



Project Proposal

AI-Based Recommendation System for Selecting Suitable Training Courses for Students (AIRSS)

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Abstract:

This research, from the researcher's perspective, aims to develop a unique, intelligent system based on modern artificial intelligence technologies to support Saudi university graduates in selecting courses that align with their academic specializations and prepare them for the job market. The system's significance lies in the variety of models available across major digital platforms, enabling graduates to make informed choices and helping them meet the demands of the local labor market.

The proposed system relies on analyzing users' textual data, such as their educational preferences and career interests, and linking it to descriptions of available language specializations using natural language processing techniques and textual similarity measurement algorithms, particularly the TF-IDF algorithm and cosine similarity measurement. The aim is to provide specific, personalized recommendations tailored to meet the individual needs of each user.

The researcher hopes this system will contribute to improving the quality of educational innovation among graduates, reducing the time and effort required to employ them, and supporting researchers in educational institutions through its analytical tools. Its popularity stems from its contribution to the concept of enhanced learning through diverse, flexible, and digitally effective models, in line with the requirements of modern educational trends.

Keywords:

Search, Artificial Intelligence, Natural Language Processing, Candidate Selection, Surveys, Self-Learning or Personalized Learning

Chapter One: Introduction

1.1 Background of the Study

The education and training sector has witnessed rapid development in recent years thanks to the increasing reliance on digital technologies and diverse e-learning platforms, resulting in a vast number of training courses available across various fields and specializations. The researcher believes that this expansion, while positive, has created a real challenge: the difficulty of choosing the most suitable courses, especially for students and recent graduates. This development has also provided students and graduates with ample opportunities to develop their skills and build career paths that align with the evolving demands of the labor market.

However, this expansion in training content has been accompanied by a clear challenge: the difficulty of choosing the most suitable training courses, especially for graduates, given the abundance of options and the varying levels and objectives of training programs. The

researcher believes that the lack of smart and specialized guidance tools for students in Saudi Arabia leads many graduates to rely on manual research or general recommendations, which can result in inaccurate training decisions or decisions that do not align with their actual interests and abilities.

In this context, artificial intelligence technologies, particularly smart recommendation systems, have emerged as a promising solution, according to the researcher, for supporting educational decision-making. These systems rely on analyzing user data and providing personalized recommendations that help guide students toward the most appropriate training path.

1.2 Research Problem

University graduates in Saudi Arabia face a significant challenge in choosing suitable training courses due to the abundance of educational platforms and the diversity of course content and specializations. According to the researcher, this fragmentation often leads to ill-considered training decisions that do not align with the graduate's academic interests or the demands of the local job market.

Furthermore, most currently available search tools lack personalization capabilities, failing to directly analyze user interests and personal data. This diminishes the effectiveness of academic advising and increases the time and effort spent searching for appropriate courses.

Therefore, the research problem addressed by the researcher revolves around the following key question: How can artificial intelligence technologies be employed to provide personalized training recommendations that help university graduates in Saudi Arabia choose the courses best suited to their career paths and developmental needs?

1.2.1 Research Questions

This research seeks to answer the following main question:

- ❖ How can artificial intelligence (AI) techniques be used to develop an intelligent recommendation system that helps graduates in Saudi Arabia choose suitable training courses based on their interests and career paths?

Based on the main research question, the researcher seeks to answer a set of sub-questions, namely:

- ❖ To what extent can content-based recommendation systems support graduates in making objective training decisions?
- ❖ How can natural language processing techniques be employed to analyze user interests and link them to descriptions of available online training courses?

- ❖ To what extent do personalized and explainable recommendations contribute to improving the user experience and increasing satisfaction with the proposed AIRSS system?
- ❖ What is the impact of the proposed AIRSS system on reducing the time and effort spent by graduates in searching for suitable training courses?

1.2.2 Research Hypothesis

The researcher expects that the proposed Intelligent Recommendation System (AIRSS) will improve the suitability of training recommendations for Saudi graduates compared to traditional or manual methods of course selection.

1.3 Research Objectives

This research aims to develop an intelligent recommendation system that supports graduates in making more accurate and effective training decisions by:

1. Assisting graduates in selecting training courses that align with their interests and career paths.
2. Reducing the time and effort spent manually searching for suitable courses.
3. Improving the quality of academic advising using artificial intelligence techniques.
4. Analyzing user text data to provide accurate and personalized training recommendations.
5. Supporting universities and training centers in developing intelligent student advising tools.
6. Paving the way for the development of more advanced systems in the field of smart education and personalized learning.

1.4 Significance of the Research

The importance of this research is evident in several scientific, applied, and social aspects, which can be explained as follows:

1.4.1 Scientific Significance

The researcher believes the scientific significance of this research lies in its contribution to enriching the scientific literature related to educational recommendation systems, by focusing on content-based recommendation models and employing natural language processing techniques in textual data analysis. She also hopes the research will clarify the role these techniques can play in improving the accuracy of educational recommendations and aligning them with users' interests.

1.4.2 Applied Significance

The practical significance of this research stems from its presentation of a proposed practical model for an Intelligent Recommendation System (AIRSS), which can be used to support graduates in selecting appropriate training courses based on their interests and career paths. The researcher believes that implementing such a system could reduce reliance on manual search methods or general recommendations, thereby improving the efficiency of the training decision-making process.

1.4.3 Societal Significance

The researcher believes that supporting the concept of personalized learning and professional development through smart solutions contributes to raising the level of graduates' readiness for the labor market, especially in light of the accelerating digital transformation, and in line with the directions of the Kingdom of Saudi Arabia's Vision 2030 towards employing smart technologies in the education and training sector in particular.

1.5 Justification for Choosing the Topic

The researcher believes that the choice of this topic came as a result of a set of scientific and applied reasons that reflect a real need in the field of education and training, and these reasons can be explained as follows:

1. The continuous increase in the number of training courses on local and international educational platforms.
2. The absence of a user-friendly Arabic smart system that helps Saudi graduates accurately and quickly select suitable courses.
3. The lack of similar smart systems in Saudi Arabia specifically targeting Saudi graduates.
4. The growing trend among educational institutions to employ artificial intelligence and data analytics in developing their services.
5. The need for an applied project that combines the technical and academic aspects of artificial intelligence.
6. The system's potential for future expansion and development into a comprehensive platform.
7. The project's direct relevance to the future of e-learning and personalized learning.

1.6 Scope of the Research

The researcher believes that the scope of this research is limited to a set of specific aspects that define the study's boundaries and focus, which can be summarized as follows:

Target group: University graduates in the Kingdom of Saudi Arabia, as the research focuses on supporting them in making appropriate training decisions for their career paths.

Thematic area: Educational recommendation systems, with an emphasis on supporting the process of selecting suitable courses or training programs.

Technical area: Content-based recommendation, through the use of natural language processing techniques in analyzing textual data.

Data type: Textual data that includes users' interests and descriptions of courses or training programs, which are used to build the proposed recommendation system.

1.7 Research Gap and the Context of the Current Study

A review of previous studies, from the researchers' perspective, revealed that several research heads did not adequately address the investigation. This research seeks to excuse their absence, summarizing the following:

- Most previous studies focused on developing leading organizations and were geared towards university students or students in public educational institutions, while the research we selected did not adequately address the needs of graduates.
- Educational orders and systems were implemented in communication plans without sufficient consideration of the local educational and cultural context or the requirements of the Saudi Arabian labor market.
- Arabic studies employing textual interest analysis using natural language techniques to provide tailored learning opportunities remain limited in number and application.
- There is no shortage of tools that directly differentiate between the interests of scientific graduates or the characteristics of their specializations or disciplines, which are used to create a distinctive and interpretable content list.
- This highlights the need for strategic applied models of educational systems beneficial to graduates, which can be further developed to meet the digital requirements of the distinguished education sector.

1.8 Operational Definitions

For the purposes of this research, the researcher uses the following terms with the operational meanings explained below:

- **Intelligent Recommendation System (AIRSS):** An AI-based system that provides appropriate training recommendations to graduates based on an analysis of their textual interests.
- **Content-Based Recommendations:** A recommendation method that compares content characteristics with the user's interests without relying on data from other users.
- **TF-IDF:** An algorithm for digitally representing text based on the importance of its words.
- **Cosine Similarity:** A mathematical measure used to assess the degree of similarity between textual vectors.

1.9 Research Organization

This research consists of four main chapters:

Chapter 1: Introduction, research problem, objectives, significance, scope, research gap, and research organization.

Chapter 2: Previous studies related to the research topic.

Chapter 3: Research methodology and design of the proposed system.

Chapter 4: Implementation of the proposed system and discussion of its expected results.

Chapter Two: Literature Review

This chapter aims to review and analyze the most prominent previous studies that have addressed the application and use of artificial intelligence technologies and recommendation systems in the educational field, with a particular focus on course and training recommendation systems, personalized learning concepts, and supporting educational decision-making processes.

This review contributes to building the theoretical framework of the current research by analyzing prevailing research trends, comparing the methods and techniques used in previous studies, and identifying research gaps that have not been adequately addressed. Accordingly, this research seeks to contribute to bridging these gaps by developing an intelligent recommendation system specifically tailored to university graduates in the Kingdom of Saudi Arabia, taking into account their educational and professional needs within the local context.

2.1 AI-Powered Educational Recommendation Systems

Educational recommendation systems have witnessed remarkable development and significant diversification in recent years as a result of the rapid advancements in artificial intelligence (AI) technologies. This has impacted the methods used to support learners in selecting appropriate educational content. These systems no longer simply present available options but now rely on analyzing learners' preferences and individual needs to provide more relevant recommendations.

The importance of educational recommendation systems lies in their ability to reduce cognitive strain caused by an abundance of educational choices and to enhance the learning experience through personalization, making them a valuable tool for supporting students' educational decision-making.

In this context, Akbar et al. (2023) indicated that AI-powered recommendation systems contribute to improving the quality of educational decisions by providing recommendations based on user data analysis, which positively impacts user satisfaction and trust in the system. Cha et al. (2024) also demonstrated that course recommendation systems play a crucial role in various stages of educational decision-making, from course research and evaluation to final selection, thus reinforcing their role as a supportive tool for academic advising in digital learning environments.

The researcher believes that these results indicate the importance of employing recommendation systems as tools to support personalized learning decisions, which is what the current research seeks to build upon.

2.2 Recommendation Systems Supporting Course Selection and Lifelong Learning

The researcher notes that many studies have focused on the role of recommendation systems in supporting course selection and linking it to career paths and lifelong learning. A study by Tani et al. (2021) showed that recommendation systems help guide learners toward courses that align with labor market needs and support the concept of lifelong learning, especially after graduation.

Other studies have also shown that educational recommendations are no longer limited to undergraduate studies but have extended to graduates and professionals, aiming to support skills development and keep pace with the rapid changes in the labor market. This trend aligns with the objectives of the current research, which focuses on graduates, as they are among the groups most in need of intelligent training guidance tools.

2.3 Content-Based Recommendation Techniques

The researcher observes that content-based recommendation systems are among the most common approaches in the educational field, as they rely on analyzing user characteristics and the content of educational materials to provide personalized recommendations. These systems are distinguished by their ability to operate without requiring data from other users, making them suitable for educational environments with limited collaborative data.

Bazani and Belsous (2007) reviewed the theoretical foundations for building content-based recommendation systems, focusing on user modeling and content representation mechanisms. Lopes et al. (2019) discussed recent trends in this type of system, highlighting the importance of using rich text representations and the role of interpretability in enhancing system reliability.

In a related context, Tolletti and Prasad (2022) presented a hybrid recommendation system combining content-based and collaborative recommendation. The study's results showed that employing text analysis techniques, such as TF-IDF, contributes to improving recommendation quality. These findings support the current research's choice to adopt a content-based recommendation approach in designing the proposed system.

2.4 Personalized Recommendations and Explanatory Nature

The researcher observes a need among graduates in Saudi Arabia for recommendation systems that not only present training courses but also explain the rationale behind each recommendation, enabling them to make informed and logical training decisions.

- A study by Mintec (2023) demonstrated that explaining the reasons for a recommendation and how the system works helps users better understand the results, increases their confidence in the system, and encourages its use.

- Recent studies indicate that personalized recommendations are more effective when they are explainable, particularly in educational and professional environments that demand clarity when choosing a training or career path.
- In the context of graduates in Saudi Arabia, explainability is especially important because training decisions are directly linked to job opportunities and the demands of the local labor market.
- Therefore, this research focuses on designing an AIRSS system that provides personalized recommendations with clear explanations of the reasons behind each recommendation. This helps graduates understand the relationship between their interests and the suggested courses and make more confident training decisions.

2.5 Comprehensive Reviews of AI Applications in Education

Several studies have provided comprehensive reviews of AI applications in education and recommendation systems. Malik and Gangopadhyay (2023) reviewed the proactive and interactive uses of AI in various stages of the learning process, highlighting its role in supporting personalization and enhancing interaction.

Obalhassan et al. (2023) presented a systematic review of the technologies used in educational recommendation systems, identifying current research trends and future challenges. Salim et al. (2025) focused on recommendation systems in Massive Open Online Courses (MOOCs), highlighting research gaps related to personalization and decision support, thus underscoring the importance of current research.

2.6 Summary of Previous Studies

The following table summarizes the most prominent previous studies related to educational recommendation systems and the artificial intelligence technologies used in them, indicating the contribution of each study to the current research topic (AIRSS).

Table (2-1): Summary of Previous Studies Related to Educational Recommendation Systems

#	Reference	Title	Authors	Study Summary	Methodologies / Techniques	Contribution to AIRSS
1	Akbar et al. (2023)	The Role of Artificial Intelligence-Based Recommendation Systems in Selection of Courses for Students	Akbar, Z.; Sopandi, E.; Badruzzaman, B.; Khalik, M. F.	Examines the role of AI-based recommender systems in supporting course selection, focusing on user satisfaction,	Quantitative Survey, Descriptive Analysis	Confirms the effectiveness of recommender systems in improving educational decision-making, aligning with AIRSS objectives.

				trust, and decision-making effectiveness.		
2	Cha et al. (2024)	The Impact of AI-Based Course- Recommender System on Students' Course-Selection Decision-Making Process	Cha, S.; Loeser, M.; Seo, K.	Investigates how AI-based course recommender systems support different stages of decision-making (search, evaluation, selection).	Qualitative Method, Thematic Analysis	Supports the role of AIRSS as an intelligent assistant during the evaluation and selection stages.
3	Tani et al. (2021)	Recommendation Systems and AI Solutions Guiding Open (Life-Long) Learning	Tani, P. et al.	Presents a development project linking recommender systems with open studies and labor market needs to support lifelong learning.	AI-based Matching, Recommender Systems	Supports AIRSS's focus on lifelong learning and career-oriented training recommendations.
4	Mentec (2023)	Explainable Job Recommender Systems for Recruiters and Consulting Companies	Mentec, F.	Focuses on explainable recommender systems indicating how transparency improves user trust and acceptance.	NLP, Semantic Similarity, Explainable AI	Supports the explainability and transparency aspect of AIRSS recommendations.
5	Oubalahcen et al. (2023)	The Use of AI in E-Learning Recommender	Oubalahcen, H.; Tamym, L.;	Provides a comprehensive survey of AI	Systematic Literature Review	Establishes a strong theoretical and technical

		Systems: A Comprehensive Survey	El Ouadghiri, M. D.	techniques used in e-learning recommender systems.		foundation for the recommender techniques adopted in AIRSS.
6	Tolety & Prasad (2022)	Hybrid Content and Collaborative Filtering Based Recommendation System for E-Learning Platforms	Tolety, V. B. P.; Prasad, E. V.	Proposes a hybrid recommender system combining content-based and collaborative filtering approaches with experimental evaluation.	TF-IDF, Content-Based Filtering, Collaborative Filtering	Supports the effectiveness of text-based content analysis, reinforcing AIRSS's content-based design.
7	Salim et al. (2025)	Advancements in Personalized Learning: A Systematic Review of Recommendation Systems in MOOCs	Salim, A. I. M. et al.	Systematic review of personalized course recommender systems in MOOCs, highlighting challenges and research gaps.	PRISMA, Content-Based, Hybrid Approaches	Supports personalization concepts and highlights gaps addressed by AIRSS.
8	Mallik & Gangopadhyay (2023)	Proactive and Reactive Engagement of Artificial Intelligence Methods for Education	Mallik, S.; Gangopadhyay, A.	Reviews proactive and reactive applications of AI in education across multiple learning stages.	Literature Review	Provides contextual theoretical support for integrating AI into educational systems like AIRSS.
9	Lops et al. (2019)	Trends in Content-Based Recommendation	Lops, P.; Jannach, D.; Musto, C.;	Discusses recent trends in content-based	Theoretical Analysis	Justifies AIRSS's reliance on content-based

			Bogers, T.; Koolen, M.	recommender systems, including rich textual representations and explainability.		recommendation and NLP techniques.
10	Pazzani & Billsus (2007)	Content-Based Recommendation Systems	Pazzani, M. J.; Billsus, D.	A foundational work explaining user modeling and content representation in recommender systems.	Conceptual Models	Provides the conceptual and methodological foundation for the AIRSS system design.
11	Stewart (2023)	Evaluating Organizational Success of an AI- Based Recommender System at a Higher Education Institution	Stewart, C. P.	Evaluates the success of an AI-based recommender system in higher education using organizational effectiveness metrics.	Mixed Methods, DeLone & McLean IS Success Model	Supports the evaluation framework and user satisfaction assessment for AIRSS.

2.7 The Research Gap

Despite previous research efforts in the field of educational recommendation systems, significant gaps remain, which the researcher summarizes as follows:

- Most studies focus on university students or general educational settings, with few studies targeting postgraduate students.
- Most recommendation systems are applied in international contexts without considering the specific educational, cultural, and labor market characteristics of Saudi Arabia.
- There is a lack of practical applied models that combine content-based recommendations with the interpretability of results in the field of training and continuing education.

Based on these gaps, this research aims to develop an intelligent recommendation system for university graduates in Saudi Arabia. This system will analyze their textual interests and link them to

course descriptions, with the goal of providing tailored recommendations that align with their career needs and the requirements of the Saudi labor market.

Chapter Three: Research Methodology

This chapter aims to clarify the scientific methodology employed in this research, explaining the steps for designing and implementing the proposed Intelligent Recommendation System (AIRSS). It details the research type, design, data sources, analytical methods used, system evaluation approach, and study limitations. This chapter serves as a link between the theoretical framework presented in Chapter Two and the practical application of the system, which will be explained in Chapter Four.

3.1 Research Methodology

The researcher adopted an applied methodology in this study, a common approach in research aimed at developing practical intelligent systems. This methodology focuses on designing and building a realistic recommendation system and testing its performance in supporting the decision-making process, rather than relying solely on theoretical analysis.

The applied methodology was chosen for this research because it seeks to provide a practical solution to a problem faced by graduates in selecting appropriate training courses, through the application of artificial intelligence and natural language processing techniques.

3.2 Research Design

- ❖ An applied/experimental research design was adopted, which the researcher deemed most suitable for the nature of this research. This design focuses on developing an intelligent recommendation system and testing its ability to provide personalized training recommendations based on textual data analysis.
- ❖ The selection of this design was based on the results of previous studies that demonstrated the effectiveness of content-based recommendation systems in the educational field, thus supporting its suitability for achieving the research objectives.
- ❖ The research design emphasizes simulating a realistic user environment for the system, where the user enters their educational or professional interests in text format. The researcher believes this reflects the actual usage behavior of digital learning platforms.
- ❖ The system analyzes the textual input and compares it with the descriptions of available training courses, ultimately suggesting the courses most relevant to the user's interests.

3.3 Data Sources

In keeping with the nature of content-based recommendation systems, this research—from the researcher's perspective—relied on textual data as the most suitable for achieving the study's objectives. This data includes:

- ❖ Descriptions of training courses available on digital learning platforms, which represent a primary source of recommendation content.
- ❖ Textual user input reflecting their educational interests and future career paths, which the researcher believes mimics real-life interaction with educational platforms.
- ❖ Due to ethical considerations related to privacy protection, the researcher deemed it necessary to rely on public or hypothetical data for research purposes, rather than using actual user data.

3.4 Data Analysis Methods

The data analysis process involved several sequential stages, which the researcher considers essential for converting unstructured text into digital representations suitable for computer processing, as follows:

3.4.1 Initial Text Processing

This stage included cleaning the text data and improving its quality by removing unnecessary symbols, correcting spacing, and standardizing text formatting.

- ❖ The researcher believes this step is crucial for ensuring the accuracy of subsequent analysis results and reducing noise that could affect the recommendation system's performance.

3.4.2 Digital Text Representation

The TF-IDF algorithm was used to convert the texts into digital vectors representing the importance of words within each text compared to other texts.

- ❖ The researcher believes that using this algorithm helps highlight the words most relevant to the user's interests or the course content, thus enhancing the accuracy of the recommendation process.

3.4.3 Text Similarity Measurement

After converting the texts into digital representations, the cosine similarity metric was used to measure the degree of similarity between the user's interests and the course descriptions.

- ❖ The resulting similarity value, according to the researcher, is a suitable indicator for measuring how well each course aligns with the user's interests.

3.4.4 Recommendation Mechanism (Top N)

Based on the similarity measurement results, the training courses are ranked in descending order of similarity. A specific number of courses (Top N) are then selected and presented to the user as personalized recommendations.

- ❖ The researcher believes this mechanism allows for focused training options without overwhelming the user with a large number of results.

3.5 Resources Required to Implement the AIRSS System

This section outlines the resources required to implement the proposed system. The researcher believes that the availability of these resources is essential for ensuring the efficient development and testing of the system. These resources include technical, software, and knowledge-based components, as follows:

3.5.1 Technical Resources

- ❖ A computer (desktop or laptop) with suitable capabilities, which the researcher believes is necessary for processing text data and running algorithms efficiently.
- ❖ Sufficient storage space to store system data and operational files, ensuring stable performance during system implementation and testing.

3.5.2 Software Resources

- ❖ The Python programming language, which the researcher considers the most suitable option due to its flexibility and widespread use in artificial intelligence and data processing applications.
- ❖ The Jupyter Notebook environment for interactively testing algorithms and analyzing results, which the researcher believes will facilitate the development and testing process.
- ❖ Data and text processing libraries such as Pandas and NumPy, which are essential tools for managing and preparing data for analysis.
- ❖ The Scikit-learn library is used to implement TF-IDF algorithms and the cosine similarity metric, providing readily available and reliable tools for building recommendation models.
- ❖ The Streamlit tool displays recommendation results through a simple user interface, which the researcher believes is suitable for representing the proposed system in a clear and easy-to-understand manner.

3.5.3 Knowledge Resources

- ❖ Basic knowledge of artificial intelligence concepts and recommendation systems, which the researcher considers essential for understanding the system's mechanism and interpreting its results.
- ❖ Familiarity with the fundamentals of natural language processing to enable the analysis of textual data and its application within the recommendation system.
- ❖ A general understanding of the education and training field and graduate needs, which contributes to aligning the system design with the targeted educational and professional context.

3.6 System Evaluation Approach

For this reason, a reciprocal option regarding the user is sought, partly due to the nature of the specialized research department, and consequently, the number of researchers in the scientific field. The evaluation focused on a set of indicators that can be used to judge the effectiveness of the system, namely:

- ❖ The degree of alignment agreed upon with the user's interests.

- ❖ The level of qualification of the ideal employee, as verified by the results.
- ❖ The system's role in facilitating the process of making fundamental decisions.
- ❖ The clarity and interpretability of the constraints.

3.7 Study Limitations

The researcher believes that the limitations of this study stem from the framework within which it is currently operating and the nature of the adopted applied methodology. These limitations can be summarized as follows:

- This research, in its current phase, is limited to addressing the initial theoretical and applied aspects related to designing and building a model for an intelligent recommendation system, without expanding to a full field application or conducting large-scale tests on actual users.
- The study focuses on university graduates in the Kingdom of Saudi Arabia and does not include other educational categories such as undergraduate students or vocational trainees, in accordance with the research objectives and scope.
- The scope of the research is limited to the selection of post-graduation training courses and does not address other orientations such as the choice of specialization.
- The proposed system was developed within a virtual digital learning environment, focusing on analyzing textual data related to graduates' interests and training course descriptions, without expanding to other data sources.

3.8 Expected Results of the Study

The AIRSS system is expected to contribute to:

- Improving the accuracy and relevance of training recommendations provided to graduates.
- Reducing the time and effort spent searching for suitable courses.
- Supporting more organized and informed training decisions.
- Enhancing user confidence through clear and explainable recommendations.

This research aims to highlight the practical value of content-based intelligent recommendation systems in supporting education and training within the local context of the Kingdom of Saudi Arabia.

Chapter Four: Project Implementation

This chapter aims to present the practical aspects of implementing the proposed Intelligent Recommendation System (AIRSS). The researcher believes this chapter represents the actual application of the proposed methodological framework and design. The chapter addresses the system's operational mechanism and the tools used in its implementation, along with a review of the expected outputs, serving as a practical extension of what was presented in Chapter Three.

4.1 Project Overview

The AIRSS system (AI-based course selection recommendation system) was developed based on the researcher's vision of providing an intelligent tool to address the challenges graduates face when choosing courses from the vast number of options available on digital platforms.

The system analyzes graduates' educational and professional interests in textual form and links them to course descriptions using artificial intelligence and natural language processing techniques to provide personalized recommendations that support more informed training decisions.

4.2 Project Goal

The AIRSS system aims to achieve a set of objectives, which the researcher believes will contribute to enhancing the effectiveness of graduates' training decisions, as follows:

- ❖ Supporting graduates in selecting training courses that align with their interests and future career paths.
- ❖ Reducing the time and effort spent manually searching for suitable training courses.
- ❖ Providing a smart and practical model that contributes to improving the quality of academic and training advising.
- ❖ Promoting the concept of personalized learning and linking educational outcomes to labor market needs.
- ❖ Supporting the digital transformation in the education and training sector, in line with the objectives of Saudi Arabia's Vision 2030.

4.3 Approach

The application of the Intelligent Recommendations System (AIRSS) relies on a content analysis methodology, which is used to analyze textual data related to user interests and course descriptions. The researcher believes that this methodology is appropriate for the nature of the proposed system, given its proven effectiveness in educational environments, particularly in supporting personalized and interpretable recommendations.

This methodology is based on an integrated series of steps, beginning with the collection and processing of textual data, followed by its digital representation using natural language processing techniques. Next, the degree of similarity between user interests and training courses is measured, culminating in the generation of personalized training recommendations that support the decision-making process.

From the researcher's perspective, this methodology is distinguished by several aspects, most notably:

- ❖ Focusing on tailoring recommendations to suit each user's needs.
- ❖ Enhancing the interpretability and transparency of the system's outputs.
- ❖ Its suitability to the local educational and training context.
- ❖ Its flexibility and potential for future scalability and development.

4.4 Implementation Environment and Tools

The system was implemented using a suite of software tools that support the development of AI-based recommendation systems, including:

- The Python programming language as the primary development environment.
- Jupyter Notebook for testing algorithms, experimenting with models, and analyzing results.
- Data processing libraries such as Pandas and NumPy.
- The Scikit-learn library for implementing TF-IDF and Cosine Similarity algorithms.
- The Streamlit tool for displaying system results in a simple and user-friendly interface.

These tools were chosen for their flexibility and ease of development, as well as their widespread use in relevant previous research.

4.5 Project Implementation Steps

The implementation of the AIRSS system involved several sequential stages, as shown in the following table:

Table (4-1): Steps for Implementing the Intelligent Recommendation System (AIRSS)

Week No.	Stage	Description
1	Project Initialization & Data Collection	Defining project requirements, identifying system objectives, and collecting training course descriptions from digital learning platforms.
2	User Data Preparation	Preparing and structuring user input data that represents educational interests and desired career paths in textual form.
3	Text Preprocessing	Cleaning and preprocessing textual data by removing irrelevant words, normalizing text, and improving data quality for analysis.
4	Exploratory Text Analysis	Exploring course descriptions and user interests to identify key terms and patterns relevant to recommendation generation.
5	Text Vectorization	Converting textual data into numerical representations using the TF-IDF algorithm to reflect term importance.
6	Similarity Measurement	Applying Cosine Similarity to calculate similarity scores between user interests and course descriptions.
7	Recommendation Generation	Ranking training courses based on similarity scores and generating Top-N personalized recommendations.

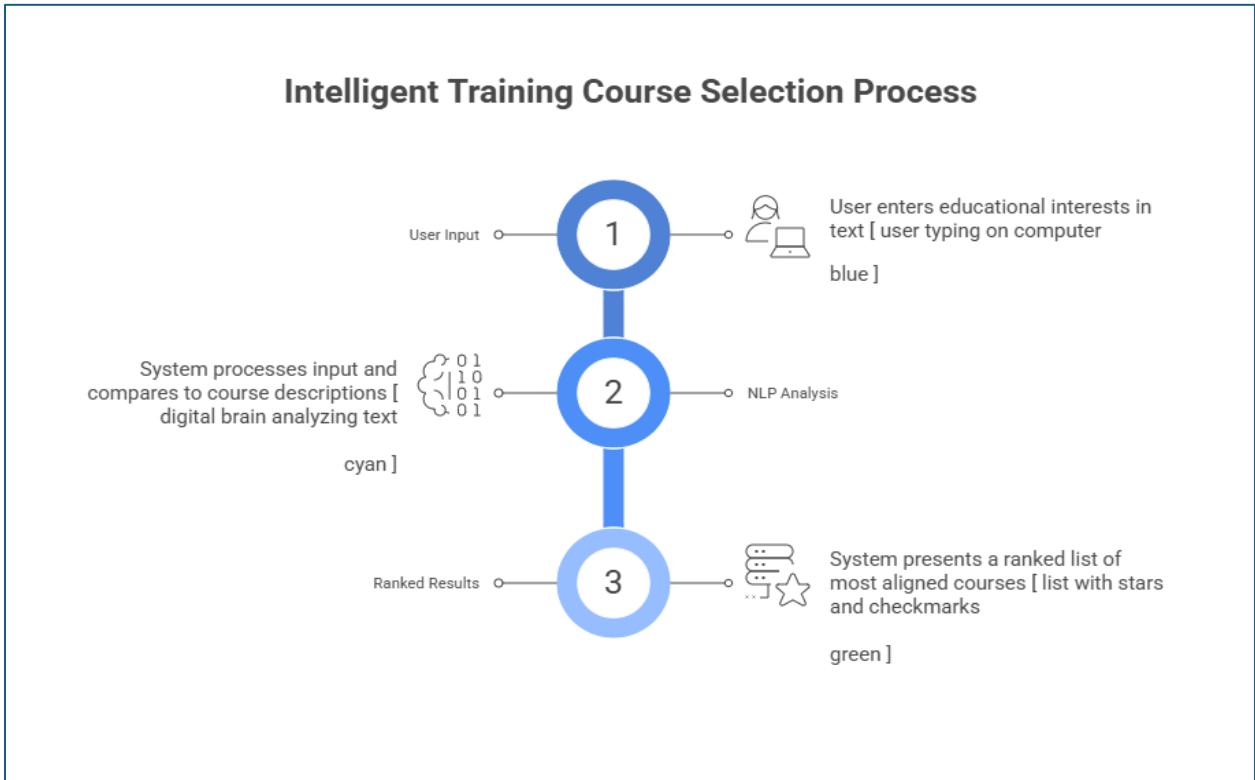
8	Results Presentation	Designing and presenting recommended courses in a clear and user-friendly format, including explanation of recommendations.
9	System Evaluation	Evaluating the system based on recommendation relevance, user acceptance, and effectiveness in supporting decision-making.
10	Final Refinement & Documentation	Refining the system based on evaluation results and completing system documentation and final reporting.

4.6 How the Proposed Project Works

The system begins by having the user input their educational interests or the field they wish to develop in text format. The researcher believes this approach reflects the real-world interaction with digital learning platforms. The system then processes this input and compares it to available course descriptions using natural language processing techniques and textual similarity analysis.

In the final stage, a ranked list of courses most aligned with the user's interests is displayed. The researcher believes this transforms the course selection process from a manual or random procedure into an intelligent, data-driven process, contributing to more informed and accurate training decision-making.

Figure (1): The proposed AIRSS system's operational mechanism – prepared by the researcher.



4.7 Expected Outcomes of System Implementation

The application of the AIRSS system is expected to yield a range of results, which the researcher believes reflect the practical value of the proposed system. These results include:

- Improving the accuracy and relevance of training recommendations provided to graduates.
- Reducing the time and effort spent searching for suitable training courses.
- Supporting more informed and organized training decisions.
- Enhancing user confidence in the system through clear and explainable recommendations.

These findings are consistent with previous studies that have confirmed the effectiveness of educational recommendation systems in supporting academic guidance and promoting lifelong learning.

4.8 Scalability and Expansion

The proposed system is characterized by its scalability and future development potential. The researcher believes this scalability is a key strength of the AIRSS system, as it allows for:

- Integrating additional data, such as user level or prior experience, to enhance the accuracy of recommendations.
- Adding other recommendation technologies, such as collaborative filtering or hybrid systems, to improve system performance.
- Transforming the system into a comprehensive platform that can be utilized in universities or training centers.
- Expanding Arabic language support and improving Arabic text processing to suit the local context.

Conclusion

This study aimed to highlight the importance of employing artificial intelligence (AI) technologies in supporting educational decision-making. This was achieved through the design and development of an intelligent content-based recommendation system (AIRSS) to assist university graduates in Saudi Arabia in selecting the most suitable training courses for their interests and future career paths. The researcher believes this approach is a direct response to the challenges posed by the significant expansion of digital platforms and the multitude of training options, which can make informed training decisions difficult.

The study employed an applied methodology based on natural language processing techniques and text representation and similarity measurement algorithms, such as TF-IDF and Cosine Similarity, to analyze textual interests and link them to training course descriptions. The researcher concludes that the study's findings indicate that content-based recommendation systems are an effective tool for providing personalized training recommendations, reducing the time and effort spent on manual research and enhancing data-driven training guidance.

The study also highlighted a research gap characterized by a limited number of studies targeting graduates and a scarcity of research that considers the educational and cultural context and labor market demands in Saudi Arabia, particularly those based on textual interest analysis. The researcher believes this study contributes to bridging part of this gap by offering an applied model that can be built upon and developed further, aligning with the requirements of digital transformation and the goals of Saudi Vision 2030 in human capital development.

Recommendations

In light of the proposed theoretical framework and design of the Intelligent Recommendation System (AIRSS), the researcher believes that the system's true value lies in its applicability and future development. Accordingly, the study recommends the following:

- Implementing the proposed system in a real educational or training environment, in collaboration with universities or digital training platforms, to evaluate its efficiency and effectiveness in supporting graduates in selecting appropriate training courses based on their actual needs.
- Expanding the data sources used in the future by integrating textual data with other data, such as behavioral or interactive data. The researcher believes this will contribute to improving the accuracy and quality of the recommendations provided.
- Developing the system to include hybrid recommendation methods that combine content-based and collaborative recommendations. This will enhance the diversity of results and reduce bias associated with relying on a single method.
- Enhancing the interpretability of the system's outputs by clarifying the rationale behind the recommendations provided to users. The researcher believes that transparency in recommendations is a key factor in fostering user trust and encouraging more informed training decisions.
- The study will be expanded in the future to include other educational groups besides graduates, such as university students and vocational trainees, with the system adapted to meet the needs of each group.
- The system will be linked to the requirements of the Saudi labor market in future studies, by utilizing data on required skills and labor market trends, thus ensuring that training recommendations align with the actual needs of the national economy.

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