Master of Computing and Innovation Project

AI-based Recommendation System

Business Case and Draft Plan

by Team HA1

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1. Business Case

This project aims to build an AI-based recommendation system to solve the problem of migration agent selection and industry opacity in Australia. By collecting user behavior data, the system can realize personalized recommendations and improve the efficiency and success rate of decision-making. The project includes literature reviews, model training and testing, and performance evaluation based on recall rate, NDCG, and computation time to validate the practical value of the recommendation system in immigration services.

1.1. Introduction

A recommendation system is an information filtering tool that provides personalized suggestions based on user interactions. When users engage with a platform—whether by liking, rating, clicking, or simply browsing—the system collects both explicit data (such as ratings and preferences) and implicit data (like click patterns, browsing history, and behavioral records). By analyzing this data, the system understands user preferences and tailors recommendations accordingly (Ko *et al.*, 2022).

Recommendation systems have played an important role in people's daily lives in recent years, including information overload, improving user experience and satisfaction, and increasing sales and business value. The systems help tackle information overload by predicting and ranking items based on user preferences. Instead of users having to sift through vast amounts of information, the systems analyze data and suggest the most relevant content, making it easier (Ko *et al.*, 2022). For example, Netflix: Its recommendation system uses intelligent algorithms to analyze users' viewing history, search preferences and ratings to provide users with personalized movie and television content recommendations (Gomez-Uribe and Hunt, 2015). This can greatly reduce users' time spent selecting content. Additionally, Recommendation systems enhance user experience by personalizing content and helping users quickly find products, movies, or music that match their interests (Ko *et al.*, 2022). By making accurate recommendations, they create a better match between users and content, leading to higher satisfaction (Resnick and Varian, 1997). Trip is one such example, it is a travel recommendation system that not only considers the preferences of tourists but also analyzes the dynamic context of the trip. The system provides recommendations based on the traveler's current environment. It can recommend hotels in popular areas. Beyond that, Recommendation systems also boost sales and business value by suggesting relevant products and services, encouraging more purchases (Ko *et al.*, 2022). On membership platforms, they help users discover interesting content, increasing engagement and loyalty (Gomez-Uribe and Hunt, 2016). A concrete example is Amazon. As a global e-commerce platform, it also uses recommendation algorithms to personalize online shopping for users. When the user opens the website, the recommendation system analyzes the user's browsing history, shopping history and items added to the cart to make recommendations (Linden et al., 2003).

Because of the wide applications of recommendation systems, recently, most people find agents through an online search, social media and friend recommendations, all of which have different problems, such as professional mismatches, communication barriers and unreliable agents (Verschueren 2008; Vandevoordt 2018; Khan 2019). These can lead to failed applications and wasted time and money (Lauren 2016, P. 16).

Traditional recommendation systems mainly rely on rule-based methods, collaborative filtering, and content-based recommendations. It lacks personalization and cannot make accurate recommendations based on the interests of different users (Adomavicius & Tuzhilin 2005). Compared with traditional methods, AI-based recommendation systems have significant advantages. The AI recommendation system uses machine and deep learning technology to learn user preferences from massive data and provide personalized recommendations, and AI can also integrate multiple types of data to improve the quality of recommendations and cope with cold-start problems. Therefore, the project aims to build a system that can provide accurate and personalized recommendations to users according to their needs.

1.2. Project Objectives

The goal of this project is to develop a recommendation system, which integrates three popular AI recommendation system models within the framework of the system, which can improve the personalization and accuracy of recommendation results. The goal is to generate different personalized recommendation results by calling three models according to the relevant background information input by analyzing users and then evaluating the performance of the results given by the three models. Finally, after evaluation, three results of the model with the best evaluation value are recommended to users. The data set used for the training and evaluation of the recommendation system is derived from the immigration service, which contains the user's personal background information and their immigration tendency. This data provides the model with rich feature categories so that the model can output the recommendation results more accurately.

This system is needed for the current immigration environment problem, because there are more than 7,000 registered migration agents in Australia, each with different expertise, success rates and fees. This makes it difficult for applicants to make decisions, as incomplete information leads to the wrong agent being chosen and visa applications being rejected, wasting time and money. The migration industry lacks transparency, and migrants cannot verify the true performance and success rate of agents. Applicants can only rely on the agent's propaganda or oral statements from others to judge, which will lead to easy misled, and eventually pay the price of time and money, and even finally abandon the immigration plan.

2. Draft Plan for Milestone One

In our project, there are three milestones, including literature review, training and testing, and comparison and evaluation. For the literature review, we will analyze the existing recommendation models within their limitations and evaluation metrics to complete the model selection. Meanwhile, we will focus on data collection and generation. In milestone two, we will preprocess the data and split it into different sizes of training and testing sets, such as 70% and 30%, 80% and 20%, and 90% and 10% respectively. By comparing the results of different training sets, the one with the best evaluation results is finally selected for subsequent experiments, and it will be used to generate recommendations for each model. Finally, we will compare model performance using recall, normalized discounted cumulative gain, and computing time, and develop an interface, in which users can interact with the system and view the recommendations from the system.

2.1. Milestone One Plan

Figure 1 shows a plan in the Gantt chart for the milestone 1 literature review, including seven tasks, from the 3rd of March to the 6th of April. Additionally, the details about milestone 1 are demonstrated in Table 1 with activities and the expected output of them.

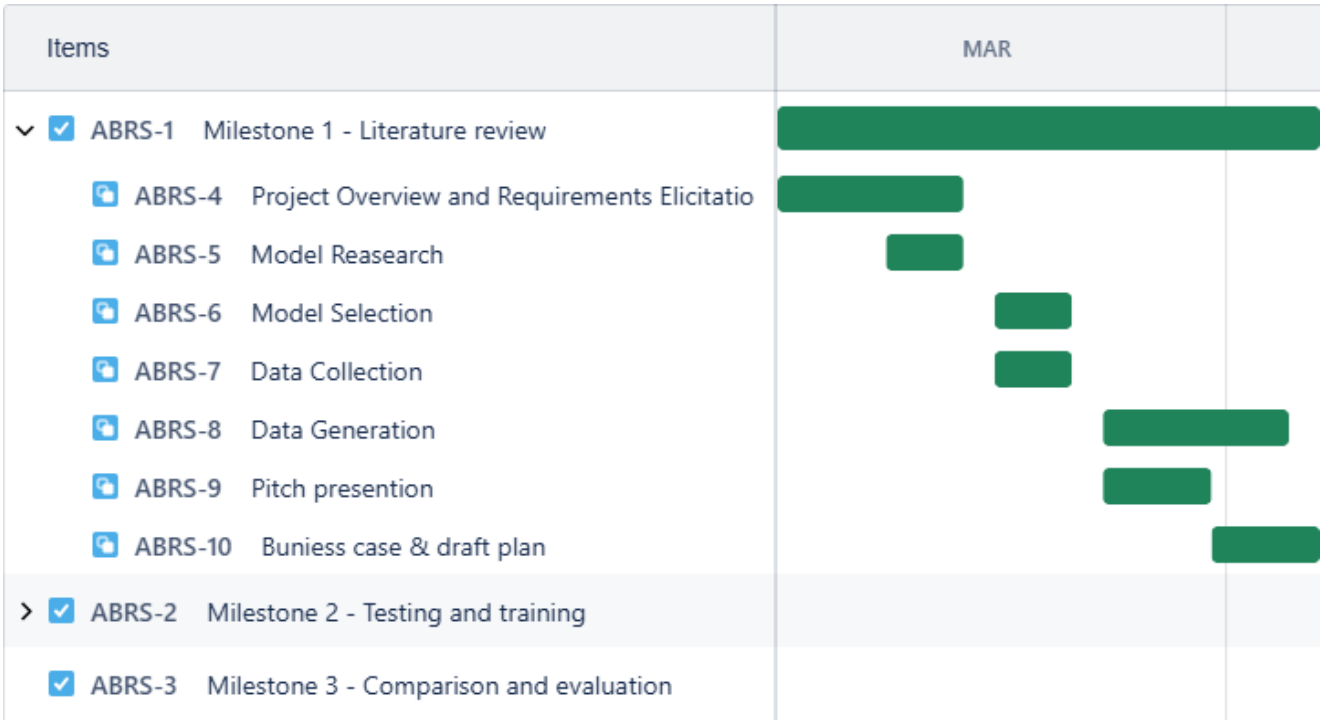

Figure 1 a Gantt Chart for Milestone 1

Milestone 1	Activities	Projected Outputs

Literature review	Project Overview and Requirements Elicitation: have meetings with client to learn about the project	Understand what the project is, the aim of the project, and the scope of it.
	Model Reasearch: Do research for recommendation system models to identify their evaluations and understand their limitations.	Each group member collects and summarizes two recommendation system models about their limitations and evaluations.
	Model Selection: Identify the top 3 popular AI-based recommendation system models recently and fill up the form with columns including model name, brief description, reference, evaluations.	Complete the table of top 3 popular recommendation system models as required.
	Data Collection: Identify the Australian migrants' requirements and fill up the form with 2 columns including requirements and why it is important.	Complete the table of Australian migrants' requirements and show out the process we did in the slides
	Data Generation: According to the requirements from the supervisor, we should generate a data file based on the given data files and link it with the requirements we collected before.	Generate a data file with Australian migrant agents and Australian migrant requirements and write a data dictionary to explain the generated data ranges and types.
	Pitch Presentation: according to the rubric and the suggestions from client, complete the pitch presentation on time.	Finish a pitch video and presentation slides before the due time.
	Business Case and Draft Plan: based on the pitch presentation and criteria, write the document about business case and a draft plan for milestone one.	Finish the document including business case and draft plan for milestone 1.

Table 1 Milestone 1 Plan Details

2.2. Team Description

2.2.1. Team Organization

Every week we hold two meetings within the group internally, one is held on Wednesday, before the project meeting with our supervisor to check our work and discuss our confusion for the future, and the other is held on Friday to summarize what we have discussed in the project meeting and assign tasks to each team member. Both meetings are held on Zoom online. We also have a group chat on WeChat to share our ideas and confusion. To communicate with our supervisor, a group chat on Teams can be helpful for us to ask questions and clear up our confusion conveniently. Additionally, a project meeting is held every Thursday afternoon with our supervisor face-to-face. For the project meeting agendas and minutes, two members will be assigned to write and upload them to GitHub.

For task management and accountability, we built a project task board in GitHub and this is the link: https://github.cs.adelaide.edu.au/orgs/MCI-Project-2025/projects/6/views/1.

2.2.2. Team Roles

There are five members in our team, each one is responsible for different jobs, shown as in Table 2.

Team Member	Role	Responsibility
Manhong Chen (Crystal)	Product manager & project manager	1. System requirements analysis and prototyping 2. Confirm project scope, manage project implementation progress and ensure the project work as the plan
Zihan Luo	Front-end engineer	Front-end architecture building and front-end interactive page coding
Ziyan Zhao	Data/Machine Learning Engineer	Responsible for data preprocessing, model selection evaluation and model training
Jianing Dang (Lerina)	Back-end engineer	Backend architecture building and backend data interaction and database management
Jianghao Jin (Michael)	Test Engineer	Perform unit, integration and system testing of system functionality

Table 2 Team Roles Details

2.2.3. Risk Management

To minimize the damage caused by risks to the project, we have carried out the following risk management to cope with the corresponding problems in Table 3.

Risk Type	Risk description	How to solve	Coordinator
Scope Risk	Frequent scope changes disrupt development and lead to scope creep.	Use backlog grooming and prioritize user stories in each sprint to control scope. Implement a Definition of Done to ensure deliverables meet acceptance criteria.	Project Manager
Schedule Risk	Tasks take longer than expected, leading to sprint delays.	Use velocity tracking to estimate workloads realistically and adjust sprint scope accordingly. Conduct daily stand-ups to identify blockers early.	All Team Members
Quality Risk	Code contains bugs, and functionality tests fail.	Implement unit and integration testing and perform code reviews before merging. Conduct exploratory testing to uncover hidden defects.	Test Engineer
Resource Risk	Lack of available team members (for example, illness), skill gaps, or overburdened team.	Crosstrain team members and use pair programming or swarming to share knowledge and balance workload.	All Team Members
Communication Risk	Misunderstanding between team members and supervisor, and misalignment in team members	Hold daily stand-up online and review our work every week, by using GitHub project task board.	All Team Members

Table 3 Risk Management Details

2.3. Document Organization

To manage our documents and codes easily, we should upload them in our project GitHub repository (link: https://github.cs.adelaide.edu.au/MCI-Project-2025/HA1), based on the following rules:

1. Agendas: stored in docs/Agendas/
2. Minutes: stored in docs/Minutes/
3. Timesheets: stored in docs/Timesheets/

4. Output documents for each week, such as report slides, table images and prototypes: store in docs/Report/, with a folder name with the week number.
5. Data files: stored in datafiles/, named with a specific title, for example, Migrant requirements.csv.
6. Back-end codes: stored in BackCode/ after testing and merging on the main branch.
7. Front-end codes: stored in front-end/ after testing and merging on the main branch.
8. Codes management: Firstly, we should create a branch named after our name and push the codes on this branch. After testing on local devices, the codes will be merged into the main branch to continue future testing.
9. Document sharing: use Microsoft 365 to share all the editable documents, such as slides, Word and Excel, which can help members monitor and check each other and facilitate cooperation.

Reference:

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