

**COMPARISON ANALYSIS OF FUZZY AI AND LLM IN ENHANCING
WOMEN MENSTRUAL TRACKING APP**

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STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.



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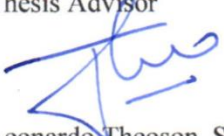
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ABSTRACT

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This study compares fuzzy logic, traditional machine learning (LSTM and Random Forest), and large language models (LLMs) in predicting menstrual cycles, using user data in the Nona Woman app. Historical cycle logs, user demographics, and contextual variables (sleep, stress, symptoms) were pre-processed into JSON format. Model performance was evaluated using evaluation metrics (accuracy, precision, recall, F1 score, and mean absolute error (MAE)).

Results show that advanced LLMs (Llama 3 70B, ChatGPT GPT-4o, and Gemma 12B) significantly outperform fuzzy logic models and fine-tuned LLM variants, which tended to hallucinate or overfit. In addition, LSTM and Random Forest models performed reliably for users with regular cycles but lagged behind the LLMs on predictive metrics. The study also considers business implications, where LLM inference costs (approximately \$0.01–\$0.12 per query) may limit large-scale deployment in commercial menstrual tracking apps.

In conclusion, the findings suggest that LLMs offer superior menstrual cycle prediction, but practical deployment must balance model performance with operational cost and interpretability.

Keywords: Menstrual Cycle Prediction, Large Language Model, Machine Learning, Time-series Forecasting, Nona Woman App.



DEDICATION

I dedicate this work to myself for the perseverance and determination that carried me through this journey. To my family, whose unwavering support and encouragement have been my foundation. To my mentors, for their invaluable guidance and wisdom. To my co-workers, for their consistent support and collaboration. And to my girlfriend, whose love, patience, and belief in me strengthened me during the most challenging moments.



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TABLE OF CONTENTS

	Page
STATEMENT BY THE AUTHOR.....	2
ABSTRACT.....	3
DEDICATION	5
ACKNOWLEDGEMENTS	6
TABLE OF CONTENTS.....	7
LIST OF FIGURES	9
LIST OF TABLES	10
CHAPTER 1 – INTRODUCTION.....	11
1.1 BACKGROUND	11
1.2 RESEARCH PROBLEM	13
1.3 RESEARCH OBJECTIVES.....	14
1.4 RESEARCH SCOPE.....	14
1.5 RESEARCH LIMITATION	15
1.6 SIGNIFICANCE OF STUDY	15
1.7 RESEARCH QUESTIONS.....	16
1.8 HYPOTHESIS.....	16
CHAPTER 2 - LITERATURE REVIEW	17
2.1 GENERAL KNOWLEDGE	17
2.2 TECHNICAL KNOWLEDGE.....	18
2.3 RELATED WORKS	19
2.3.1 <i>Period tracker applications: What menstrual cycle information are they giving women?</i> (2021)	19
2.3.2 <i>Artificial Intelligence and Women’s Health: Innovations, Challenges, and Ethical Considerations (2023)</i>	19
2.3.3 <i>Predictive Modelling of Menstrual Cycle Length: A Time Series Forecasting Approach (2023)</i>	20
2.3.4 <i>LLM is All You Need: How Do LLMs Perform on Prediction and Classification Using Historical Data (2024)</i>	21
2.3.5 <i>Time Series Forecasting with LLMs: Understanding and Enhancing Model Capabilities (2024)</i>	21
2.3.6 <i>Comparison table.....</i>	22
CHAPTER 3 – RESEARCH METHODS	24
3.1 RESEARCH DESIGN	24
3.2 TIME FRAME OF STUDY	24
3.3 DATA PREPARATION.....	25
3.4 LLM DEVELOPMENT	25
3.5 EVALUATION.....	26
3.6 DOCUMENTATION.....	28
3.7 IMPLEMENTATION TOOLS.....	28
3.8 USE CASE DIAGRAM.....	29
3.9 WORKFLOW DIAGRAM	30
3.10 SYSTEM ARCHITECTURE DIAGRAM	31
CHAPTER 4 – RESULTS AND DISCUSSIONS.....	32

4.1	FUZZY LOGIC.....	32
4.2	MACHINE LEARNING	33
4.2.1	<i>Long Short-Term Memory (LSTM)</i>	33
4.2.2	<i>Random Forest</i>	33
4.3	LARGE LANGUAGE MODEL (LLM)	34
4.3.1	<i>Gemma 3</i>	35
4.3.2	<i>DeepSeek-R1</i>	36
4.3.3	<i>Llama 3</i>	38
4.3.4	<i>ChatGPT</i>	41
4.4	FINE-TUNED LLM MODEL	42
4.5	RESULT ANALYSIS	45
4.5.1	<i>Comparison Analysis For Regular Menstrual Cycle</i>	46
4.5.2	<i>Comparison Analysis For Irregular Menstrual Cycle</i>	48
CHAPTER 5 – CONCLUSIONS AND RECOMMENDATIONS		51
5.1	CONCLUSIONS.....	51
5.2	FUTURE RECOMMENDATIONS	52
APPENDIX.....		54
REFERENCES		67
CURRICULUM VITAE.....		69



LIST OF FIGURES

Figures	Page
Figure 1.1 Women's response about menstrual tracker apps accuracy in predicting the start date of their period. (Broad et al., 2022).....	12
Figure 1.2 The difference between predicted and actual cycle length, in days. (Worsfold et al., 2021).....	12
Figure 3.1 Research Design	24
Figure 3.2 Interquartile Range Formula.....	26
Figure 3.3 Accuracy Formula	26
Figure 3.4 Precision, Recall, and F1 Score Formula	26
Figure 3.5 Mean Absolute Error (MAE) Formula	27
Figure 4.1 Fuzzy model result	32
Figure 4.2 Fuzzy Model Results	32
Figure 4.3 LSTM model result.....	33
Figure 4.4 LSTM model results	33
Figure 4.5 Random Forest model result.....	34
Figure 4.6 Random Forest model results	34
Figure 4.7 LLM Setup.....	34
Figure 4.8 Gemma 3 1B result.....	35
Figure 4.9 Gemma 3 4B result.....	35
Figure 4.10 Gemma 3 12B result.....	36
Figure 4.11 Gemma 3 12B results	36
Figure 4.12 DeepSeek-R1 1.5B result	37
Figure 4.13 Deepseek-R1 7B result	37
Figure 4.14 Deepseek-R1 8B result	37
Figure 4.15 Deepseek-R1 14B result	37
Figure 4.16 Deepseek-R1 Results.....	38
Figure 4.17 Llama 3.1 8B result	39
Figure 4.18 Llama 3.2 1B result	39
Figure 4.19 Llama 3.2 3B result	39
Figure 4.20 Llama 3.3 70 B result	40
Figure 4.21 Llama 3 results	40
Figure 4.22 ChatGPT (GPT-4o) result.....	41
Figure 4.23 ChatGPT (GPT-4o) results	42
Figure 4.24 Phi trained result.....	42
Figure 4.25 Llama 3.1 8B trained result	43
Figure 4.26 Llama 3.2 3B trained result	44
Figure 4.27 Fine-tune LLM Results.....	45
Figure 4.28 Threshold result	46
Figure 4.29 Models Performance Comparison Graph (Regular cycle)	47
Figure 4.30 Models Performance Comparison Graph (Irregular cycle)	49

LIST OF TABLES

Table	Page
Table 2.1: Table Comparison.....	22
Table 3.1 Thesis work timeline.....	24
Table 4.1 Model Comparison Overview (Regular cycle).....	47
Table 4.2 Model Comparison Overview (Irregular cycle).....	49

