



**OPTIMAL TRAVEL PLANNING IN TERMS OF DISTANCE AND TRAVEL
TIME IN CENTRAL KALIMANTAN USING K-MEANS CLUSTERING
ALGORITHM**

UNDERGRADUATE THESIS

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

By

NIKEN AYUNING TYAS

001202000139

**FACULTY OF COMPUTING
INFORMATION TECHNOLOGY STUDY PROGRAM
CIKARANG**

SEPTEMBER, 2023

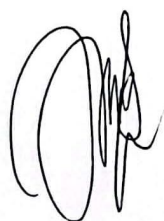
PANEL OF EXAMINER APPROVAL

The Panel of Examiners declare that the undergraduate thesis entitled "**OPTIMAL TRAVEL PLANNING IN TERMS OF DISTANCE AND TRAVEL TIME IN CENTRAL KALIMANTAN USING K-MEANS CLUSTERING ALGORITHM**" that was submitted by **Niken Ayuning Tyas** majoring in **Informatics** from the Faculty of Computer Science was assessed and approved to have passed the Oral Examination on Saturday September 16, 2023.

Panel of Examiner



Chair of Panel Examiner



Genta Sahuri, S.Kom, M.Kom.

Examiner I

**OPTIMAL TRAVEL PLANNING IN TERMS OF DISTANCE AND TRAVEL
TIME IN CENTRAL KALIMANTAN USING K-MEANS CLUSTERING
ALGORITHM**

By

Niken Ayuning Tyas

001202000139

Approved:



Ir. Rusdianto Roestam MSc., PhD.
Thesis Advisor



Cutifa Safitri, B.CS., M.IT., Ph.D
Program Head of Information Technology



Rila Mandala, Ph.D
Dean of Faculty of Computing

STATEMENT OF ORIGINALITY

In my capacity as an active student at President University and as the author of the final project stated below:

Name : Niken Ayuning Tyas

Student ID number : 001202000139

Study Program : Informatics Technology

Faculty : Computing

I hereby declare that my final project entitled “**Optimal Travel Planning In Terms Of Distance And Travel Time In Central Kalimantan Using K-Means Clustering Algorithm**” is to the best of my knowledge and belief, an original piece of work based on sound academic principles. If there is any plagiarism detected in this final project, I am willing to be personally responsible for the consequences of these acts of plagiarism and will accept the sanctions against these acts in accordance with the rules and policies of President University.

I also declare that this work, either in whole or in part, has not been submitted to another university to obtain a degree.

Cikarang, September 19, 2023



Niken Ayuning Tyas

SCIENTIFIC PUBLICATION APPROVAL FOR ACADEMIC INTEREST

As an academic community member of the President's University, I, the undersigned:

Name : Niken Ayuning Tyas

Student ID number : 001202000139

Study program : Informatics

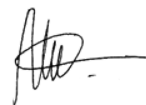
for the purpose of development of science and technology, certify, and approve to give President University a non-exclusive royalty-free right upon my final report with the title:

“Optimal Travel Planning In Terms Of Distance And Travel Time In Central Kalimantan Using K-Means Clustering Algorithm”

With this non-exclusive royalty-free right, President University is entitled to converse, to convert, to manage in a database, to maintain, and to publish my final report. There are to be done with the obligation from President University to mention my name as the copyright owner of my final report.

This statement I made in truth.

Cikarang, September 19, 2023



Niken Ayuning Tyas

ADVISOR APPROVAL FOR JOURNAL/INSTITUTION'S REPOSITORY

As an academic community member of the President's University, I, the undersigned:

Name : Ir. Rusdianto Roestam MSc., PhD

ID number : 20170800704

Study program : Informatics

Faculty : Computing

declare that following thesis:

Title of thesis : **Optimal Travel Planning In Terms Of Distance And Travel Time In Central Kalimantan Using K-Means Clustering Algorithm**

Thesis author : Niken Ayuning Tyas

Student ID number : 001202000139

will be published in **journal / institution's repository / proceeding / unpublished.**

Cikarang, September 19, 2023



Ir. Rusdianto Roestam MSc., PhD

SIMILARITY INDEX REPORT

Optimal Travel Planning

ORIGINALITY REPORT

12% SIMILARITY INDEX	11% INTERNET SOURCES	2% PUBLICATIONS	0% STUDENT PAPERS
--------------------------------	--------------------------------	---------------------------	-----------------------------

PRIMARY SOURCES

1	repository.president.ac.id Internet Source	3%
2	etd.aau.edu.et Internet Source	2%
3	es.scribd.com Internet Source	1%
4	fr.slideshare.net Internet Source	1%
5	iptek.its.ac.id Internet Source	<1%
6	dspace.daffodilvarsity.edu.bd:8080 Internet Source	<1%
7	Leonard Matheus Wastupranata. "UAV Waypoint Strategy for COVID-19 Medicine Delivery based on Cheapest Link and Hamilton Circuit Algorithm", Institute of Electrical and Electronics Engineers (IEEE), 2023 Publication	<1%

GPT ZERO CHECK

The screenshot shows the GPTZero AI Detection interface. On the left is a navigation sidebar with options: AI Detection (selected), Scan History, Usage Stats, API, and Settings. The main content area displays the result: "Your text is most likely human written". Below this, a disclaimer states that AI-generated content is changing and detection results should not be used to punish students. It recommends using "Writing Reports" as part of a holistic assessment and refers to an FAQ for more information. The model version is noted as "2023-09-14". A text box contains the following content:

1 CHAPTER I INTRODUCTION 1.1 Background Tourism is one that has an important contribution in increasing state revenue.

Indonesia is an extraordinary country with its cultural diversity and natural beauty, hence the need for improvement as a support for the tourism sector in Indonesia.

This is of course because tourism is one of the sectors that has a high value of profit and certainly has the potential to be developed for Indonesia as one of the assets that produce.

This certainly requires optimisation in the provision of services to further support the potential of the tourist areas visited.

Central Kalimantan is a fascinating province in Indonesia, characterised by its extraordinary natural beauty.

The outstanding natural beauty of Central Kalimantan is not only a valuable asset for the local community, but also attracts travellers from various parts of the world to make Central Kalimantan one of the tourist destinations in Indonesia.

The screenshot shows the "Stats" page in the GPTZero interface. It features two main statistics:

- Average Perplexity Score: 81.260**
A document's perplexity is a measurement of the randomness of the text
- Burstiness Score: 114.719**
A document's burstiness is a measurement of the variation in perplexity

Below these, a specific sentence is highlighted: "Your sentence with the highest perplexity, 'After getting clear needs, then determine more detailed things.', has a perplexity of: 536".

ABSTRACT

Optimal journey planning is an important aspect of the tourism industry. In Central Kalimantan, a province with a wide range of tourist destinations and travel challenges, finding travel routes that minimise distance and travel time is an issue for new tourists. Therefore, in this study helping tourists have a well-organised itinerary, tourists can spend more time enjoying the tourist attractions and activities they enjoy rather than being stuck in a long journey.

This application called Optimal Travel Planning focuses on how the proposed algorithm can optimise the application in terms of processing time for the benefit of system efficiency. To create an optimal travel plan, the user must enter the number of days to travel, starting location, and tourist destinations to be visited. Tourist destinations will be clustered using the K-Means Clustering algorithm, then the Travelling Salesman Problem solution will be found for the best or shortest route in each cluster. The development of this application is expected to help and provide a better and more efficient travel experience for tourists visiting Central Kalimantan.

DEDICATION

I would like to dedicate it to my parents, my father H.Budi Susetyo S.sos (Alm) and my mother Hj. Aulia Ridhayani S.pd who never stop praying and fighting with all their might for their children without complaining. Thank you for educating your child with love from childhood until now. Your prayers and sincerity have led me to realise my dreams. This self may not be able to repay your kindness. But God willing, this spirit will never be extinguished to be able to make you all happy.

ACKNOWLEDGMENTS

I would like to express my gratitude to Allah SWT because it is thanks to His mercy and grace that I can complete this final project. In completing this final project, I received a lot of help, teaching, guidance, and direction from various parties both directly and indirectly. For that, I would like to express my deepest gratitude to:

1. God Almighty for all His favors, graces, and blessings that have been given during this final project.
2. Parents and family for always providing support and prayers.
3. Sir Rusdianto Roestam MSc, PhD as my final project advisor who has provided guidance and direction during making the final project.
4. All those who have helped provide ideas and also helpful suggestions.
5. Last but not least to myself Niken Ayuning Tyas for taking responsibility to finish what I started. Thank you for always trying and not giving up, and always enjoying every process that is practically not easy. Thank you for persevering.

TABLE OF CONTENTS

ABSTRACT	i
DEDICATION	ii
ACKNOWLEDGMENTS	iii
LIST OF TABLES	ix
LIST OF FIGURES	x
CHAPTER I INTRODUCTION	1
1.1 Background	1
1.2 Problem Statement.....	2
1.3 Final Project Objectives.....	2
1.4 Scope and Limitation.....	3
1.5 Methodology	3
1.6 Final Project Outline.....	5
CHAPTER II LITERATURE STUDY	7
2.1 K-Means Clustering.....	7
2.2 Flowchart K-Means Clustering	9
2.3 Traveling salesman problem (TSP).....	10
2.4 Flowchart Traveling salesman problem (TSP).....	12
2.5 Google Maps API.....	13
2.6 Related Works	14
2.6.1 Eightydays App.....	14
2.6.2 Green Flag App.....	15

2.7	Comparison Overview	15
CHAPTER III SYSTEM ANALYSIS		16
3.1	System Overview.....	16
3.2	Functional Analysis	17
3.3	Hardware and Software Requirements	17
3.3.1	Hardware Requirement.....	17
3.3.2	Software Requirement.....	18
3.4	Use Case Diagram	18
3.5	Use Case Narrative	19
3.6	Activity Diagram.....	33
3.6.1	Activity Diagram – About Us.....	33
3.6.2	Activity Diagram – View Tourist Attraction.....	34
3.6.3	Activity Diagram – View Tourist Attractions by type	34
3.6.4	Activity Diagram – Create Itinerary.....	35
3.6.5	Activity Diagram – View Itinerary Results	36
3.6.6	Activity Diagram – Login.....	37
3.6.7	Activity Diagram – Manage Tourism Types	38
3.6.8	Activity Diagram – Add Tourism Types.....	39
3.6.9	Activity Diagram – Edit Tourism Types	40
3.6.10	Activity Diagram – Delete Tourism Types	40
3.6.11	Activity Diagram – Manage Tourist Attractions	41
3.6.12	Activity Diagram – Add Tourist Attraction.....	42
3.6.13	Activity Diagram – Edit Tourist Attraction.....	42

3.6.14	Activity Diagram – Delete Tourist Attraction	43
3.6.15	Activity Diagram – Logout.....	44
CHAPTER IV	SYSTEM DESIGN	45
4.1	User Interface Design	45
4.1.1	Home Page.....	45
4.1.2	About Us Page	46
4.1.3	Tourist Attraction Page.....	46
4.1.4	Create Itinerary Page	47
4.1.5	Itinerary Results Page.....	48
4.1.6	Admin Login Page	49
4.1.7	Admin Page.....	50
4.1.8	Manage Tourism Types Page.....	51
4.1.9	Add Tourism Types Page	51
4.1.10	Edit Tourism Types Page	52
4.1.11	Manage Tourist Attractions Page.....	53
4.1.12	Add Tourist Attraction Page.....	54
4.1.13	Edit Tourist Attraction Page	54
4.2	Physical Design	55
4.3	Database Design	56
4.3.1	Admin Table	56
4.3.2	Tourism Type Table	57
4.3.3	Tourist Attractions Table.....	57
CHAPTER V	IMPLEMENTATION	58

5.1	User Interface Development	58
5.1.1	Home Page.....	58
5.1.2	About Us Page	59
5.1.3	Tourist Attraction Page.....	59
5.1.4	Create Itinerary Page.....	60
5.1.5	Itinerary Results Page.....	61
5.1.6	Admin Login Page	62
5.1.7	Admin Page.....	63
5.1.8	Manage Tourism Types Page.....	63
5.1.9	Manage Tourist Attractions Page.....	65
5.2	Application Details	67
5.2.1	Home Page.....	67
5.2.2	About Us.....	67
5.2.3	Tourist Attraction	68
5.2.4	Tourism Types	69
5.2.5	Create Itinerary	70
5.2.6	Login.....	72
5.2.7	Admin Page.....	73
5.2.8	Add Tourism Types.....	74
5.2.9	Edit Tourism Types.....	75
5.2.10	Delete Tourism Types	76
5.2.11	Add Tourist Attraction	76
5.2.12	Edit Tourist Attraction.....	77

5.2.13 Delete Tourist Attraction	78
CHAPTER VI SYSTEM TESTING	79
6.1 Testing Environment	79
6.2 Testing Scenario	79
6.2.1 User Features Testing Scenario.....	80
6.2.2 Admin Features Testing Scenario	81
CHAPTER VII CONCLUSION AND FURTHER WORK.....	83
7.1 Conclusion	83
7.2 Further Work.....	84
REFERENCES.....	85

LIST OF TABLES

TABLE	Page
Table 3. 1 Use Case Narrative – About Us.....	19
Table 3. 2 Use Case Narrative – View Tourist Attraction.....	20
Table 3. 3 Use Case Narrative – View Tourist Attractions by type.....	20
Table 3. 4 Use Case Narrative – Create Itinerary.....	21
Table 3. 5 Use Case Narrative – View Itinerary Results.....	22
Table 3. 6 Use Case Narrative – Login.....	23
Table 3. 7 Use Case Narrative – Manage Tourism Types.....	24
Table 3. 8 Use Case Narrative – Add Tourism Types.....	25
Table 3. 9 Use Case Narrative – Edit Tourism Types.....	26
Table 3. 10 Use Case Narrative – Delete Tourism Types.....	27
Table 3. 11 Use Case Narrative – Manage Tourist Attractions.....	28
Table 3. 12 Use Case Narrative – Add Tourist Attractions.....	29
Table 3. 13 Use Case Narrative – Edit Tourist Attractions.....	30
Table 3. 14 Use Case Narrative – Delete Tourist Attractions.....	31
Table 3. 15 Use Case Narrative – Logout.....	32
Table 4. 1 Software Requirement.....	56
Table 4. 2 Hardware Requirement.....	56

LIST OF FIGURES

FIGURE	Page
Figure 1. 1 Rapid Application Development (RAD) Methodology.....	4
Figure 2. 1 Flowchart K-Means Clustering	10
Figure 2. 2 The Example of TSP.....	11
Figure 2. 3 Flowchart Travelling Salesman Problem (TSP).....	12
Figure 2. 4 Eightydays App	14
Figure 2. 5 Green Flag App	15
Figure 3. 1 Use Case Diagram	18
Figure 3. 2 Activity Diagram – About Us	33
Figure 3. 3 Activity Diagram – View Tourist Attraction	34
Figure 3. 4 Activity Diagram – View Tourist Attractions by type.....	35
Figure 3. 5 Activity Diagram – Create Itinerary.....	36
Figure 3. 6 Activity Diagram – View Itinerary Results.....	37
Figure 3. 7 Activity Diagram – Login	38
Figure 3. 8 Activity Diagram – Manage Tourism Types.....	39
Figure 3. 9 Activity Diagram – Add Tourism Types	39
Figure 3. 10 Activity Diagram – Edit Tourism Types.....	40
Figure 3. 11 Activity Diagram – Delete Tourism Types	41
Figure 3. 12 Activity Diagram – Manage Tourist Attractions.....	41

Figure 3. 13 Activity Diagram – Add Tourist Attraction	42
Figure 3. 14 Activity Diagram – Edit Tourist Attraction	43
Figure 3. 15 Activity Diagram – Delete Tourist Attraction.....	44
Figure 3. 16 Activity Diagram – Logout	44
Figure 4. 1 User Interface - Home Page	45
Figure 4. 2 User Interface - About Us Page.....	46
Figure 4. 3 User Interface - Tourist Attraction Page	47
Figure 4. 4 User Interface - Create Itinerary Page	48
Figure 4. 5 User Interface - Itinerary Results Page	49
Figure 4. 6 User Interface - Admin Login Page.....	50
Figure 4. 7 User Interface - Admin Page	50
Figure 4. 8 User Interface - Manage Tourism Types Page.....	51
Figure 4. 9 User Interface - Add Tourism Types Page.....	52
Figure 4. 10 User Interface - Edit Tourism Types Page	53
Figure 4. 11 User Interface - Manage Tourist Attractions Page	53
Figure 4. 12 User Interface - Add Tourist Attraction Page	54
Figure 4. 13 User Interface - Edit Tourist Attraction	55
Figure 5. 1 Home Page	58
Figure 5. 2 About Us Page.....	59
Figure 5. 3 Tourist Attraction Page	60

Figure 5. 4 Create Itinerary Page.....	61
Figure 5. 5 Itinerary Results Page	62
Figure 5. 6 Admin Login Page.....	62
Figure 5. 7 Admin Page.....	63
Figure 5. 8 Manage Tourism Types Page.....	64
Figure 5. 9 Add Tourism Types Page.....	64
Figure 5. 10 Edit Tourism Types Page.....	64
Figure 5. 11 Manage Tourist Attractions Page	65
Figure 5. 12 Add Tourist Attractions Page.....	66
Figure 5. 13 Edit Tourist Attractions Page	66
Figure 5. 14 Home Page Source Code.....	67
Figure 5. 15 About Us Source Code.....	67
Figure 5. 16 Tourist Attraction Source Code.....	68
Figure 5. 17 Tourism Types Source Code	69
Figure 5. 18 Controls the display of the Create itenerary Source Code	70
Figure 5. 19 Create itenerary Source Code.....	72
Figure 5. 20 Login Source Code	73
Figure 5. 21 Admin Page Source Code	73
Figure 5. 22 Add Tourism Types Source Code.....	74
Figure 5. 23 Edit Tourism Types Source Code.....	75

Figure 5. 24 Delete Tourism Types Source Code	76
Figure 5. 25 Add Tourist Attraction Source Code	77
Figure 5. 26 Edit Tourist Attraction Source Code.....	78
Figure 5. 27 Delete Tourist Attraction Source Code.....	78