



IMPLEMENTATION OF INTELLIGENT CHATBOT AND
RECOMMENDATION SYSTEM TO HELP STUDENTS CHOOSE MAJORS AT SMK
NEGERI 7 MEDAN

UNDERGRADUATE THESIS
Submitted as one of the requirements to obtain
Sarjana Komputer (S.Kom)

By:
AULIA AZ ZAHRA
001202200109

FACULTY OF COMPUTER SCIENCE
INFORMATICS STUDY PROGRAM
CIKARANG
AUGUST, 2025

ORIGINALITY REPORT

5%

SIMILARITY INDEX

4%

INTERNET SOURCES

1%

PUBLICATIONS

3%

STUDENT PAPERS

PRIMARY SOURCES

1	www.coursehero.com Internet Source	<1 %
2	Submitted to University of Birmingham Student Paper	<1 %
3	origin.geeksforgeeks.org Internet Source	<1 %
4	www.researchgate.net Internet Source	<1 %
5	Submitted to Pukyong National University Student Paper	<1 %
6	Submitted to Manchester Metropolitan University Student Paper	<1 %
7	docplayer.net Internet Source	<1 %
8	Submitted to Universitas Islam Majapahit Student Paper	<1 %
9	www.geeksforgeeks.org Internet Source	<1 %
10	ejournal.lppm-unbaja.ac.id Internet Source	<1 %
11	Ton Duc Thang University Publication	<1 %

AI Report

We predict this text is

Human Generated

AI Probability

5%

This number is the probability that the document is AI generated, not a percentage of AI text in the document.

Plagiarism



The plagiarism scan was not run for this document. Go to gptzero.me to check for plagiarism.

FORM 1 - 8/28/2025

Aulia Az Zahra

FORM 2

SPECIFICATION

2.1 Existing Business Process

Currently, the information service process at SMK Negeri 7 Medan still relies on manual staff via telephone, email, and WhatsApp. Responses to inquiries are often delayed, taking 30-45 minutes by phone and 1-2 days by email. Service hours are also limited to 8:00 a.m. to 4:00 p.m. WIB (Western Indonesian Time). Many questions are repetitive, making staff inefficient. There is no automated system that can handle off-hours, making access to information limited and inflexible.

2.2 Proposed Business Process

This chatbot functions as a digital assistant to help students find and obtain comprehensive information about universities. The system provides various important information such as school profiles, the latest campus news, available facilities, study programs offered, tuition fees, and new student admission information.

The chatbot uses friendly, easy-to-understand, and informative Indonesian to help students explore their university options. The system is designed to provide quick and accurate responses to students' questions about various aspects of the campus, from accreditation, achievements, location, to campus life. Its primary goal is to serve as a reliable information source that helps students gain a comprehensive understanding of the universities they are interested in, enabling them to make informed decisions when choosing where to continue their education.

Figure 2.1 Flow Diagram Existing Business Process

2.3 Global Description of The Product

ABSTRACT

This study aims to develop an artificial intelligence-based chatbot system specifically designed to improve the quality of educational information services at SMK Negeri 7 Medan. The background of this study is that the information service system is still manual and limited to working hours, often resulting in delayed responses, especially for students and parents who need quick access to school information. Therefore, the proposed solution is the development of a chatbot that utilizes Natural Language Processing (NLP) technology to understand students' everyday language, including abbreviations and common terms. This chatbot is capable of providing 24/7 service and can be accessed through the school's website. System testing shows that the chatbot can respond to questions in less than 3 seconds and can serve up to 30 users simultaneously. Additionally, the chatbot successfully provides relevant answers to common questions about academic programs, facilities, and extracurricular activities. With the implementation of this system, SMK Negeri 7 Medan can improve communication efficiency and provide faster, more practical, and easily accessible information to all stakeholders, without relying on working hours or limited human resources. This research is expected to serve as a foundational step in the digital transformation of educational information services at the vocational high school level.

TABLE OF CONTENTS

STATEMENT OF ORIGINALITY.....	ii
SCIENTIFIC PUBLICATION APPROVAL FOR ACADEMIC INTEREST	iii
ADVISOR APPROVAL FOR JOURNAL/INSTITUTION'S REPOSITORY	iv
SIMILARITY INDEX REPORT.....	v
ABSTRACT.....	vii
DEDICATION	viii
ACKNOWLEDGMENTS	ix
TABLE OF CONTENTS.....	x
LIST OF TABLES.....	xiv
LIST OF FIGURES.....	xv
PROPOSAL.....	17
1.1 Problem Formulation	17
1.1.1 Background of the Problem.....	17
1.1.2 Problem Statement	18
1.1.3 Objective.....	18
1.1.4 Problem from a Customer Perspective.....	18
1.2 Problem Constraint Analysis.....	19
1.2.1 Aspect 1: The Challenge of Understanding Students' Everyday Language.....	19
1.2.2 Aspect 2: User Doubts About New Technology	20
1.3 Problem Functional Analysis.....	20
1.3.1 Functionalities 1: Natural Language Processing for Understanding Language...	20
1.3.2 Functionalities 2: User-Friendly System Design and Teacher Support.....	21
1.4 Solution Selection	21
1.4.1 Alternative Solution 1: GPT-Based Chatbot Integrated with School Information System	21
1.4.2 Alternative Solution 2: AI-Based Queue Management System with Rule-Based Chatbot	22
1.4.3 Alternative Solution 3: Hybrid Chatbot with Intelligent Information System	22
1.5 Solution Usage Scenario.....	22

1.6	<i>Development Effort</i>	24
1.6.1	Man-months	24
1.6.2	Machine Months	25
1.6.3	Development Tools	25
1.6.4	Test Equipment	25
1.6.5	Expert Needs	26
1.6.6	Cost Estimation	26
1.6.7	Timeline	26
	<i>SPECIFICATION</i>	28
2.1	<i>Existing Business Process</i>	28
2.2	<i>Proposed Business Process</i>	28
2.3	<i>Global Description of The Product</i>	29
2.3.1	Main Functionality	29
2.3.2	User Characteristics	30
2.3.3	Constraints	30
2.3.4	Product Development Environment	31
2.3.4.1	Hardware	31
2.3.4.2	Software	31
2.3.5	Product Operational Environment	31
2.3.5.1	Hardware	31
2.3.5.2	Software	31
2.3.5.3	Connection	31
2.4	<i>Requirement Analysis</i>	32
2.4.1	External Interface	32
2.4.1.1	Hardware Interface	32
2.4.1.2	Software Interface	32
2.4.1.3	Connection Interface	32
2.4.2	Functional Diagram	32
2.4.2.1	Use-Case Diagram	32
2.4.2.2	Use-Case Scenario	33
2.4.3	Data Requirement from the user's perspective	34
2.4.3.1	ERD	34
2.4.3.2	Data Dictionary	34
2.4.3.3	Relations with the cardinality of each Relation	35
2.4.4	Functional Requirement from the user's perspective	35
2.4.4.1	Context Diagram	35
2.4.4.2	Activity Diagram and Data Flow Diagram	36
2.4.4.3	Describe in detail the process inside the Activity Diagram and Data Flow Diagram	37
2.4.5	Non-Functional Requirement	38
2.4.5.1	Performance Requirements	38

2.4.5.2	Usability Requirements.....	39
2.4.5.3	Compatibility Requirements	39
2.5	<i>Specification Testing.....</i>	39
2.5.1	Performance.....	39
2.5.2	Usability.....	40
2.5.3	Compatibility	40
	<i>DESIGN</i>	41
3.1	<i>Alternative Solution Design.....</i>	41
3.2	<i>Rational / Systematic Design</i>	45
3.2.1	Comparison Table	45
3.2.2	Quantitative Solution Selection	47
3.2.3	Solution Selection.....	48
3.3	<i>Hierarchical / Iterative Design</i>	49
3.3.1	Block Diagram Level 0	49
3.3.2	Block Diagram Level 1	50
3.3.3	Block Diagram Level 2	50
3.3.4	Block Diagram Level 3	50
3.3.5	Block Diagram Level 4.....	51
3.3.6	Interface information between block diagrams	51
3.3.7	Implement steps in Software Engineering Design as your design documentation	52
3.3.8	Provide the details of component references and libraries used	53
3.3.9	Use Case Diagram.....	53
3.4	<i>Verification Demonstration and Proof of Design Process</i>	54
3.5	<i>Standards Used.....</i>	54
3.6	<i>Implementation and Testing Plans</i>	55
3.6.1	Gantt Chart.....	55
3.6.2	Expected Outcome.....	56
	<i>IMPLEMENTATION.....</i>	59
4.1	<i>Design Implementation.....</i>	59
4.1.1	Functions/Procedure/Class	59
4.1.1.1	Block Diagram Level 4.....	59
4.1.1.2	Block Diagram Level 5.....	65
4.1.2	Database Implementation	65
4.1.3	Implementation Verification	68

4.2	<i>Product Display</i>	71
4.2.1	Software Product Display	71
4.3	<i>Component Cost Analysis</i>	72
4.4	<i>Manual Guide</i>	73
4.4.1	System Build.....	73
4.4.2	Installation.....	74
4.4.3	User Guide.....	75
4.5	<i>Video Demonstration</i>	76
	<i>TESTING</i>	77
5.1	<i>Functional Testing</i>	77
5.1.1	Testing Results of Every Function in The Specification	77
5.1.1.1	Chatbot Initialization Testing	77
5.1.1.2	Query Processing and Response Generation Testing.....	78
5.1.1.3	Conversation Flow Testing.....	79
5.1.2	Qualitative Testing	80
5.1.2.1	User Satisfaction.....	80
5.1.2.2	Ease of Use	81
5.1.2.3	Accessing the Chatbot on the Website.....	81
5.1.2.4	Chatbot Display Rating.....	82
5.1.2.5	Information Accuracy	83
5.1.2.6	Information Accuracy	83
5.1.2.7	Response Speed	84
5.1.2.8	Relevance of Chatbot Responses	85
5.1.2.9	Chatbot Usage Patterns.....	85
5.1.2.10	Interaction Duration.....	86
5.1.2.11	First-Time Use	87
5.1.2.12	Device Preferences and Technological Capabilities	87
5.1.2.13	Technology Proficiency Level.....	88
5.1.2.14	User Demographics	89
5.1.2.15	Educational Status	89
5.1.3	Detail the test procedures that are carried out according to the design.....	90
5.1.3.1	Chatbot System Testing	90
5.2	<i>Testing Other Specifications</i>	92
5.2.1	Non-functional Specifications.....	92
5.2.1.1	Performance.....	92
5.2.1.2	Compatibility	93
5.2.2	Photo/Recording of The Test.....	95
5.3	<i>Conclusion</i>	96
	<i>REFERENCES</i>	98

LIST OF TABLES

Table 1. 1 Man Months Table.....	24
Table 1. 2 <i>Machine Months Table</i>	25
Table 1. 3 <i>Cost Estimation Table</i>	26
Table 1. 4 <i>Timeline</i>	26
Table 2. 1 <i>User Characteristics Table</i>	30
Table 2. 2 <i>Use Case Scenario Chatbot Table</i>	33
Table 2. 3 <i>Data Dictionary Chatbot Table</i>	34
Table 3. 1 <i>Alternative Solution Selection Comparison Table</i>	46
Table 3. 2 <i>Solution 1 Quantitative Solution Selection Table</i>	47
Table 3. 3 <i>Solution 2 Quantitative Solution Selection Table</i>	47
Table 3. 4 <i>Solution 3 Quantitative Solution Selection Table</i>	48
Table 3. 5 <i>References and Libraries Table</i>	53
Table 3. 6 <i>Verification Demonstration and Proof of Design Process Table</i>	54
Table 3. 7 <i>Standard Used Table</i>	54
Table 3. 8 <i>Gantt Chart Table</i>	55
Table 3. 9 <i>Of Expected Outcome</i>	56
Table 4. 1 <i>Implementation Verification Table</i>	68
Table 4. 2 <i>Component Cost Analysis</i>	72

LIST OF FIGURES

Figure 1.1 Usage Scenario Diagram	23
Figure 2.1 Flow Diagram Existing Business Process	29
Figure 2.2 Use Case Diagram	32
Figure 2.3 ERD Diagram	34
Figure 2.4 Relations Diagram	35
Figure 2.5 Context Diagram	35
Figure 2.6 Activity Diagram	36
Figure 2.7 Data Flow Diagram	36
Figure 3.1 Alternative Solution 1 Block Diagram Level 0	41
Figure 3.2 Alternative Solution 1 Block Diagram Level 1	42
Figure 3.3 Alternative Solution 2 Block Diagram Level 0	43
Figure 3.4 Alternative Solution 2 Block Diagram Level 1	43
Figure 3.5 Alternative Solution 3 Block Diagram Level 0	44
Figure 3.6 Alternative Solution 3 Block Diagram Level 1	44
Figure 3.7 Block Diagram Level 0	49
Figure 3.8 Block Diagram Level 1	50
Figure 3.9 Block Diagram Level 2	50
Figure 3.10 Block Diagram Level 3	50
Figure 3.11 Block Diagram Level 4	51
Figure 3.12 Use Case Diagram	53
Figure 4.1 Load and Prepare Data Flow Diagram	59
Figure 4.2 Preprocess Dataset Data Flow Diagram	60
Figure 4.3 Encode Words and Labels Data Flow Diagram	61
Figure 4.4 Create Training Data Flow Diagram	61
Figure 4.5 Build and Train Model Data Flow Diagram.....	62
Figure 4.6 Evaluate Model Data Flow Diagram	63
Figure 4.7 Save Model Data Flow Diagram	63
Figure 4.8 Prepare for Prediction Data Flow Diagram	64
Figure 4.9 Retrieve Response from Intent Data Flow Diagram	64
Figure 4.10 Run Chatbot Data Flow Diagram	64
Figure 4.11 Convert Model Data Flow Diagram	65
Figure 4.12 Chatbot Page.....	72
Figure 4.13 System Build Chatbot.....	74
Figure 4.14 System Installation Chatbot.....	75
Figure 5.1 Chatbot Initialization Testing	78
Figure 5.2 Query Processing and Response Generation Testing.....	78

Figure 5.3 Conversation Flow Testing.....	79
Figure 5.4 Overall Satisfaction with Chatbot Services	80
Figure 5.5 Ease of Navigation	81
Figure 5.6 Accessing the Chatbot on the Website	81
Figure 5.7 Chatbot Display Rating	82
Figure 5.8 Question Understanding	83
Figure 5.9 Information Accuracy.....	83
Figure 5.10 Response Speed	84
Figure 5.11 Relevance of Chatbot Responses.....	85
Figure 5.12 Frequency of Questions	85
Figure 5.13 Interaction Duration.....	86
Figure 5.14 First-Time Use.....	87
Figure 5.15 Devices Used	87
Figure 5.16 Technology Proficiency Level	88
Figure 5.17 Age Group	89
Figure 5.18 Educational Status	89
Figure 5.19 SEO Testing Performance	93
Figure 5.20 Website System on Tablet Display.....	95
Figure 5.21 Chatbot Display	96