproductive system, genotoxic and carcinogenic properties. This study aims to determine the optimum pH MG in the source phase. Membrane preparation was carried out by dissolving Co-EEGDMA, polyvinyl chloride (PVC), and dibenzyl ether (DBE) into tetrahydrofuran (THF) solvent. The PIM method in liquid membrane techniques has developed as a more stable alternative compared to other liquid membrane methods. This study used the PIM method for the separation of MG with copoly-eugenol ethylene dimethacrylate (Co-EEGDMA) as a carrier to transport the target compound from the source phase to the recipient phase. The concentration of MG after transport was determined by a UV-Vis spectrophotometer. The results for absorbance was measured by UV-Vis spectrophotometer at a wavelength of 613 nm. The results of the study showed, the PIM membrane with the Co-EEGDMA carrier was able to transport MG at a source phase pH of 7 with a %removal was 81.43%. The results of this study showed that MG was still left in the membrane phase 18.57%, MG was recovered 5.59%, MG was left in the membrane phase 75.84% and MG was removed 81.43%.

Keywords: Co-EEGDMA, liquid membrane, malachite green, PIM, textile industry.

Synthesis of Hydroxyapatite/Carboxymethyl Cellulose Composite as an Eco-Friendly Adsorbent for Crystal Violet

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ABSTRACT

This study aims to synthesize hydroxyapatite/carboxymethyl cellulose (HAp/CMC) composites using natural calcium sources from eggshells and to evaluate their potential as adsorbents for crystal violet dye. The synthesis was carried out using the in-situ sol-gel method with varying CMC concentrations (2.71%, 5.28%, 10.04%, 14.34%, and 18.25%) to observe their effects on the composite characteristics. Characterization was performed using FTIR, BET, XRD, and SEM-EDS. The best composite was obtained at a CMC concentration of 2.71%, showing high surface area, mesoporous structure, crystallinity according to ICSD standard #157481, and spherical porous morphology. Adsorption tests showed optimal conditions at pH 11 with a maximum adsorption capacity of 0.7807 mg/g and efficiency of 97.59%, following the Langmuir isotherm and second-order pseudo-kinetic models. The composite also demonstrated regeneration capability up to five cycles. These results indicate that the HAp/KMS composite is an effective adsorbent and can be reused for dye waste treatment.

Keywords: Hydroxyapatite, Carboxymethyl cellulose, Composite, Adsorption, Crystal violet.

Effectiveness of Pb^{2+} Metal Ion Sorption Using Silica xerogel adsorbent and Modified Silica Xerogel (Si@EDA-Cu)

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ABSTRACT

Modification of silica xerogel using ethylendiamine (EDA) and impregnated with $CuCl_2$ for the absorption of Pb^{2+} metal ions by batch method has been done. The purpose of this research is the development of adsorbent material based on silica from durian peel waste which is modified and applied to overcome the problem of hazardous metal waste pollution, especially pollution of lead metal ions Pb^{2+} which is compared with silica xerogel without modification. It was found that the absorption capacity of Pb^{2+} metal ions increased when using modified silica xerogel. The results of FTIR, XRD and BET characterization showed changes in the structure and physical properties of silica xerogel after being modified with EDA-Cu.

Keywords: Adsorbent, Durian Rind, Pb^{2+} Ions, Silica Xerogel

Chemical Modification of Eugenol with Secondary Amine: Synthesis and Structural Elucidation

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ABSTRACT

A new eugenol derivative was successfully synthesized through controlled chemical reactions involving eugenol and secondary amine. This synthesis pathway aims to introduce specific functional groups from amine into the eugenol, which have the potential to improve its biological or chemical properties. Eugenol was reacted with epichlorohydrin leading to the synthesis of epoxide eugenol. The epoxide ring was cleaved to secondary amine-substituted eugenol by mixed the epoxide eugenol with a secondary amine (4-Methyl piperidine). Initial monitoring of the reaction progress and preliminary assessment of product purity were performed using Thin Layer Chromatography (TLC). The structures of eugenol derivative was confirmed by spectroscopic techniques like FTIR, LC-MS/MS, ^{1}H-NMR, and ^{13}C-NMR. TLC showed a single spot confirming the product's formation. LC-MS/MS revealed a molecular ion peak at m/z 320 consistent with the theoretical mass of the desired derivative. FTIR spectra exhibited a C-N stretch at 1234 cm^{-1} and the appearance of the O-H band at 3079 cm^{-1}. NMR data (^{1}H and ^{13}C) provided full assignment of chemical shifts, confirming the successful synthesis of eugenol derivate.

Keywords: eugenol, secondary amine, structural elucidation, synthesis

Characteristics of MOFs ZIF-67 Modified with Iron Sand from Kaur, Bengkulu

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ABSTRACT

Iron sand from Kaur Regency has the potential to be developed as the main material in the synthesis of Metal Organic Frameworks (MOFs) composite materials. MOFs ZIF-67 and MOFs composite ZIF-67@Fe_3O_4 at various mass percentages of Fe_3O_4 (5, 7, and 10%) using the solvothermal method have been successfully synthesized. The characterization results using Fourier Transform Infrared Spectroscopy (FTIR) showed absorption peaks from Co-N stretching vibrations, indicating that a bond has been formed between Co and the N atom in 2-methylimidazole, bending and stretching vibrations of C-N. The MOFs composite ZIF-67@Fe_3O_4 showed an FTIR spectrum identical to ZIF-67. This also proves that the combination of Fe_3O_4 particles does not affect ZIF-67 or does not cause new bonds with ZIF-67. Characterization using X-Ray Diffraction (XRD) shows that the addition of Fe_3O_4 to ZIF-67 causes a decrease in crystallinity, but it is not significant. Characterization using Scanning Electron Microscope (SEM) shows that the ZIF-67 MOFs particles are dodecahedral with a smooth surface and uniform size. Analysis using Energy Dispersive Spectroscopy (EDS) shows the content of C, N, O, and Co elements in ZIF-67 MOFs, and the presence of other elements, such as Fe, Al, and Si in the ZIF-67@Fe_3O_4 MOFs composite, which are the constituent elements of magnetite minerals (Fe_3O_4).

Keywords: Composite, Fe_3O_4, Iron sand, MOFs ZIF-67, Solvothermal

Harnessing Remote Sensing and AI for Sustainable Geothermal Prospecting in Remote Volcanic Terrains: A Case Study from Solok, Indonesia

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ABSTRACT

Indonesia's geothermal potential, comprising roughly 40% of the world's reserves, remains largely underexplored due to the high costs and logistical challenges of traditional field-based surveys. This study proposes a scalable, data-driven framework for geothermal anomaly detection using satellite remote sensing and unsupervised machine learning. Focusing on the Solok region of West Sumatra, the research integrates Normalized Difference Vegetation Index (NDVI), Land Surface Temperature (LST), and Sentinel-1 InSAR-derived deformation data to detect surface anomalies indicative of geothermal activity.

Data were collected and pre-processed through Google Earth Engine (GEE) over a 10 km × 10 km area surrounding Mount Talang. Anomalies were identified using two unsupervised learning methods: KMeans clustering and Isolation Forest, both operating on standardized NDVI–LST–VV feature space. Geospatial visualization techniques—including 3D scatter plots and Folium-based anomaly maps—revealed high-priority zones where both models independently detected statistically significant deviations. These zones show strong correspondence with known geothermal features, such as fumaroles and hot springs.

The results highlight the efficacy of combining remote sensing with unsupervised learning for early-stage geothermal exploration, especially in data-scarce, remote environments. This approach offers a cost-efficient, replicable model for anomaly detection that can support decision-making in sustainable energy development across Indonesia's volcanic zones.

Keywords: Geothermal Anomaly Detection, Google Earth Engine (GEE), Isolation Forest, KMeans Clustering, Remote Sensing, Solok West Sumatra, Unsupervised Machine Learning

Coconut Supply Chain Analysis as Sustainable Aviation Fuel

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ABSTRACT

Coconut or Cocos nucifera is a plantation crop that has strategic significance for the Indonesian people and is classified as an annual plant with high economic value starting from the leaves, fruit flesh, stems, to the roots that can be utilized by the community. This study analyzes the coconut supply chain as a sustainable aircraft fuel with a case study in Indragiri Hilir Regency, especially to map the availability of non-edible coconut supplies starting from the upstream side to the downstream side of its use. This study uses the coconut global value chain approach based on the concept of input output structure which provides an overview of the coconut plant value chain from various factors such as input, production, main processes, advanced processes, manufacturing processes, to the end market. This study concludes that there are many other derivative or by-products that can be developed from the current coconut agro-industry starting from the main product, by-product, non-standard product to its waste. Non-standard coconut meat and copra can be maximized as raw materials for bioavtur that do not compete with food so that they can increase economic feasibility, provide added value, create a circular economy, and encourage investment in the development of environmentally friendly, clean bioavtur that meets CORSIA standards. The use of information technology such as sensors and IoT, drones and satellite imagery, artificial intelligence and big data, and integrated management systems (ERP and e-plantation) in the coconut agro-industry supply chain as a raw material for bioavtur is still very wide open to manage logistics, finances, and plantation operations digitally and increase efficiency and accuracy of reporting and sustainability of the coconut supply chain.

Keywords: coconut, non-standard, supply chain, sustainable, bioavtur

Classification of Residential and Business Building Using Deep Learning

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ABSTRACT

IndiHome and IndiBiz faced challenges in customizing service offerings. Inappropriate marketing strategies lead to missed sales targets and the increasing amount of data makes manual monitoring ineffective. In the face of these challenges, advances in Deep Learning technology support the automation of various computer vision tasks, including recognizing digital objects. This research applies Convolutional Neural Network (CNN) model and MobileNetV2 architecture for building image classification. The dataset consists of 882 images categorized into two classes and divided into three parts, 60% for training, 20% for validation, and 20% for testing. Optimization is done based on batch size and learning rate to improve model performance. The best results were obtained at batch size 32 and learning rate 0.0001 on MobileNetV2 architecture. This model shows superior performance, with test results using testing data showing an accuracy value of 92.05%, as well as precision, recall, and f1-score values of 91.46% each. The performance of the model is measured based on the confusion matrix on the testing data. The results show that false positives and false negatives in both classes have low error rates, so they do not significantly affect the overall performance of the model. Thus, the MobileNetV2 architecture is proven to optimally support digital object recognition automation.

Keywords: Convolutional Neural Network, IndiBiz, IndiHome, Internet Service Provider, MobileNetV2

Electricity Demand Prediction in Duri City Using an Artificial Neural Network

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ABSTRACT

The growing demand for electrical energy each year necessitates a reliable prediction system to support effective energy planning and management. This study aims to forecast the electricity demand of customers in Duri City using the Artificial Neural Network (ANN) method with the Backpropagation algorithm, and to evaluate the accuracy of this approach. The data used in this study consists of historical electricity consumption records of customers in Duri City over the past 60 months, without incorporating any external factors. The dataset was divided into 90% for training and 10% for testing. The ANN model was developed using specific parameters, including eight neurons in the hidden layer, a learning rate of 0.01 and 150 epochs, to achieve optimal prediction performance. The model's performance was evaluated using the Root Mean Squared Error (RMSE) and Mean Absolute Percentage Error (MAPE) metrics. The results show an RMSE value of 0.0404, which indicates good accuracy, and a MAPE value of 3.51%, categorized as very accurate. These findings suggest that the model is effective in predicting the electricity demand of customers in Duri City.

Keywords: Artificial Neural Network, Backpropagation, Duri City, Electricity Demand, Prediction

The Potential of Non-Linear Optimization in Decision Making

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ABSTRACT

Effective decision-making requires precise analysis and suitable optimization methods. However, many decision-making problems involve non-linear relationships between relevant variables, necessitating more complex optimization approaches. Non-linear optimization offers significant potential in addressing these problems by enabling more accurate modeling and optimal solutions. This article discusses the fundamental concepts of non-linear optimization, its applications in decision-making, and its potential benefits in improving decision quality. Using case examples and comparative analysis, this article demonstrates how non-linear optimization can be used to tackle complex decision-making problems and enhance desired outcomes

Keywords: Non-linear optimization, decision making, decision analysis, mathematical modeling.

Statistical Analysis of the Russia–Indonesia Strategic Partnership

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ABSTRACT

This study analyzes the strategic implications of the Russia–Indonesia bilateral summit held on June 18–20, 2025, using a statistical analysis approach and the hedging theory model in international relations. In the context of Western sanctions against Russia and Indonesia's non-aligned stance, this research employs quantitative and/or qualitative analysis of primary documents from both governments, along with secondary policy analysis, to examine the economic and geopolitical dimensions of this partnership. The main findings reveal a carefully calibrated cooperation in three areas: a ruble–rupiah payment mechanism to circumvent financial sanctions, Russian nuclear technology transfer for Indonesia's energy transition, and asymmetric trade in agricultural commodities and strategic minerals. The summit resulted in tangible outcomes including projected investments of $12 billion and eight joint initiatives, but also presents latent risks such as secondary sanctions and technological dependence. The study concludes that while this partnership offers short-term economic benefits for Indonesia and a strategic foothold in Asia for Russia, its sustainability de- pends on Nusantara's ability to maintain balance in its"free and active" foreign policy amid great power rivalry. These findings contribute to broader discussions on middle power diplomacy in an era of geopolitical fragmentation.

Keywords: economic diplomacy, Indonesia–Russia relations, non-alignment, hedging strategy

FORECASTING THE CLOSING PRICE OF PT BANK CENTRAL ASIA TBK USING THE AUTOREGRESSIVE INTEGRATED MOVING AVERAGE (ARIMA) METHOD

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ABSTRACT

The collapse of the stock market, which was accompanied by a significant decline in the IHSG, as well as the presence of Danantara as a state asset management institution are factors that are quite influential in the movement of stock prices in Indonesia. In line with this, this study aims to forecast the daily closing price of BBCA shares using the Autoregressive Integrated Moving Average (ARIMA) method. The data used is the daily closing price of BBCA shares from January 1 to April 30, 2025 as many as 74 observations. Research data obtained from *www.yahoo.finance*. Forecasting was carried out on the closing price of BBCA shares for the period May 2025 to June 2025. The results showed that the best model that meets all assumptions is ARIMA (0,1,2) with a MAPE value of 1.58% and MSE of 0.0329. Based on these values, the ARIMA model is included in the highly accurate category in forecasting. Forecasting the closing price of BBCA shares shows a fairly stable trend with a slight decrease at the end of the period.

Keywords: ARIMA, BBCA Stock, Forecasting, Investment

Dynamical Analysis of a Mathematical Model for Bullying Behavior in Schools with Violence Factors

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ABSTRACT

Bullying in schools is a pervasive social issue that adversely affects students' psychological well-being and social development. This study proposes a mathematical model to capture the dynamics of bullying behavior in a school environment, treating its spread analogously to infectious disease transmission. The model categorizes the student population into four compartments: Susceptible individuals (S), Bullies (B), Exposed victims (E), and Violent individuals (V). It incorporates recruitment, intercompartmental transitions, and natural exit through graduation or dropout. A system of nonlinear differential equations is formulated to describe the transitions and analyzed to determine equilibrium points and their stability. Analytical results reveal the existence of two equilibrium states: a bullying-free equilibrium and an endemic equilibrium. Stability is assessed using the basic reproduction number and the Routh– Hurwitz criteria, showing that the bullying-free equilibrium is locally asymptotically stable when the reproduction number is less than one, and the endemic equilibrium is stable when it exceeds one. Numerical simulations support the analytical findings and demonstrate how changes in key parameters, particularly the transition rate from susceptible individuals to bullies, affect the system's dynamics. This study underscores the utility of mathematical modeling in understanding school bullying behavior, highlighting critical leverage points for effective intervention strategies.

Keywords: bullying behavior, dynamical analysis, equilibrium stability, mathematical modeling, school violence.

Jackknife Resampling Approach for Outlier Detection in Linear Regression Models

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ABSTRACT

In this study, the potential of using the jackknife resampling method to identify influential observations in (linear) regression-models is investigated with some simulated data. The data was simulated with multiple distributional assumptions, including two continuous and one categorical input variables, and a continuous response variable. The OLS regression analysis was used, and the model performance was tested via the F-test, individual t-test, and determination coefficient. To test the sensitivity of the model, every observation was left out, one at a time, using jackknife resampling. Observations that induced large changes in parameter estimates were considered as potential outliers or high-leverage points. Data distribution and variable relationships were explored by visualization using scatter plots, histograms and boxplots. Results The results of this study suggest that the jackknife approach can be used to improve the robustness and reliability of a model, particularly a model trained on non-ideal or complex data.

Keywords: Jackknife Resampling, Linear Regression, Model Robustness, Outlier Detection, Simulated Data

MODULAR VERSION OF TOTAL EDGE IRREGULARITY STRENGTH FOR GENERALIZED PETERSEN GRAPH

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ABSTRACT

We investigate the modular total edge irregularity strength of graph, focusing on the well-known family cubic graphs that is generalized Petersen graph $GP_{n,2}$. Let $G = (V, E)$ be a simple graph with the vertex set $V(G)$ and the edge set $E(G)$. A total k-labeling $\varphi: V(G) \cup E(G) \rightarrow \{1,2, \dots k\}$ is called a total edge irregularity labeling if for any two distinct edges $uv, u'v' \in G$ their edge weights are distinct, that is, $wt_\varphi(uv) = \varphi(u) + \varphi(v) \neq \varphi(u') + \varphi(v') = wt_\varphi(u'v')$. The total edge irregularity strength, denoted by $tes(G)$, is defined as the minimum k for which the graph G has an edge irregular total k-labeling. Furthermore, the total edge irregularity labeling $\varphi: V(G) \cup E(G) \rightarrow \{1,2, \dots, k\}$ is called a modular total edge irregularity k-labeling if the total edge weight function $\varphi: V(G) \cup E(G) \rightarrow \mathbb{Z}_q$ define by $w_\varphi(uv) = \varphi(u) + \varphi(uv) + \varphi(v)$ is bijective, and is refered to as the modular total edge weight of the total edge uv, where $\mathbb{Z}_q$ is the group of integer modulo q. The modular edge irregularity strength of G, denoted by $mtes(G)$ is defined as the smallest integer k for which G admits a modular total edge irregularity k-labeling. Determining the total edge irregularity strength for generalized Petersen graph has been completed, but not for modular version. In this paper, we prove that the exact value of the total edge irregularity strength of generalized Petersen graph is $mtes(GP_{n,2}) = \left\lceil \frac{3n+2}{3} \right\rceil$.

Keywords: Generalized Petersen graph, irregular labeling, total edge irregularity strength, total edge irregular labeling, modular total edge irregular labeling.

The Total Vertex Irregularity Labeling for Neuron Graph

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ABSTRACT

Let $G = (V, E)$ be a simple graph with vertex set V and edge set E, a vertex irregular total k-labeling $\psi: V \cup E \to \{1,2, \dots, k\}$ is a labeling of vertices and edges of G such that for any two different vertices u and v, their weight $wt_\psi(u) = \psi(u) + \sum_{ux \in E} \psi(ux)$ and $wt_\psi(v) = \psi(v) + \sum_{vy} \psi(vy)$ are distinct. The total vertex irregularity strength of a graph G is the minimum value of the largest label k such that G has total vertex irregular labeling. We introduce a new class of graph called Neuron Graph, denoted by N_s where $s \geq 3$, formed by combining a prism and a path P_n with some graph operations. The aim of this paper is to determine the total vertex irregularity strength of the Neuron graph N_s. Determining the total vertex irregularity strength of the Neuron graph is very interesting research, as it has many applications in network theory and graph structure. Finally, the result show that $tvs(N_s) = \lceil \frac{5s+1}{2} \rceil$ for $s \geq 3$.

Keywords: Irregular labeling, Irregularity strength, total vertex irregularity labeling, total vertex irregularity strength, neuron graph.

On N-Soft Hypergraph

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ABSTRACT

In this paper, we present the concepts of N-soft hypergraph, strong N-soft hypergraph, complete N-soft hypergraph, and induced complete N-soft hypergraph. We explore some special subhypergraph such as path and tree. We investigate some of their unary operations such as relative complement, and examine their properties. Then, we present some real-life problem that could be modeled and solved by N-Soft hypergraph.

Keywords: Hypergraph; N-Soft Set; N-Soft Hyperset, Complement, Application.

APPLICATION OF AUTOREGRESSIVE INTEGRATED MOVING AVERAGE (ARIMA) MODEL IN FORECASTING INDONESIAN SILVER PRICES

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ABSTRACT

In the era of globalization, silver prices are consistently rising, primarily due to the increasing demand from the automotive industry. Additionally, silver is highly sought after by the Indonesian populace for jewelry making. This topic is very important to discuss for investors, the government, and those starting silver trading businesses. The price of silver is currently at Rp. 17,367 per gram (April 30, 2025). Over time, silver prices have continuously increased. The rising silver prices will be analyzed using forecasting techniques with the ARIMA (Autoregressive Integrated Moving Average) model. In this study, the ARIMA model used is ARIMA (13, 1, 10). By employing this ARIMA (13, 1, 10) model, the study forecasts a final price of Rp. 19,620.28 on August 1, 2025, with a MAPE of 1.004% and a MAE of 169.877, indicating that the ARIMA (13, 1, 10) model is very effective for forecasting silver prices in Indonesia. ARIMA (13. 1. 10) shows that the trend of Silver Prices is rising, providing an insight to investors who want to invest in precious metals Silver.

Keywords: Silver Prices, Time Series, ARIMA (Autoregressive Integrated Moving Average).

Estimating the Value of π through Riemann Integration

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ABSTRACT

This study presents a numerical method for estimating the mathematical constant π using the Riemann integral approach. The background of this research lies in the fundamental relationship between definite integrals and areas under curves, particularly for functions that are known to yield well-known constants. The objective is to approximate the value of π by applying the Riemann sum to a specific integral function over a defined interval. The method involves dividing the interval into a large number of equal subintervals, calculating the function value at each point, and summing the results to obtain an estimate of the area. In this study, the process is executed with 1500 subintervals, resulting in a numerical approximation of π as 3.140926. This value is then compared to the reference value provided by MATLAB, showing a relative error of only 0.021228 percent. The findings confirm that the Riemann integral method, despite its simplicity, offers a remarkably close estimate of π. The results also highlight that increasing the number of subintervals significantly improves accuracy. This approach demonstrates the effectiveness of Riemann integration as a teaching tool and practical technique in computational mathematics for approximating fundamental mathematical constants.

Keywords: numerical integration, π approximation, Riemann integral, scientific computation, teaching mathematics

A Preliminary Study: Predicting Lung Cancer Subtype from Gene Expression Data Using Neural Networks

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ABSTRACT

In recent years, neural networks have achieved notable performance in a wide range of applications by applying an adaptive parametric basis function that optimises the parameter during training, resulting in highly compact models that are faster to evaluate. Their strength lies in the ability to learn nonlinear patterns from the data, which makes them particularly effective for complex tasks. This study aims to investigate the effectiveness of basis feedforward neural network in classifying lung cancer subtype, specifically, Lung Adenocarcinoma (LUAD) and Lung Squamous Cell Carcinoma (LUSC), based on gene expression profiles. The dataset presents a significant challenge due to its high dimensionality (60,661 predictors) and sparsity across a relatively small samples size (1141 samples). The sparsity may arise from biological specificity (for example, certain gene remain inactive under specific condition or contribute minimally to the lung cancer subtypes) or technical limitation (such as insufficient sequencing depth or dropout events). These characteristics often leads to overfitting and hinder model convergence. We employ Xavier initialisation, apply 10-fold cross-validation, and train model for one hundred epochs. Preliminary finding shows that increasing number of neurons in single hidden layer improves classification performance. However, the model has not fully converged, and the accuracy remains moderate, enhancing the difficulty of learning meaningful patterns from sparse and high dimensional data. This result underscore the importance of incorporating methods that address sparsity and tackle the curse of dimensionality. Future work will focus on integrating sparsity and conducting extensive to explore architecture that balance complexity with generalisation.

Keywords: Neural network, gene expression, sparsity.