



**THE IMPACTNESS OF SMOTE AS IMBALANCE CLASS HANDLING  
FOR MYOCARDIAL INFARCTION COMPLICATION  
CLASSIFICATION USING MACHINE LEARNING APPROACH WITH  
DATA IMPUTATION AND HYPERPARAMETER**

**Skripsi**

**Untuk Memenuhi Persyaratan  
Dalam Menyelesaikan Strata-1 Ilmu Komputer**

**Oleh**

**AHMAD TAJALI**

**NIM 2111016110009**

**PROGRAM STUDI S-1 ILMU KOMPUTER  
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM  
UNIVERSITAS LAMBUNG MANGKURAT  
BANJARBARU  
OKTOBER 2024**



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# SKRIPSI

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Oleh:

**AHMAD TAJALI**

**NIM. 2111016110009**

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## KATA PENGANTAR

Puji syukur penulis panjatkan ke Tuhan kita Yang Maha Esa karena atas berkas rahmat dan karunia-Nya penulis dapat menyelesaikan jurnal yang berjudul *“The Impactness of SMOTE as Imbalance Class Handling for Myocardial Infarction Complication Classification using Machine Learning Approach with Data Imputation and Hyperparameter”* untuk memenuhi syarat dalam menyelesaikan pendidikan program S1 Ilmu Komputer, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Lambung Mangkurat.

Pada lembar ini penulis ingin menyampaikan ucapan terimakasih kepada semua pihak yang sangat mendukung penulis dalam pembuatan dan penyusunan jurnal ini, adapun yang dimaksud adalah sebagai berikut:

1. Diri saya sendiri yang tidak pernah patah semangat walaupun banyak menemui kesulitan baik disebabkan oleh diri sendiri maupun hal lain.
2. Keluarga besar yang selalu memberikan bantuan, semangat, doa dan dukungan dalam proses penyelesaian jurnal ini.
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5. Ibu Dwi Kartini, S.Kom., M.Kom. selaku Ketua Program Studi Ilmu Komputer FMIPA ULM, atas bantuan dan izin beliau jurnal ini dapat diselesaikan.
6. Seluruh Dosen dan staff Program Studi Ilmu Komputer FMIPA ULM atas ilmu dan bantuan yang diberikan selama ini yang sangat bermanfaat.
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proses mengerjakan jurnal.

9. Serta semua pihak yang tidak dapat disebutkan satu persatu yang telah turut membantu dalam penyelesaian jurnal ini.

Akhir kata penulis menyadari sepenuhnya bahwa penulisan ini jauh dari sempurna. Semoga tulisan ini dapat bermanfaat bagi ilmu pengetahuan dan pembaca khususnya dibidang informatika. Semoga Allah ﷻ senantiasa memberikan petunjuk dan bimbingan-Nya kepada kita semua. Aamiin Allahumma Aamiin

Banjarbaru, 23 Desember 2024



Ahmad Tajali

## **SURAT PERNYATAAN**

Dengan ini saya menyatakan bahwa dalam jurnal ini tidak terdapat karya yang pernah diajukan untuk memperoleh gelar kesarjanaan di suatu Perguruan Tinggi, dan sepanjang pengetahuan saya juga tidak terdapat karya atau pendapat yang pernah ditulis atau diterbitkan oleh orang lain, kecuali yang secara tertulis diacu dalam naskah ini dan disebutkan dalam Daftar Pustaka.

Banjarbaru, 23 Desember 2024  
Yang Menyatakan,



Ahmad Tajali  
NIM. 2111016110009



KEMENTERIAN PENDIDIKAN, KEBUDAYAAN,  
RISET, DAN TEKNOLOGI  
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PROGRAM STUDI ILMU KOMPUTER

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**BERITA ACARA  
PERSETUJUAN REKOGNISI KEGIATAN PENGGANTI SKRIPSI**

Pada hari ini, Senin Tanggal 23 Desember 2024, telah dilakukan evaluasi kelengkapan dokumen pengganti kegiatan skripsi mahasiswa S1 Ilmu Komputer Fakultas MIPA ULM

Nama : Ahmad Tajali  
NIM : 2111016110009  
Jenis Kegiatan : Jurnal Nasional  
Kualifikasi Jurnal/Seminar : Sinta 2  
Judul Publikasi : The Impactness of SMOTE as Imbalance Class Handling for Myocardial Infarction Complication Classification using Machine Learning Approach with Data Imputation and Hyperparameter  
Nama Jurnal/ Penyelenggara : Indonesian Journal of Electronics, Electromedical Engineering, and Medical Informatics  
Tanggal Publikasi/ Presentasi : November 2024

Dokumen yang diajukan dinyatakan :

**Memenuhi syarat untuk diterima sebagai REKOGNISI PENGGANTI KEGIATAN SKRIPSI dan DINYATAKAN LULUS SKRIPSI.**

Demikian Berita Acara ini dibuat untuk digunakan sebagaimana mestinya.

No	Nama	Tanda Tangan
1.	H. Irwan Budiman, S.T., M.Kom.	1.
2.	Andi Farmadi, S.Si., M.T	2.
3.	Triando Hamonangan Saragih, S.Kom., M.Kom.	3.
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**LoA**



# Indonesian Journal of Electronics, Electromedical Engineering, and Medical Informatics

Rapid review : Open access : Multidisciplinary  
Sinta 2, Google Scholar, ISSN: [2656-8624](#); [homepage](#)

Ref. No. 13/IJEEEMI/11/2024

Dear,  
Ahmad Tajali et al.

## **LETTER of ACCEPTANCE (LOA)**

It's a great pleasure to inform you that, after the peer review process, the scientific committee agree that the manuscript is accepted for publication in **Indonesian Journal of Electronics, Electromedical Engineering, and Medical Informatics** and manuscript will be published in Vol. 6 No. 4, November 2024.

Title	The Impactness of SMOTE as Imbalance Class Handling for Myocardial Infarction Complication Classification using Machine Learning Approach with Data Imputation and Hyperparameter
Authors	Ahmad Tajali et al.
Article Publication Charge*	Rp. 1.000.000 (Account Name: Triwiyanto; Bank: BNI; Account No: 0266 5645 77). <b>Note: please attach the payment proof in the discussion menu (OJS)</b>

Thank you for your contribution to the **Indonesian Journal of Electronics, Electromedical Engineering, and Medical Informatics** and we look forward to receiving further submission from you.

Sincerely,

Associate Professor Dr. Triwiyanto

Editor-in-chief

Indonesian Journal of Electronics, Electromedical Engineering, and Medical Informatics  
(Email): [triwiyanto@ieee.org](mailto:triwiyanto@ieee.org) : (Profile): [Scopus](#): [Publon](#)

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Editorial: Department of Medical Electronics Technology, Poltekkes Kemenkes Surabaya  
Jl. Pucang Jajar Timur No. 10, Surabaya, Indonesia

# **Form Review**



Ahmad Tajali <ahmadtajali61@gmail.com>

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## Your submission has been reviewed and we encourage you to submit revisions

1 message

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**IJEEEMI [Notification]** <ijeeemi@poltekkesdepkes-sby.ac.id>  
To: Ahmad Tajali <ahmadtajali61@gmail.com>

Sun, Oct 13, 2024 at 8:44 PM

Dear Ahmad Tajali,

Your submission *The Impactness of SMOTE as Imbalance Class Handling for Myocardial Infarction Complication Classification using Machine Learning Approach with Data Imputation and Hyperparameter* has been reviewed and we would like to encourage you to submit revisions that address the reviewers' comments. An editor will review these revisions and if they address the concerns adequately, your submission may be accepted for publication.

The reviewers' comments are included at the bottom of this email. Please respond to each point in the reviewers' comments and identify what changes you have made. If you find any of the reviewer's comments to be unjustified or inappropriate, please explain your perspective.

When you have completed your revisions, you can upload revised documents along with your response to the reviewers' comments at your [submission dashboard](#). If you have been logged out, you can login again with the username tajali.

If you have any questions, please contact me from your [submission dashboard](#).

We look forward to receiving your revised submission.

Kind regards,

IJEEEMI [Sinta 2 Accredited]  
Department of Medical Electronics Technology,  
Poltekkes Kemenkes Surabaya

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The following comments were received from reviewers.

**Reviewer 1:**

Recommendation: Revisions Required

**Introduction**

The introduction of the paper sets the stage for the research by outlining the significance of early prediction in myocardial infarction (MI) complications. However, it could benefit from a more comprehensive literature review that contextualizes the current study within existing research. First, while the introduction mentions the importance of class imbalance in machine learning, it lacks specific references to prior studies that have addressed this issue, which would strengthen the argument for the necessity of the current research. Second, the rationale for selecting the specific machine learning models (SVM, RF, XGBoost) is not adequately justified; a brief discussion on their comparative advantages in the context of MI prediction would enhance clarity. Third, the introduction could be improved by clearly stating the research questions or hypotheses, which would provide a focused direction for the study. Fourth, the potential implications of the research findings on clinical practice are not sufficiently articulated, leaving the reader uncertain about the practical relevance of the study. Lastly, the introduction could benefit from a more structured flow, ensuring that each paragraph logically transitions to the next, thereby enhancing the overall coherence of the narrative.

**Method**

The methodology section outlines the research design and the various techniques employed in the study. However, several critical aspects warrant attention. First, while the paper describes the dataset used, it lacks detailed information regarding the data collection process, including any ethical considerations or potential biases in the dataset. This omission raises questions about the reliability and generalizability of the findings. Second, the choice of imputation techniques (KNN, MICE, Miss Forest) is mentioned, but the rationale for selecting these specific methods over others is not discussed, which could leave readers questioning the appropriateness of these choices. Third, the description of the hyperparameter tuning process is somewhat vague; a more detailed explanation of the Bayesian Optimization approach would enhance the reader's understanding of how optimal parameters were determined. Fourth, the section could benefit

from a clearer explanation of the evaluation metrics used to assess model performance, as this is crucial for interpreting the results. Lastly, the methodology lacks a discussion on potential limitations of the chosen methods, which is essential for providing a balanced view of the research design.

#### Result

The results section presents the findings of the study, yet it has several areas that require critical evaluation. First, while the results are summarized, there is a lack of visual aids (e.g., tables or graphs) that could enhance the clarity and accessibility of the data presented. Visual representations are essential in conveying complex information effectively. Second, the section does not adequately compare the performance of the different models and imputation techniques, which is crucial for understanding the relative effectiveness of each approach. Third, the statistical significance of the results is not clearly stated, leaving the reader uncertain about the robustness of the findings. Fourth, the results could be better contextualized within the existing literature; a brief comparison with similar studies would provide a more comprehensive understanding of the implications of the findings. Lastly, the section could benefit from a more structured presentation, ensuring that each result is clearly linked to the corresponding research question or hypothesis.

#### Discussion

The discussion section interprets the results and situates them within the broader context of existing research. However, several critical comments can be made. First, while the authors discuss the implications of their findings, they do not sufficiently address how these results contribute to the existing body of knowledge on MI prediction, which is essential for establishing the study's significance. Second, the limitations of the study are not adequately explored; a thorough discussion of potential biases, confounding variables, and limitations of the dataset would provide a more balanced perspective. Third, the authors could enhance the discussion by proposing specific recommendations for clinical practice based on their findings, which would demonstrate the practical applicability of the research. Fourth, the section lacks a critical evaluation of the machine learning models used; discussing their strengths and weaknesses in the context of MI prediction would provide valuable insights. Lastly, the discussion could benefit from a more forward-looking perspective, suggesting areas for future research that could build on the findings of this study.

#### Conclusion


The conclusion succinctly summarizes the key findings of the research but lacks depth in several areas. First, while the authors reiterate the importance of their findings, they do not sufficiently emphasize the broader implications for healthcare practice, which is crucial for translating research into practice. Second, the conclusion could benefit from a more explicit statement regarding the potential impact of the study on patient outcomes, as this would underscore the relevance of the research. Third, the authors do not adequately address the limitations discussed in the previous sections, which is essential for providing a balanced view of the research. Fourth, the conclusion lacks a call to action or specific recommendations for practitioners, which would enhance its practical relevance. Lastly, the authors could strengthen the conclusion by suggesting specific avenues for future research, thereby encouraging ongoing inquiry into the topic and highlighting the study's contribution to the field.

#### Reviewer 2:

Recommendation: Revisions Required

read the attached file for comment and suggestion

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