



**UNDERGRADUATE THESIS**

**PREDICTION OF COMMERCIAL CHICKEN EGG  
PRICES IN SIDOARJO REGENCY USING  
GATED RECURRENT UNIT (GRU)-TPE**

**MOHAMMAD ZAKI MUSHODDAQ**  
NPM 19081010017

**THESIS ADVISORS**

Andreas Nugroho Sihananto, S.Kom., M.Kom.  
Ardhon Rakhmadi, S.Tr.T., M.Kom.

**MINISTRY OF HIGHER EDUCATION, SCIENCE, AND TECHNOLOGY  
UNIVERSITAS PEMBANGUNAN NASIONAL VETERAN JAWA TIMUR  
FACULTY OF COMPUTER SCIENCE  
INFORMATICS STUDY PROGRAM  
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**APPROVAL SHEET**


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SIDOARJO REGENCY USING GATED RECURRENT UNIT (GRU)-TPE**

By :  
**MOHAMMAD ZAKI MUSHODDAQ**  
NPM. 19081010017

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 Nasional Veteran Jawa Timur, on June 17, 2026

Approved,

**Andreas Nugroho S., S.Kom., M.Kom.**  
NIP. 19900412 202406 1 003

  
..... (Advisor I)


**Ardhon Rakhmadi, S.Tr.T., M.Kom.**  
NIP. 19910805 202406 1 002

  
..... (Advisor II)

**Dr. Ir. Mohammad Idhom, SP., S.Kom.,  
MT**  
NIP. 19830310 202121 1 006


  
..... (Head Assessor)

**Dr. Firza Prima Aditiawan, S.Kom, M.T.I,  
M.C.F, M.O.S**  
NIP. 19860523 202121 1 003

  
..... (Assessor I)

Acknowledge by,

**Dean of the Faculty of Computer Science**

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

**APPROVAL SHEET**

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By :  
MOHAMMAD ZAKI MUSHODDAQ  
NPM. 19081010017

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 : Mohammad Zaki Mushoddaq  
NPM : 19081010017  
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 education 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 bibliography.

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Surabaya, June 17, 2026  
Declarant,



MOHAMMAD ZAKI  
MUSHODDAQ  
NPM. 19081010017

## ABSTRACT

Student Name / NPM : Mohammad Zaki Mushoddaq / 19081010017  
Thesis Title : Prediction Commercial Chicken Egg Prices in  
Sidoarjo Regency Using Gated Recurrent Unit  
(GRU)-TPE  
Advisor : 1. Andreas Nugroho Sihananto, S.Kom., M.Kom  
2. Ardhon Rakhmadi, S.Tr.T., M.Kom.

Commercial chicken eggs are a strategic food commodity with highly volatile prices, reaching up to 82% difference between the lowest and highest values based on daily SIMPONI Ternak data from Sidoarjo Regency for the 2020–2025 period. This price instability significantly affects farmers, traders, and regional food security, underscoring the need for an accurate prediction system accessible to non-technical users. This study aimed to evaluate the performance of a Gated Recurrent Unit (GRU) model optimized with the Tree-structured Parzen Estimator (TPE) via Optuna, assess the contribution of calendar-based exogenous features to prediction accuracy, and deploy the best model as a Streamlit-based web application. A quantitative experimental approach was employed with three input scenarios: univariate (price only), bivariate (price + is\_holiday), and trivariate (price + is\_holiday + dtoh\_norm). A total of 2,192 daily observations were chronologically split at a 70:15:15 ratio, with each scenario independently optimized over 100 trials. The GRU-TPE-Tri model achieved the best performance on the test data, with a MAPE of 0.6064%, MAE of Rp164.80, and RMSE of Rp359.16, outperforming the unoptimized LSTM baseline by 16.35% in MAPE. Adding the dtoh\_norm feature reduced the MAE by 28.03% compared to the bivariate scenario, demonstrating that a quantitative representation of temporal distance to holidays is more informative than a binary signal alone. The best model was successfully deployed as a functional web application prototype without programming expertise. Subsequent research may add other exogenous variables, perform multi-step prediction, or use hybrid methods.

**Keywords:** Gated Recurrent Unit (GRU), Tree-structured Parzen Estimator, Commercial chicken egg price prediction, calendar exogenous features, Streamlit

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Surabaya, June 17<sup>th</sup> 2026

Author

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