Application of Collaborative Filtering Algorithm in Personalization of Product Recommendations in E-Commerce

UNDERGRADUATE THESIS

Submitted as one of the requirements to obtain
Sarjana Komputer

By:
MULLAH CADRE GIAWA
001201900117

FACULTY OF COMPUTING

INFORMATION TECHNOLOGY STUDY PROGRAM

CIKARANG

JUNI 2023

Copyright by

Mullah Cadre Giawa

2023

Application of Collaborative Filtering Algorithms in Personalizing Product Recommendations in E-Commerce

By

Mullah Cadre Giawa

001201900117

Approved:

Final Project Advisor

Ronny Juwono, S.Pd., M.T.

Program Head Information Technology

Cutifa Safitri, Ph.D.

Dean of Faculty of Computing
Rila Mandala, Ph.D.

STATEMENT OF ORIGINALITY

In my capacity as an active student of President University and as the author of the thesis/final project/business plan (underline that applies) stated below:

Name	: Mullah Cadre Giawa
Student ID number	: 00120190011
Study Program	: Information Technology
Faculty	: Computing

I hereby declare that my thesis/final project/business plan entitled " Application of Collaborative Filtering Algorithms in Personalizing Product Recommendations in E-Commerce" 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 thesis/final project/business plan, 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, 17 May 2023

Mullah Cadre Giawa

SCIENTIFIC PUBLICATION APPROVAL FOR ACADEMIC INTEREST

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

Name	: Mullah Cadre Giawa
Student ID number	: 00120190011
Study Program	: Information Technology
Faculty	: Computing

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:

Application of Collaborative Filtering Algorithms in Personalizing Product Recommendations in E-Commerce

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, 17 May 2023

Mullah Cadre Giawa

ADVISOR APPROVAL FOR PUBLICATION

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

Advisor Name : Ronny Juwono, S.Pd., M.T.

Employee ID number :

Study program : Information Technology

Faculty : Computer Science

declare that following thesis:

Title of thesis : Application of Collaborative Filtering Algorithms in Personalizing Product Recommendations in E-Commerce Thesis

author : Mullah Cadre Giawa

Student ID number : 001201900117

will be published in journal / institution's repository / proceeding / unpublish

/ ..... (choose one, underline that applies)

Cikarang, 17 May 2023

Ronny Juwono, S.Pd., M.T.

SIMILARITY INDEX REPORT

Application of Collaborative Filtering Algorithm in Personalization of Product Recommendations in E-Commerce

ORIGINALITY REPORT

5%	5%	2%	0%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.coursehero.com Internet Source	<1%
2	dokumen.pub Internet Source	<1%
3	scpe.org Internet Source	<1%
4	e-research.siam.edu Internet Source	<1%
5	link.springer.com Internet Source	<1%
6	www.researchgate.net Internet Source	<1%
7	medium.com Internet Source	<1%

ABSTRACT

The number of people using and transacting in e-commerce has skyrocketed in recent years. To help people locate items that are a good fit for them, the recommendation system becomes crucial. This research suggests that e-commerce recommendation systems use Collaborative Filtering methods. Collaborative filtering is a technique that makes suggestions based on the tastes of users who are similar to the one making the suggestion. Rapid Application Development (RAD) is the research approach used, and it consists of four phases: planning, design, development, and cutover. Metrics like as Mean Absolute Error, Root Mean Squared Error, and F-Score are used to assess and evaluate systems. Incorporating Collaborative Filtering methods into e-commerce recommendation systems improved both suggestion accuracy and user happiness. But there's still work to be done to fine-tune the algorithm and make the system flexible enough to accommodate evolving user preferences and habits.

Keywords: e-commerce, recommendation system, collaborative filtering, rapid application development, system evaluation.

TABLE OF CONTENT

ABSTRACT i
TABLE OF CONTENT ii
LIST OF FIGURES v
CHAPTER I 1
INTRODUCTION 1
I.1. Background 1
I.2. Problem Statement 2
I.3. Research Objective 3
I.4. Scope and Limitation 4
I.5. Methodology 5
CHAPTER II 7
LITERATURE STUDY 7
II.1. E-Commerce 7
II.2. Recommendating System 11
II.3. Collaborative Filtering 13
II.4. Similarity Calculation Method in Collaborative Filtering 16
1. Cosine Similarity 16
2. Pearson Correlation Coefficient 17
II.5. Related Works 18
CHAPTER III 19
SYSTEM ANALYSIS 19
III.1 System Overview 19
III.2 Identification of E-Commerce System Needs 19
III.3 Functional Requirements 20
III.4 Hardware and Software Requirements 21
III.5 Use Case Diagram 22
III.6 Use Case Narrative 23

a. Manage Log 23
b. Manage User 23
c. Manage Product 24
d. Add to Cart 24
e. Checkout 24
f. Order 25
g. Payment 25
h. Recommend Product 25
i. Search 26
j. View Product 26
III.7 Activity Diagram 27
a. Admin 27
b. User 29
c. Recommendating System 32
CHAPTER IV 35
SYSTEM DESIGN 35
IV.1. Similarity Calculation using Cosine Similarity 35
IV.2. User Interface System Recommendation 37
a. Home Page 38
b. Category Page 39
c. Brand Page 39
d. Cart Page 40
e. Dashboard Page 40
f. Review Page 41
g. Wishlist Page 41
h. Checkout Page 42
i. Address book Page 42
j. Add address Page 43
k. Order Page 43
l. Profile Page 44

m. Add review Page 44
n. List of product Page 45
o. Detail of product Page 45
IV.3. Database Design 46
CHAPTER V 47
SYSTEM IMPLEMENTATION 47
V.1. System Requirement 47
V.2. Similarity Calculation in Collaborative Filtering 47
V.3. Admin Panel 52
V.4. User View 64
CHAPTER VI 74
SYSTEM TESTING AND EVALUATION 74
VI.1. System Testing 74
VI.2. Testing and Environment 74
VI.3. Testing User Platform Features 75
VI.4. Testing Data 79
VI.5. Evaluation 81
CHAPTER VII 83
CONCLUSIONS AND FUTURE WORK 83
VII.1. Conclusion 83
VII.2. Future Work 84
REFERENCES 85

LIST OF FIGURES

Figure III. 1: Use Case Diagram....22
Figure III. 2: Activity Diagram of Admin....27
Figure III. 3: Activity Diagram of User....29
Figure III. 4: Activity Diagram of Recommendating System....32

Figure IV 1:Home Page....38
Figure IV 2: Category Page....39
Figure IV 3: Brand Page....39
Figure IV 4: Cart Page....40
Figure IV 5: Dashboard Page....40
Figure IV 6: Review Page....41
Figure IV 7: Wishlist Page....41
Figure IV 8: Checkout Page....42
Figure IV 9: Address book Page....42
Figure IV 10: Add Address....43
Figure IV 11: Order Page....43
Figure IV 12: Profile Page....44
Figure IV 13: Add Review....44
Figure IV 14: List of Product....45
Figure IV 15: Detail of Product....45
Figure IV 16: Database Design....46

Figure V 1: Login Panel....52
Figure V 2: Main Panel....52
Figure V 3: User List....53
Figure V 4: Add User....53
Figure V 5: Banner Panel....54
Figure V 6: Brand Panel....54
Figure V 7: Add Brand....54
Figure V 8: Color Panel....55
Figure V 9: Add Color....55
Figure V 10: Size Panel....56
Figure V 11: Add Size....56
Figure V 12: Product Panel....57
Figure V 13: Add Product....57
Figure V 14: Attribut Panel....58
Figure V 15: Add Attribute....58

Figure V 16: Order panel 59
Figure V 17: Add Order 59
Figure V 18: Invoice Panel 60
Figure V 19: Add Invoice 60
Figure V 20: Address Book Panel 61
Figure V 21: Add Address 61
Figure V 22: Reviews Panel 62
Figure V 23: Add Review 62
Figure V 24: Wishlist Panel 63
Figure V 25: Add Wishlist 63
Figure V 26: Login Page 64
Figure V 27: Register Page 64
Figure V 28: Home Page 65
Figure V 29: Categories Page 65
Figure V 30: Brands Page 66
Figure V 31: Search Page 66
Figure V 32: Detail Product Page 67
Figure V 33: Relate Product 67
Figure V 34: Product List Page 68
Figure V 35: Cart Page 68
Figure V 36: Checkout Page 69
Figure V 37: Payment Page 69
Figure V 38: Dashboard Page 70
Figure V 39: Profile Page 70
Figure V 40: Orders History Page 71
Figure V 41: Wishlist Page 71
Figure V 42: Reviews Page 72
Figure V 43: Address Book Page 72
Figure V 44: Password Change 73
Figure V 45: Recommend Product 73

Figure VI 1: Wrong Password 75
Figure VI 2: Password didn't match 75
Figure VI 3: username already 76
Figure VI 4: email validation with '@' 76
Figure VI 5: password too common or short 77
Figure VI 6: password similar with username 77
Figure VI 7: visitor homepage 78
Figure VI 8: user registered homepage 78

Figure VI 9: print.head data original 79
Figure VI 10: print.info data original 79
Figure VI 11: data processed 80
Figure VI 12: data processed 80

GPT ZERO CHECK

Stats
Average Perplexity Score: 2399.611
A document's perplexity is a measurement of the randomness of the text
Burstiness Score: 6909.835
A document's burstiness is a measurement of the variation in perplexity
Your sentence with the highest perplexity, "CHAPTER VII", has a perplexity of: 25095

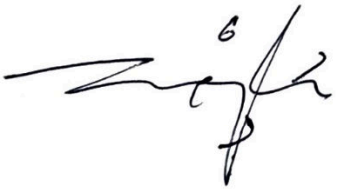
PANEL OF EXAMINER APPROVAL

The Panel of Examiners declare that the undergraduate thesis entitled **APPLICATION OF COLLABORATIVE FILTERING ALGORITHMS IN PERSONALIZING PRODUCT RECOMMENDATIONS IN E-COMMERCE** that was submitted by **MULLAH CADRE GIAWA** majoring in **Informatics** from the Faculty of Computer Science was assessed and approved to have passed the Oral Examination on Tuesday June 13, 2023.

Panel of Examiner

RUSDIANTO ROESTAM

Chair of Panel Examiner



TJONG WAN SEN

Examiner I

RONNY JUWONO

Advisor