UNDERGRADUATE THESIS

CLASSIFICATION OF JAVANESE DIALECTS USING A HYBRID CNN-TCN DEEP LEARNING ARCHITECTURE

DANIKA NAJWA ARDELIA
NPM 22081010103

THESIS ADVISORS
Dr. Faisal Muttaqin, S.Kom, MT
M. Muharrom Al Haromainy, S.Kom., M.Kom.

MINISTRY OF HIGHER EDUCATION, SCIENCE, AND TECHNOLOGY
VETERAN NATIONAL DEVELOPMENT UNIVERSITY OF EAST JAVA
FACULTY OF COMPUTER SCIENCE
INFORMATICS STUDY PROGRAM
SURABAYA
2026

APPROVAL SHEET

CLASSIFICATION OF JAVANESE DIALECTS USING A HYBRID CNN-TCN DEEP LEARNING ARCHITECTURE

By:
DANIKA NAJWA ARDELIA
NPM. 22081010103

Has been defended before, and accepted by, the Board of Assessors of the Thesis Examination of the Informatics Study Program, Faculty of Computer Science, Universitas Pembangunan East Java National Veterans, on May 19, 2026:

Approved,

Dr. Faisal Muttaqin, S.Kom, MT NIP. 19851231 202121 1 009	.....	**(Advisor I)**
M. Muharrom Al Haromainy, S.Kom., M.Kom NIP. 19950601 202203 1 006	.....	**(Advisor II)**
Eva Yulia Puspaningrum, S.Kom, M.Kom NIP. 19890705 202121 2 002	.....	**(Head Assessor)**
Yisti Vita Via, S.ST, M.Kom. NIP. 19860425 202121 2 001	.....	**(Assessor I)**

Acknowledged by,

Dean of the Faculty of Computer Science

Prof. Dr. Ir. Novirina Hendrasarie, MT.
NIP. 19681126 199403 2 001

APPROVAL SHEET

CLASSIFICATION OF JAVANESE DIALECTS USING A HYBRID CNN-TCN DEEP LEARNING ARCHITECTURE

By:
DANIKA NAJWA ARDELIA
NPM. 22081010103

Approved to proceed to the Thesis Examination

Approved by,

Coordinator of Informatics Study Program
Faculty of Computer Science

Dr. Intan Yuniar Purbasari, S.Kom. MSc.

NIP.19800602 202521 2 029

STATEMENT OF ORIGINALITY

I am the undersigned:

Student Name	:	Danika Najwa Ardelia
NPM	:	22081010103
Degree Program	:	Bachelor (S1)
Study Program	:	Informatics
Faculty	:	Faculty of Computer Science

Hereby declares that this undergraduate thesis contains no part of any other scientific work that has been submitted to obtain an academic degree at any higher educational institution. Furthermore, it does not contain any work or opinions previously written or published by others, except for those which are explicitly cited in this thesis and listed completely in references.

And I declare that this scientific document is free from elements of plagiarism. If in the future indications of plagiarism are found in this Thesis, I am willing to accept sanctions in accordance with the applicable laws and regulations.

Thus, I made this statement without any coercion from anyone and to be used as it should.

Surabaya, June 15, 2026
Declarant,

DANIKA NAJWA ARDELIA
NPM. 22081010103

ABSTRACT

Student Name / NPM	:	Danika Najwa Ardelia/22081010103
Thesis Title	:	Classification of Javanese Dialects Using A Hybrid CNN-TCN Deep Learning Architecture
Supervisor	:	1. Dr. Faisal Muttaqin, S.Kom, MT 2. M. Muharrom Al Haromainy, S.Kom., M.Kom.

The decline in the use of regional languages in Indonesia, including Javanese, threatens the preservation of local cultural identity. Classifying Javanese dialects is challenging due to subtle variations in pitch and tempo. This study proposes a hybrid Convolutional Neural Network (CNN) and Temporal Convolutional Network (TCN) architecture to identify five Javanese dialects: Arekan, Pantura (Banten), Banyumas, Cirebon, and Solo-Yogya. The CNN front-end extracts spatial features from Log-Mel Spectrograms, while the TCN back-end models long-term temporal dependencies of the speech signals.

Data was collected from The Language Archive (TLA) and YouTube, then preprocessed through 16 kHz resampling, Voice Activity Detection (VAD), 10-second segmentation with 30% overlap, and feature extraction. Noise Injection and SpecAugment techniques were applied to enrich the data and prevent overfitting. The system was evaluated using Stratified Group 5-Fold Cross Validation, employing a Soft Voting probability aggregation mechanism to combine segment-level predictions into a final audio-level decision.

The results demonstrate that the CNN-TCN integration achieved an accuracy of 90.68% and an F1-Score of 0.9032. This hybrid architecture significantly outperformed the single CNN model (83.53%) and TCN model (86.37%). Furthermore, it effectively resolved cross-dialect classification confusion, notably improving the recognition of the Arekan dialect. Finally, the optimal classification model was successfully implemented into an interactive web-based application interface to facilitate dialect identification for end users.

Keywords: Javanese Dialect, Dialect Identification, Convolutional Neural Network, Temporal Convolutional Network, Log-Mel Spectrogram.

ACKNOWLEDGEMENTS

All praise and gratitude are devoted to Allah SWT for His endless mercy, blessings, and guidance, which have granted the author the strength and opportunity to complete this undergraduate thesis entitled **"Classification of Javanese Dialects Using A Hybrid CNN-TCN Deep Learning Architecture."**

This thesis was prepared as part of the requirements for obtaining a Bachelor of Computer Science degree in the Informatics Study Program, Faculty of Computer Science, Universitas Pembangunan Nasional "Veteran" Jawa Timur.

The author acknowledges that the completion of this research would not have been possible without the invaluable support, motivation, prayers, and contributions of many individuals. Their assistance, whether in the form of academic guidance, moral encouragement, spiritual support, or practical help, played an essential role throughout the research process. Therefore, the author would like to sincerely express heartfelt appreciation and gratitude to:

1. Prof. Dr. Ir. Novirina Hendrasarie, M.T., Dean of the Faculty of Computer Science, Universitas Pembangunan Nasional "Veteran" Jawa Timur.
2. Dr. Intan Yuniar Purbasari, S.Kom., M.Sc., Head of the Informatics Study Program.
3. Dr. Faisal Muttaqin, S.Kom., M.T., and M. Muharrom Al Haromainy, S.Kom., M.Kom., as thesis supervisors, for generously sharing their expertise, providing valuable insights, and offering continuous guidance that greatly contributed to the completion of this research.
4. Eva Yulia Puspaningrum, S.Kom., M.Kom., and Yisti Vita Via, S.ST., M.Kom., as thesis assesors, for their thoughtful evaluations, constructive feedback, and recommendations that helped refine and strengthen the quality of this thesis.
5. All lecturers of the Informatics Study Program, Faculty of Computer Science, Universitas Pembangunan Nasional "Veteran" Jawa Timur, who have imparted knowledge, experience, and valuable lessons that have shaped the author's academic and personal development.

6. The author's parents and family, whose unconditional love, prayers, sacrifices, and unwavering belief have served as a constant source of strength and motivation throughout every stage of the author's education.
7. Carolus Surya Satriyan Putra, for being a dependable companion throughout the thesis process, from the early stages of research to its completion, and for providing encouragement, understanding, and emotional support during both challenging and rewarding moments.
8. Eka Maurita, Hilda Desfianty Arifin, and Oktavia Nur Khasanah, for sharing the experiences, challenges, and memorable moments of university life, as well as for their friendship and support throughout the years of study.
9. Afira Ayu Novanda and Annisah Qotrunnada Purwanto, for their enduring friendship, kindness, and willingness to listen, which provided comfort, motivation, and encouragement during the author's academic journey.
10. All friends from the Informatics Study Program of Universitas Pembangunan Nasional "Veteran" Jawa Timur, along with everyone else who has offered assistance, support, or encouragement, whether directly or indirectly, during the completion of this thesis.

The author acknowledges that this thesis is not without limitations and may still contain shortcomings. Therefore, constructive feedback and suggestions are sincerely welcomed as valuable contributions toward improving the quality of this work.

Surabaya, June 15, 2026

Author

LIST OF CONTENTS

LIST OF FIGURES

LIST OF TABLES