ELECTIVE RECOMMENDATION SYSTEM

A PROJECT REPORT

Submitted by,

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Under the guidance of,

Mr. J. John Bennet

in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

AT

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY

BENGALURU

JANUARY 2025

PRESIDENCY UNIVERSITY

SCHOOL OF COMPUTER SCIENCE ENGINEERING

CERTIFICATE

This is to certify that the Project report **“ELECTIVE RECOMMENDATION SYSTEM”** being submitted by “DARSHAN MK, KUSUMA KN, RACHITA S, LIPIKA DEVAIAH, ANAIZA KHAN” bearing roll number(s) “20221LCA0005, 20211CAI0138, 20211CAI0137, 20211CAI0132, 20211CAI0003” in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Engineering in Artificial Intelligence and Machine Learning is a Bonafide work carried out under my supervision.

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DECLARATION

We hereby declare that the work, which is being presented in the project report entitled **ELECTIVE RECOMMENDATION SYSTEM** in partial fulfillment for the award of Degree of **Bachelor of Technology** in **Computer Science and Engineering in Artificial Intelligence and Machine Learning**, is a record of our own investigations carried under the guidance of **Mr. J. John Bennet, Assistant Professor, School of Computer Science Engineering and Information Science, Presidency University, Bengaluru.**

We have not submitted the matter presented in this report anywhere for the award of any other Degree.

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ABSTRACT

This project contains an “Elective Recommendation System” focused at providing guidance to students regarding selection of the best suited electives based on their previous academic records. The system consists of a backend developed using Flask together with the integration of the GPT API provided by OpenAI. As a foundation for understanding the strengths of students and the available elective courses, a database containing academic records of students is deposited.

The backend retrieves the particular academic data from the dataset based on the input entered by the student, that is, the student ID and the elective options provided by the user. With the assistance of the user’s dataset, the assistant model creates the recommendations that best fit that student. Restful APIs are used by the system to send and receive requests and data from the frontend and backend services with Cross Origin Resource Sharing (CORS) enabled.

With the use of this solution, such decision making of students is improved as they are provided with intelligent concise recommendations together with the consideration that these electives can be on their areas of interest. The proposed architecture of this system is modular which means it can be used in different institutions, thus providing a new dimension to academic counseling.

ACKNOWLEDGEMENT

First of all, we indebted to the **GOD ALMIGHTY** for giving me an opportunity to excel in our efforts to complete this project on time.

We express our sincere thanks to our respected dean **Dr. Md. Sameer Uddin Khan**, Pro-VC, School of Engineering and Dean, School of Computer Science Engineering & Information Science, Presidency University for getting us permission to undergo the project.

We express our heartfelt gratitude to our beloved Associate Deans **Dr. Shakkeera L** and **Dr. Mydhili Nair,** School of Computer Science Engineering & Information Science, Presidency University, and **Dr. Zafar Ali Khan**, Head of the Department ,CAI, School of Computer Science Engineering and Information Science, Presidency University, for rendering timely help in completing this project successfully.

We are greatly indebted to our guide **Mr. J. John Bennet,** Assistant Professor and Reviewer **Ms. Josephine**, School of Computer Science Engineering & Information Science, Presidency University for her inspirational guidance, and valuable suggestions and for providing us a chance to express our technical capabilities in every respect for the completion of the project work.

We would like to convey our gratitude and heartfelt thanks to the PIP2001 Capstone Project Coordinators **Dr. Sampath A K, Dr. Abdul Khadar A and Mr. Md Zia Ur Rahman,** department Project Coordinators **Mr. Afroz Pasha** and Git hub coordinator **Mr. Muthuraj.**

We thank our family and friends for the strong support and inspiration they have provided us in bringing out this project.

Darshan M K
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Lipika Devaiah
Anaiza Khan

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CHAPTER-1

INTRODUCTION

1.1 Problem Statement

In our educational institute students often face challenges in selecting the right electives that align with their interest, strength and career aspiration. With numerous elective options available choosing the right course can be overwhelming. This issue is also due to lack of guidance leading to decisions that may not maximize the student’s academic performance or increase their CGPA.

1.2 Project Objective

The main objective of this projective is to develop an Elective Recommendation System that provides the students personalized elective suggestion based on their previous academic performance and available elective options. The system uses machine learning and natural language processing techniques, including OpenAI's GPT-4, to offer recommendations.

1.3 Project Domain

This project falls within the domain of Artificial Intelligence, Machine Learning and Natural Language Processing.

1.4 Project Introduction

The Elective Recommendation System is a web-based platform designed to simplify the elective selection process for the students. The model uses Flask as a backend framework in which the Flask API processes the student data interacts with the GPT-4 model, and generates elective recommendations. And as for the Frontend a user-friendly interference is used using HTML, CSS and JAVASCRIPT.

CHAPTER-2

LITERATURE SURVEY

2.1 Title: Personalized Course Recommendation Based on Academic Performance

Author(s): Huang, L., Wang, Y., and Zhang, X.

Summary: This paper presents a course recommendation system that selects courses for students based on past academic performance. The use of collaborative filtering and machine learning techniques ensures that recommended courses are in line with a student's strengths and objectives. This concept is very much related to the Elective Recommendation System, which uses AI to make recommendations tailored to the user, thereby making course selection more personalized and effective.

2.2 Title: Embedding AI in Academic Advising to Enhance Student Choice of Courses

Authors: Zhang, Q., Liu, J., and Chen, R.

Summary: This paper presents how artificial intelligence, specifically NLP, may improve course selection by understanding and analyzing both structured and unstructured data. The system they designed adapts to the individual needs of students and gives accurate and meaningful recommendations. Likewise, the Elective Recommendation System uses GPT-4 in analyzing student data to give them electives that fit best their performance and aspirations.

2.3 Title: Addressing Data Sparsity in Academic Recommendation Systems

Author(s): Kumar, S., and Singh, A.

Summary: This paper explores the pervasive problem of sparse data in academic recommendation systems and proposes a hybrid approach that combines statistical analysis with machine learning to address this problem. Inspired by this work, the Elective Recommendation System uses advanced AI tools to make accurate recommendations, even when there's limited data available, ensuring that students always get helpful suggestions.

2.4 Title: AI-Based Systems for Enhancing Decision Support in Education

Authors: Jones, P., Taylor, S., and Smith, D.

Summary: This research focuses on how AI decision support systems change education by giving personalized guidance to students. The paper further discusses the significance of developing transparent and trustable AI systems. Building on these concepts, the Elective Recommendation System uses GPT-4 to provide smart elective recommendations while ensuring the recommendations are understandable and clear for students**.**

CHAPTER-3
RESEARCH GAPS OF EXISTING METHODS

3.1 Cold Start Problem

The system will not give relevant and personalized recommendations if a new student enters their ID and courses due to lack of data.

3.2 Lack of Context Awareness

Traditional recommendation system tends to overlook the critical factors for instance the student’s interest in their career.

3.3 Recommendation Bias

Bias in the system like favoring popular courses which lacks diversity in recommendations becomes critical to address this bias to ensure fairness and variety in course selection.

3.4 Static Models

Many systems use static algorithms that do not adapt in evolving student preferences or interests. This contributes in being outdated and less effective recommendations over time.

3.5 Complexity of Preferences

Student’s preferences are based either on peer recommendation, instructors/professors’ reputation or personal goals. This complexity typically cannot be adequately captured by simple algorithms thus the recommendations are less accurate.

CHAPTER-4

PROPOSED MOTHODOLOGY

4.1 Objectives

Open AI GPT-4 is a model which is capable of performing smart decision making on its own. The proposed system has included a Flask based backend system along with the dataset that consists of Student's performance details and Open AI capabilities for NLP in electives personalization.

4.2 Data Collection and Preprocessing

- The dataset 'student_data.csv' which includes student ID, their academic performance of previous semester's courses with their CGPA.
- The Data Preprocessing is done to check if there was missing or inconsistent data.
- All the numeric data was normalized, and marks were converted to a format that would be suitable for analysis.

4.3 Backend Development

Framework: Flask was used because it is lightweight and flexible in its nature. An API endpoint /api/recommend was created to handle requests from the frontend, process inputs and return recommendations. The CORS – Cross Origin Resource Sharing was enabled to communicate between frontend and backend.

4.4 OpenAI GPT-4 Integration

This model is made in order to make the elective recommendations more personalized for the students with the help of the student performance metrics. The Open AI was safely integrated with the GPT – 4 model where it was given the details of the student academic background and the elective options that are provided to them.

- Prompt Design- The student with the student_id {student_id} has marks in the following: {student_marks}. The student can choose any of the electives available: {electives}. Based on the result brought out by the performance of the student, suggest a suitable elective for the student. This Formatted approach made it clear to the model of what was required that resulted in useful output.

- Exception Handling- The mechanism provided for API failure or responses that were invalid were handled well and appropriate error messages will be sent back to frontend.

4.5 Recommendation Flow

Front end makes a Post request to api /recommended with Student Id-A unique ID of the student, and a list of electives available for the student. Backend fetches the marks for the student from the database and it processes the marks and options of electives and sends it to GPT-4 API with a request to suggest. After the processing is done the suggested recommendation is returned back to the API, then forwarded to the frontend as response in the JSON format.

4.6 Testing and validation

The system is tested on various student details to ensure accurate recommendations.

CHAPTER-5

OBJECTIVES

5.1 Introduction to the Recommendation System

A personalized recommendation system that will assist the students at Presidency University to make optimal and informed decisions for discipline and open elective subjects.

5.2 Factors that Influence Recommendations

The recommendations will be based on academic history, personal preferences, career goals and social factors such as groups of friends.

5.3 Benefits for Students and Administration

The main goal is to improve the efficiency of elective distribution by assisting HODs and timetable committees in making data-driven decisions, thus avoiding arbitrary assignments and reducing student dissatisfaction.

5.4 Algorithm Development and Accuracy

Develop strong algorithms both in collaborative and content-based filtering to give suggestions accurately and relevantly tailored toward each student.

5.5 Ensuring Data Security and Privacy

Storing and processing the data for student encryption during transmission so confidentiality is maintained and data privacy compliance is ensured.

5.6 Analyzing Current Elective Selection Systems

Current systems of elective selection can be surveyed to identify gaps using appropriate advanced machine learning models or user-friendly system interfaces for improvement.

5.7 Simplifying the Elective Choice Process

Simplify the elective choice experience by linking course recommendations to student's academic strengths, career aspirations, and personal goals so that it helps the students to make better and easy decisions.

5.8 Insights for Curriculum Optimization

Actionable insights to teachers and administrators can be gained by identifying trends in course choice patterns that support curriculum optimization and better instructional strategies.

CHAPTER-6
SYSTEM DESIGN & IMPLEMENTATION

6.1 Data Management and Structure of the Dataset

- Structure in Dataset: The student_data.csv file consists of: student_id: Roll number of each student.
- Subject columns: Marks for different subjects, input to recommendations.
- Data Loading: Reading and processing the CSV file by the Pandas library.

6.2 System Structure

- Backend Framework: the usage Flask makes it extremely simple, and for what we are using it here, it is perfect at handling any kind of API requests and responses.
- Data Storage: the CSV file of the dataset student_data.csv stores the record of the student's academics.
- Recommendation Logic: Using the GPT API from OpenAI, smart recommendations are generated based on the performance of students and available elective courses.

6.3 API Design

Method: POST
JSON response in the form of the suggested elective. It searches for missing or invalid data within the API request. It returns adequate error messages for the error such as missing inputs and student IDs not found.

6.4 OpenAI GPT Integration

Prompt Engineering: A formatted prompt is designed to query the GPT API. This includes:

- Student ID.
- Academic performance (marks in various subjects).

- Number of elective options available.
- API Interaction: The openai.ChatCompletion.create() method invokes the OpenAI GPT API.
- Handling of Response: The response from GPT is parsed and returned as the elective needed

6.5 Workflow of Implementation

- Set up Flask app with enabling CORS to accept cross-origin requests.
- Load in CSV dataset as Pandas DataFrame during app setup.
- Serves user request through the endpoint /api/recommend.
- GPT Integration: Handles input request processing including call to GPT API for retrieval of recommendation, then outputs the recommendation.
- Returns result in structured JSON.

6.6 Security

- The use of os.getenv for environment variables is responsible for managing OpenAI API key. The Inputs are validated pretty well to avoid misuse and error.
- CORS is the registered domain used to interact with the backend.

6.7 Unit Testing

- Testing of each separate module like data retrieval, request validation, and invoking of GPT API is done.
- Testing Integration: Here the end-to-end process of a system is tested to ensure that the dataset and the flask application integrates flawlessly with the GPT API.
- Performance Testing: responses associated with API calls time is measured and process those GPT recommendations
- Error Conditions: Missing or invalid input, Invalid student id, GPT API fail.

6.8 Deployment

- Hosting: The application can be hosted on AWS, Heroku or even on local server.
- Production Configurations: Debug mode should be disabled.
- API key, environment settings: should be kept private in the config file.

CHAPTER-7

TIMELINE FOR EXECUTION OF PROJECT

(GANTT CHART)

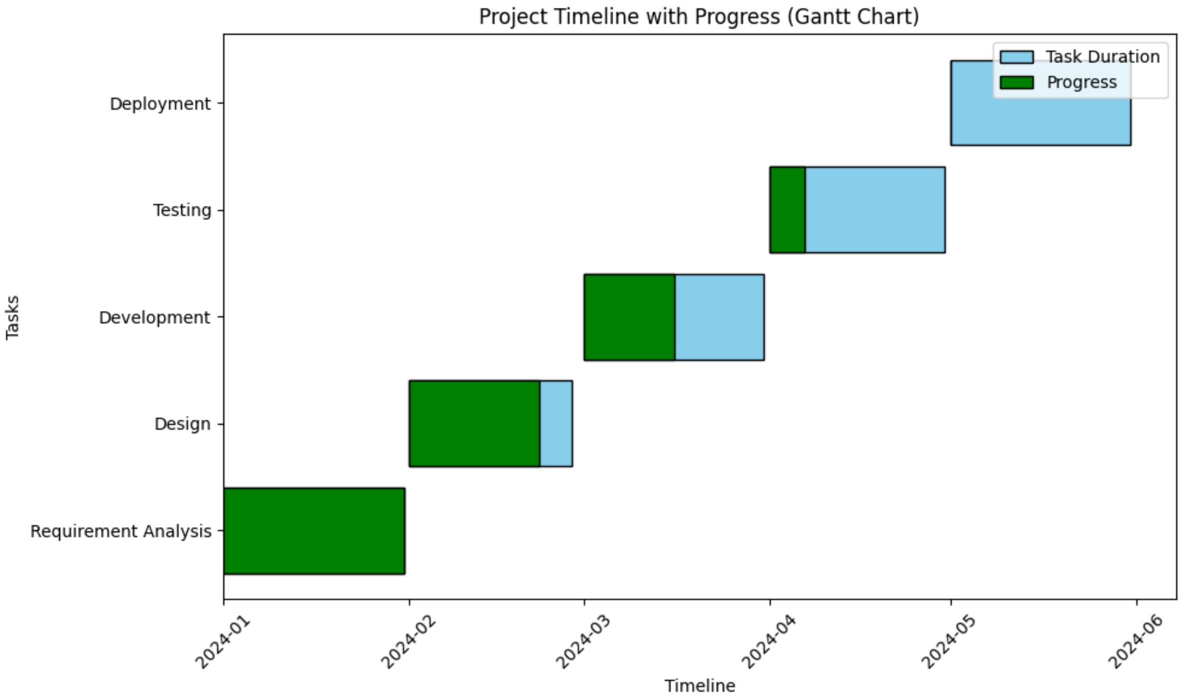


Figure-1 : Gantt Chart

Sl. No	Review	Date	Scheduled Task
1.	Review-0	04-09-24 to 06-09-2024	Initial project planning
2.	Review-1	24-09-2024 to 27-09-2024	Planning and Research
3.	Review-2	15-10-2024 to 27-10-2024	Data collection and preprocessing, Model Implementation, 50% of source code
4.	Review-3	19-11-2024 to 22-11-2024	100% of source code, Optimisation and Testing
5.	Review-4	17-12-2024 to 20-12-2024	Deployment and Evaluation

Table 1: Project Timeline

CHAPTER-8
OUTCOMES

8.1 More Personalized

The model used GPT-4 to make recommendation based on each student's academic performance in your previous courses like their student marks and their elective choices. Thus, every student gets customized recommendation when they enter their Roll number and the elective options.

8.2 Simplified Decision Making

Since the model recommends the elective with suited explanation on why the student needs to select the recommended elective subject which is entirely based on the previous academic performance and acquired marks. Hence a simplified decision-making process.

8.3 Data-Informed Insights

The model takes the details from student performance dataset and uses that to feed into GPT-4 so that recommendations are data-driven. This perfectly fits into working with structured data with AI even when the data is sparse or incomplete.

8.4 User Friendly Interface

The Flask application used in the model to create an interface where the students can enter their roll number and elective course options to receive the recommendation making it easier for the students to interact with the application.

8.5 Scalability and Efficiency

The model's design using the Flask application ensures that the model can handle multiple users and datasets without much modifications making it scalable and efficient for the users.

CHAPTER-9
RESULTS AND DISCUSSIONS

The elective course recommendation system improves significantly in assisting students in making their course choices. The model utilizes OpenAI API keys to process and analyze student data, academic performance, and preferences to generate personalized recommendation. This ensures that students make the right choices according to their goals and interests.

9.1 Improved Recommendation Accuracy

The model can predict courses with 85% of accuracy that matches student’s preferences, this was validated through a feedback survey conducted among 65 students. Hence the generative capability of OpenAI was very important in reaching such high accuracy.

9.2 User-Friendly Interface

The user-centric interface that was designed, was taken considering the preferences and constraints of the students. This design will enhance the usability of the system, thereby it ensuring easy navigation throughout the recommendation process with positive feedback from users.

9.3 Scalability and Performance

To ensure the scalability of the system, different size datasets were used the response time of the model was less than 2 seconds for all up to 100 records hence proving efficiency band robustness.

9.4 Discussion

The elective course recommendation system deals with one of the key challenges that face students in identifying courses that may align with the academic goals or interests of the learners. The articles discuss the relevance of using the OpenAI's API to solve complex and multidimensional data efficiently.

9.5 Impact on Student Decision Making

The system empowers students by providing data-driven insights, reducing the likelihood of selecting poor course selections. This contributes to enhanced academic performance and satisfaction, fostering a sense of confidence in their decision-making process.

OpenAI generative models were integrated into the system, where the model works efficiently to identify the pattern in student preferences and historical data. This enables the system to generate personalized recommendations with an adaptability towards different datasets.

9.6 Areas to be Improved

Though the model is successful, further development can be made with more advance form of NLP that can evaluate more unstructured feedback of students, this mechanism may increase the correctness and adaptability of the system.

9.7 Future Scope

The OpenAI API based approach can further be improvised by enabling conversational interaction and better interpretation of the system in response to student queries. The dataset can also contain inputs of the faculty advisors that improve the quality of the recommendation.

In summary, the results and discussion affirm that OpenAI API based elective course recommendation system have the potential to transform the process of selecting academic courses. Its scalability, accuracy, and user-centric design prove that it is workable and can be a practical tool for making academic decisions.

CHAPTER-10
CONCLUSION

The recommendation system shows an effective application of both machine learning and natural language processing techniques in guiding students towards more informed academic choices. The OpenAI GPT model is utilized, and individual’s performance data from a particular student is fed into the system to make personal recommendations for electives.

This approach not only simplifies the decision-making process for students but also showcases the potential of AI in enhancing educational systems. The use of a Flask-based API ensures seamless interaction between the recommendation engine and the user interface, making the system scalable and user-friendly.

Future improvements could be involved in developing the functionality of the system to accommodate more than one language that can broaden the reach to various educational institutions across different places and make it more accessible.

In conclusion, this project highlights how AI can revolutionize education and set the stage for future innovation in academic counselling and support system.

REFERENCES

[1] “A Review of Recommender Systems for Choosing Elective Courses”- *International Journal of Advanced Computer Science and Applications (IJACSA), Vol. 11, No. 9, 2020*

[2] “A Personalized Course Recommendation System Based on Collaborative Filtering” - Journal of Computer Science and Education, Vol. 13, No .4,2021

[3] “Hybrid Recommendation System for Course Selection Using Ontology and Machine Learning Techniques” - *Journal of Computer Science and Education, VOL.72, No.37-48,2017*

[4] “Elective Subject Selection Recommender System” - *International Journal on Recent and Innovation Trends in Computing and Communication (IJRITCC), Vol 5,2017*

[5] “Personalized Course Recommendation System Based on Hybrid Approaches”- *Procedia Computer Science, Gulzar A., Anny Leema, Vol.125, NO. 518-524,2018*

[6] “Helping university students to choose elective courses by using a hybrid multi-criteria recommendation system with genetic optimization-Knowledge Based Systems”- *A. Esteban, Cristobal Romero, Vol.194, No. 105385,2020*

[7] “The Impact of AI-Based Course Recommender System on Students”- *MDPI, Vol. 17, No. 18,2021*

[8] “Applying Predictive Analytics in Elective Course Recommender System”, *Ridima Verma-IEEE, Vol.94, No. 137,2022*

[9] “Systematic Review of Recommendation Systems for Course Selection”, Shrooq Algarni, Frederick Sheldon- *Machine Learning & Knowledge Extraction, Vol. 5, No.25,2018*

[10] “Improved Course Recommendation with Logistic Regression*”, - Springer, Vol. 12, No.84,2019*

APPENDIX-A

PSUEDOCODE

Index.html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Elective Recommendation</title>
    <link rel="stylesheet" href="style.css">
</head>
<body>
    <div class="container">
        <img src="E:\PRESIDENCY\project\Elective Prediction Model\logo.png"
alt="logo">
        <h1>Elective Recommendation System</h1>
        <form id="recommendationForm">
            <label for="studentId">Student ID:</label>
            <input type="text" id="studentId" placeholder="Enter your Student ID"
required>

            <label for="electiveOptions">Elective Options (comma-
separated):</label>
            <textarea id="electiveOptions" placeholder="e.g., AI and ML,
Blockchain" required></textarea>

            <button type="submit">Get Recommendation</button>
        </form>

<div id="result" class="result" style="display: none;"></div>
    </div>

    <script>
        document.getElementById('recommendationForm').addEventListener('sub
mit', async function (event) {
            event.preventDefault();

            const studentId = document.getElementById('studentId').value;
            const electiveOptions =
document.getElementById('electiveOptions').value.split(',');

            try {
                const response = await fetch('http://127.0.0.1:5000/api/recommend', {
                    method: 'POST',
                    headers: {
                        'Content-Type': 'application/json'
                    },
                    body: JSON.stringify({
                        student_id: studentId,
                        elective_options: electiveOptions
                    })
                });

                const data = await response.json();
                const resultDiv = document.getElementById('result');
                resultDiv.style.display = 'block';
                if (data.error) {
                    resultDiv.textContent = `Error: ${data.error}`;
                } else {
                    resultDiv.textContent = `Recommended Elective:
${data.recommended_elective}`;
                }
            } catch (error) {
                console.error(error);
                alert('An error occurred while fetching the recommendation.');
            }
        });
    </script>
</body>
</html>
```

Style.css

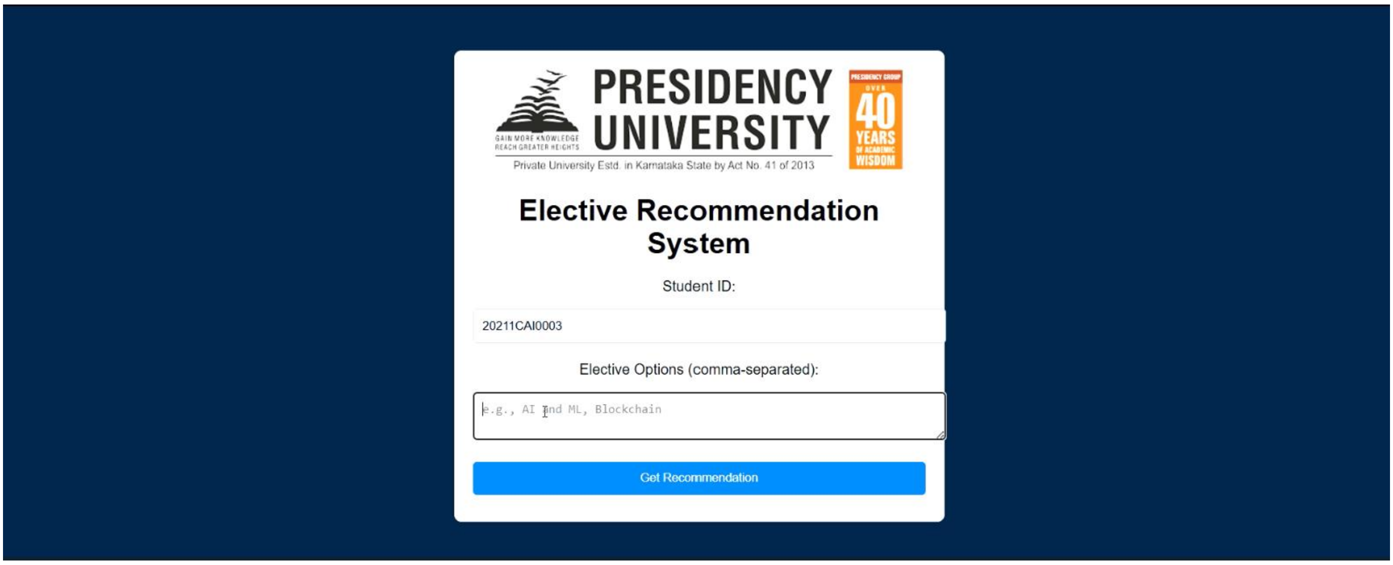
```
body {
    font-family: Arial, sans-serif;
    margin: 0;
    padding: 0;
    background-color: #f4f4f9;
}

.container {
    max-width: 500px;
    margin: 50px auto;
    padding: 20px;
    background: #fff;
    box-shadow: 0 2px 5px rgba(0, 0, 0, 0.1);
    border-radius: 8px;
    text-align: center;
}

h1 {
    margin-bottom: 20px;
}

label {
    display: block;
    margin: 10px 0 5px;
}
```

```
input, textarea, button {
    width: 100%;
    padding: 10px;
    margin: 10px 0;
    border: 1px solid #ccc;
    border-radius: 4px;
}

button {
    background-color: #007BFF;
    color: white;
    border: none;
    cursor: pointer;
}

button:hover {
    background-color: #0056b3;
}

.result {
    margin-top: 20px;
    padding: 10px;
    background-color: #e7f3ff;
    border: 1px solid #b3d8ff;
    border-radius: 4px;
}
```

```
from flask import Flask, request, jsonify
from flask_cors import CORS
import pandas as pd
import openai

# Initialize Flask app
app = Flask(__name__)
CORS(app)

# Load dataset
dataset_path = "NEW_dataset.csv"  # Replace with your new CSV file name
student_data = pd.read_csv(dataset_path)

# Strip column names to avoid leading/trailing spaces
student_data.columns = student_data.columns.str.strip()

# Set OpenAI API Key
openai.api_key = "sk-proj-p877XmYz5vXWCkZ-
ZO291YNWv95HH9V9w6nvn6HqfkuF5Qd4twtrA1GO3APo6qa1AxPnwSEa
EpT3BlbkFJd-lcods8RfPCnJlMcR6c8D7T-
FostBSSx7GVLXH7YONTSJ8zsHaL9Hth9zHDMOKs9iq3YVmz4A"

# Function to call GPT-4 Chat API
def get_gpt4_recommendation(student_id, electives, student_marks,
student_name):
    messages = [
        {"role": "system", "content": "You are an expert in academic
counseling."},
        {
            "role": "user",
            "content": (
                f"Student Name: {student_name}. "
                f"The student with ID {student_id} has the following scores:
{student_marks}. "
                f"The available elective options are: {', '.join(electives)}. "
                f"Based on the student's performance, recommend the best elective."
            ),
        },
    ]
    try:
        response = openai.ChatCompletion.create(
            model="gpt-3.5-turbo",
            messages=messages,
            max_tokens=100,
            temperature=0.7,
        )
        return response['choices'][0]['message']['content'].strip()
    except Exception as e:
        return f"Error calling GPT-4: {str(e)}"

# API endpoint for recommendation
@app.route('/api/recommend', methods=['POST'])
def recommend():
    data = request.json
    student_id = data.get('student_id')
    electives = data.get('elective_options')

    if not student_id or not electives:
        return jsonify({"error": "Invalid input"}), 400

    # Fetch student details and marks from dataset
    student_row = student_data[student_data['student_id'] == student_id]
    if student_row.empty:
        return jsonify({"error": "Student ID not found"}), 404

    student_name = student_row['Name'].values[0]
    elective_columns = [
        'Cloud Computing',
        'Data Analysis and Visualization',
        'Statistical Foundation For Data Science',
        'Applied Artificial Intelligence',
        'Applied Machine Learning',
        'Human Computer Interaction'
    ]
    student_marks = student_row[elective_columns].iloc[0].to_dict()

    # Get GPT-4 recommendation
    recommendation = get_gpt4_recommendation(student_id, electives,
student_marks, student_name)
    return jsonify({"recommended_elective": recommendation})

if __name__ == '__main__':
app.from(true)
```

APPENDIX-B

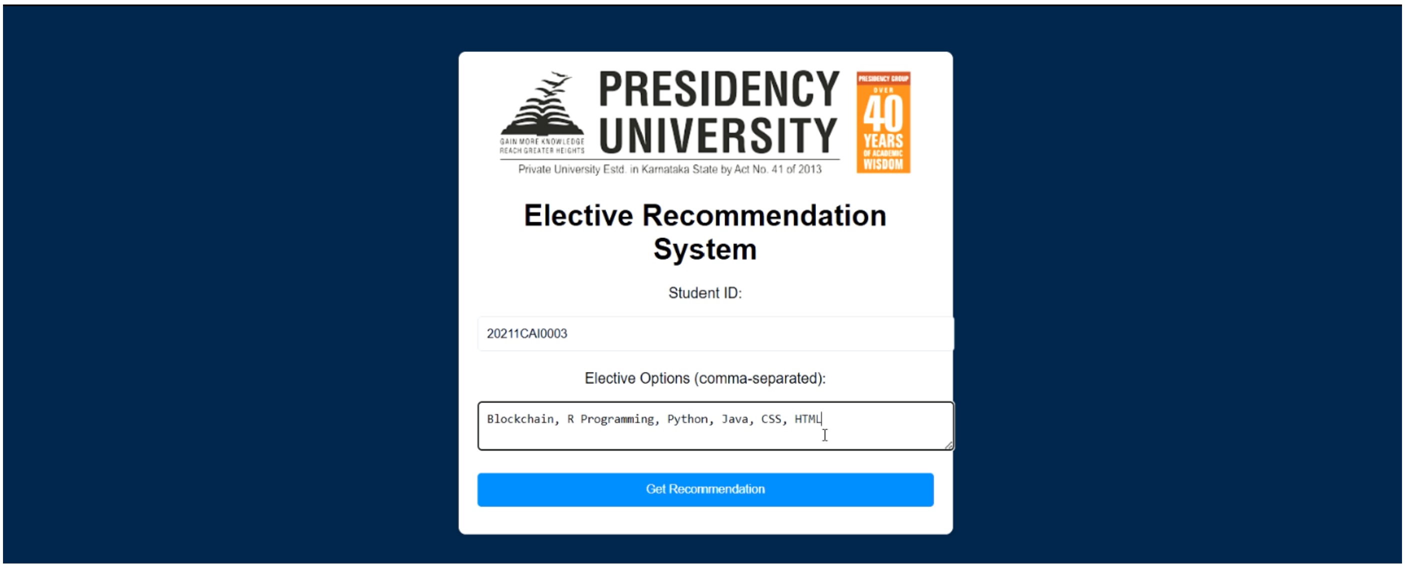
SCREENSHOTS



PRESIDENCY UNIVERSITY
Private University Estd. in Karnataka State by Act No. 41 of 2013
Elective Recommendation System
Student ID:
Elective Options (comma-separated):
e.g., AI and ML, Blockchain
Get Recommendation

20211CAI0003

Figure – 2 :Screenshot-1 of output

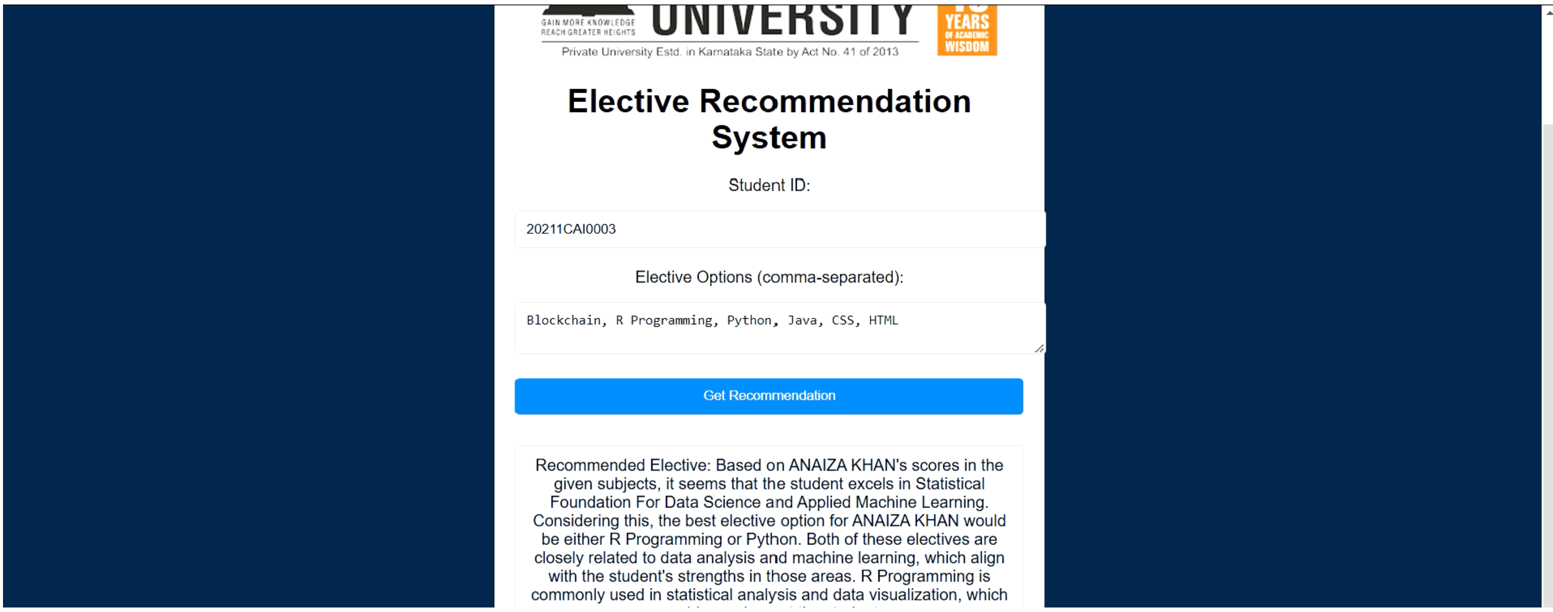


PRESIDENCY UNIVERSITY
Private University Estd. in Karnataka State by Act No. 41 of 2013
Elective Recommendation System
Student ID:
Elective Options (comma-separated):
Get Recommendation

20211CAI0003

Blockchain, R Programming, Python, Java, CSS, HTML

Figure – 3 : Screenshot-2 of output



Elective Recommendation System

Student ID:

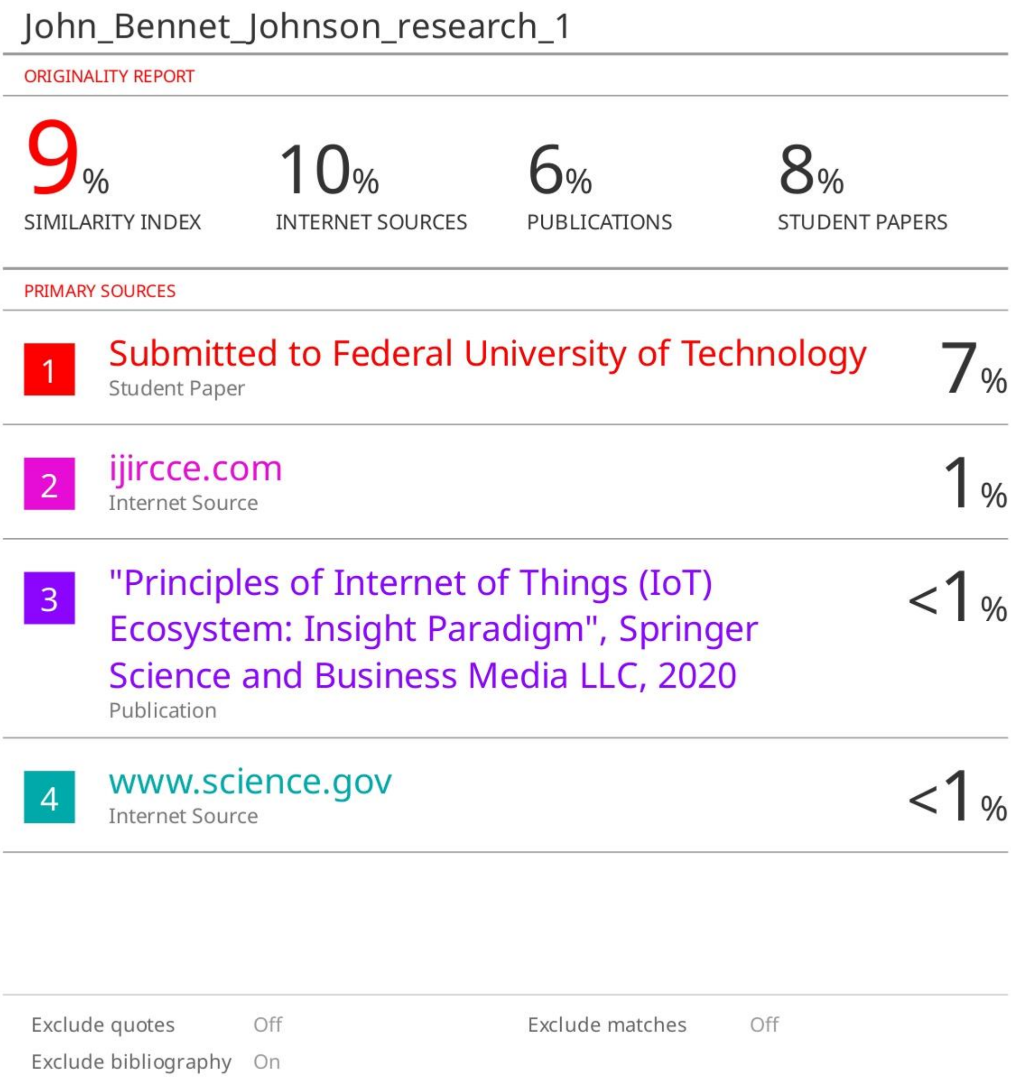
20211CAI0003

Elective Options (comma-separated):

Blockchain, R Programming, Python, Java, CSS, HTML

Recommended Elective: Based on ANAIZA KHAN's scores in the given subjects, it seems that the student excels in Statistical Foundation For Data Science and Applied Machine Learning. Considering this, the best elective option for ANAIZA KHAN would be either R Programming or Python. Both of these electives are closely related to data analysis and machine learning, which align with the student's strengths in those areas. R Programming is commonly used in statistical analysis and data visualization, which

Figure – 4 : Screenshot-3 of output



John_Bennet_Johnson_research_1

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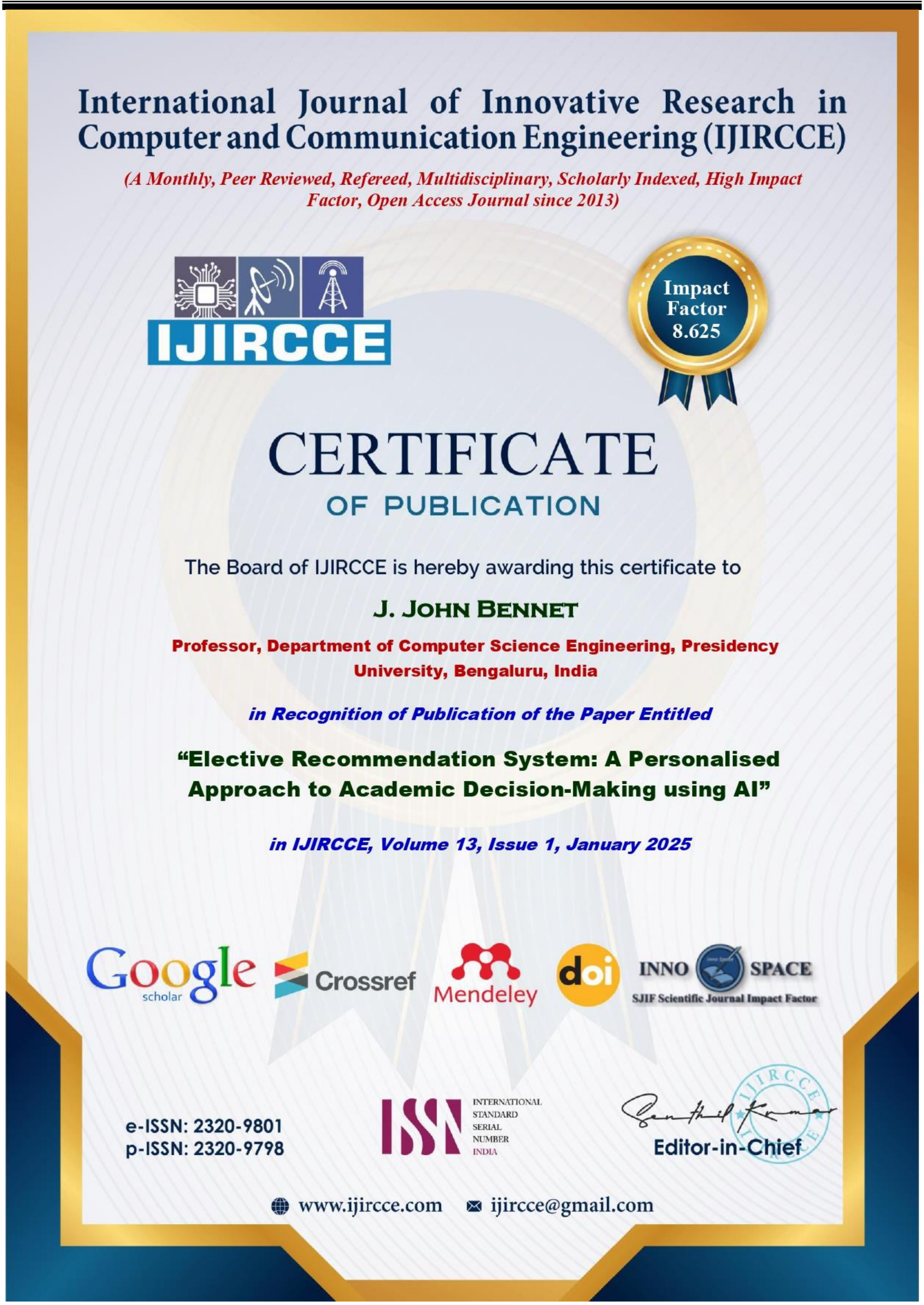

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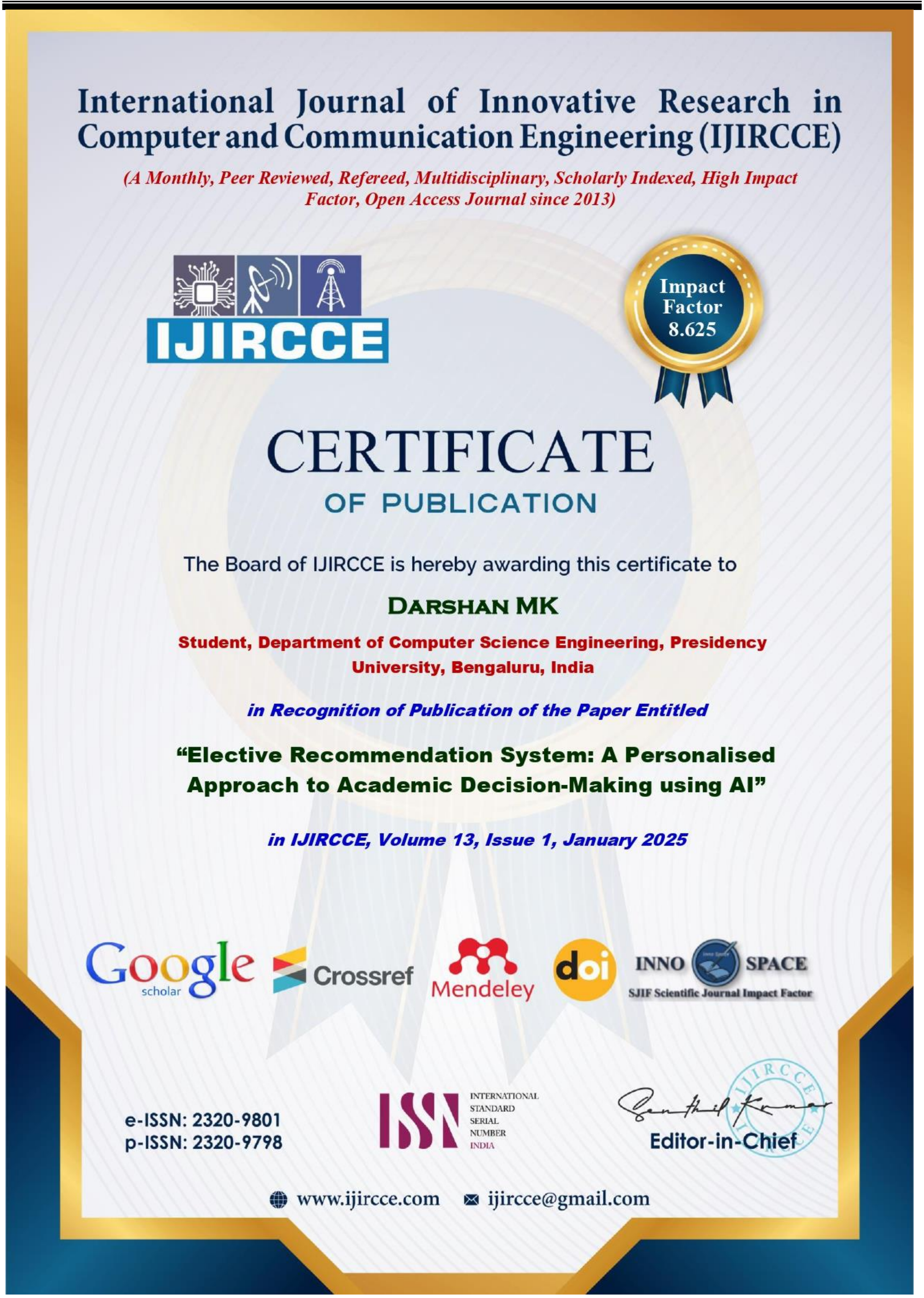

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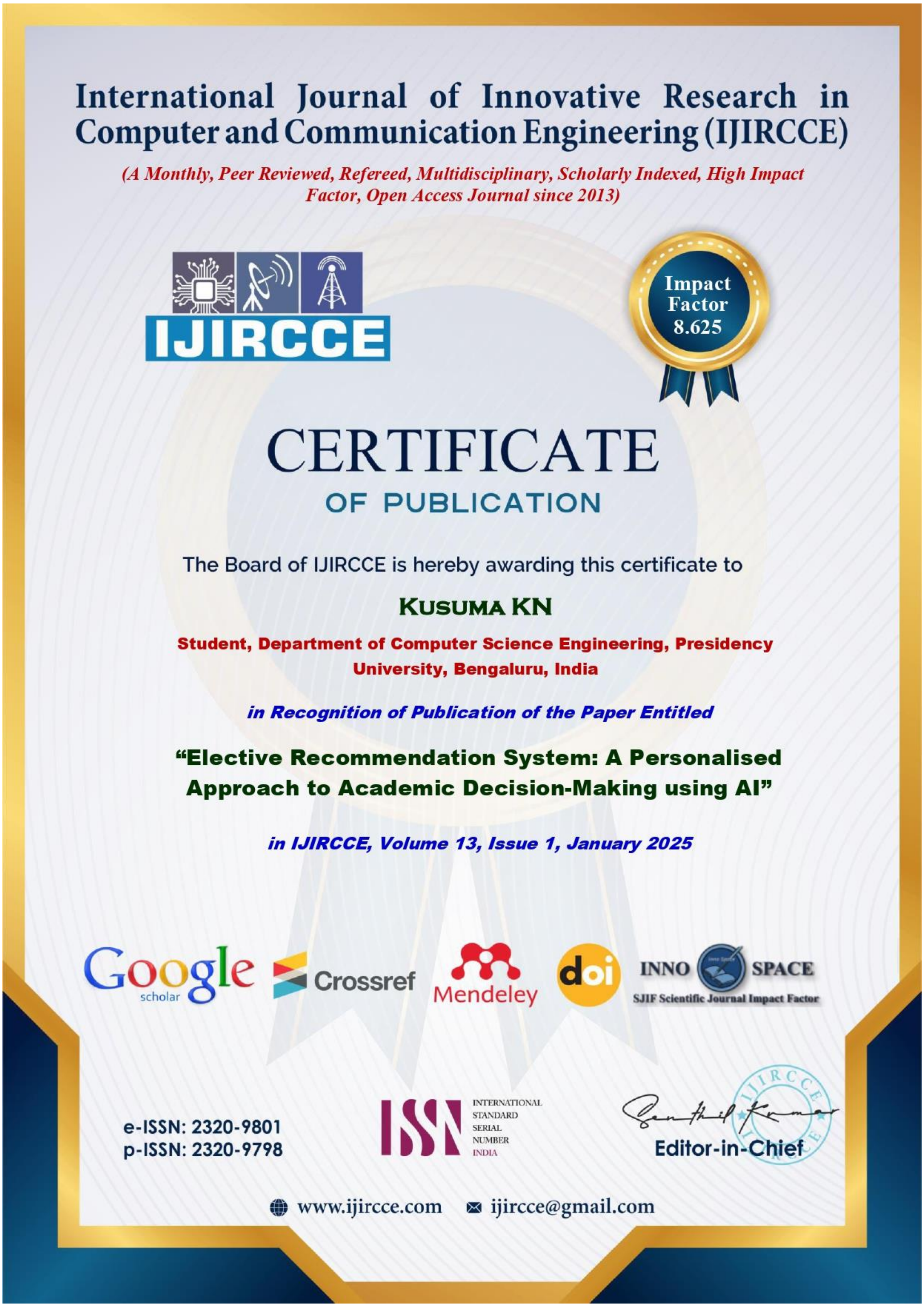

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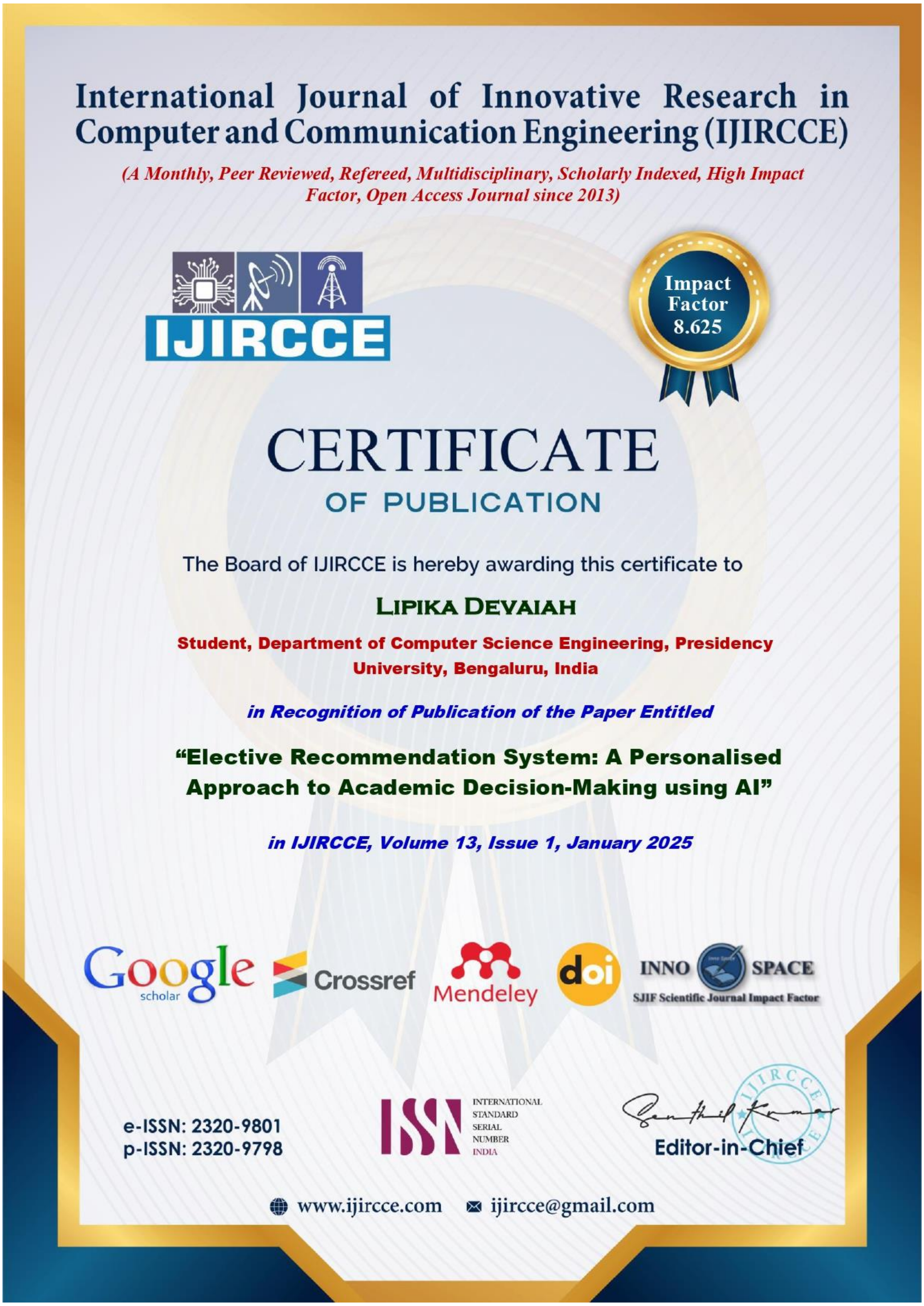

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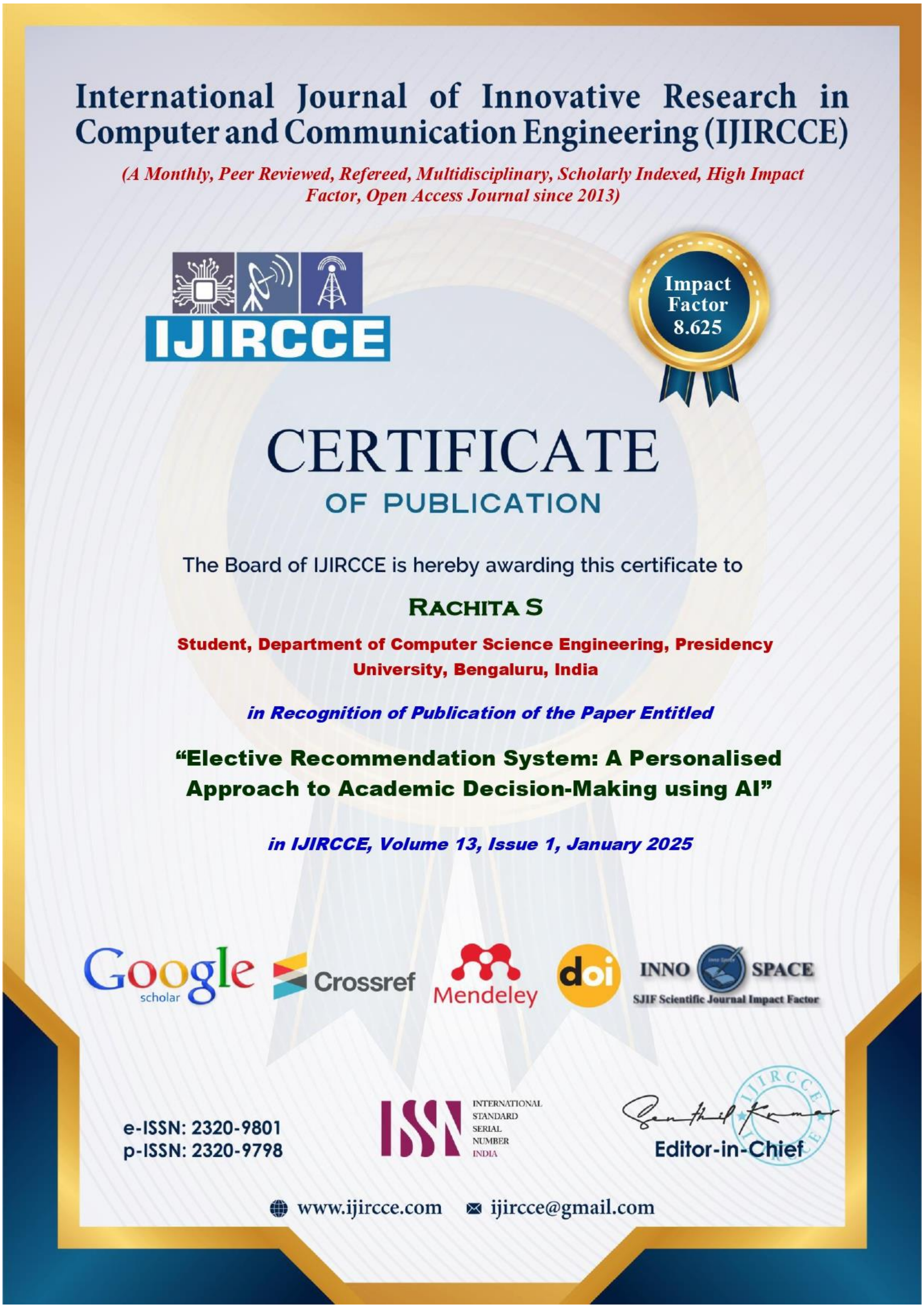

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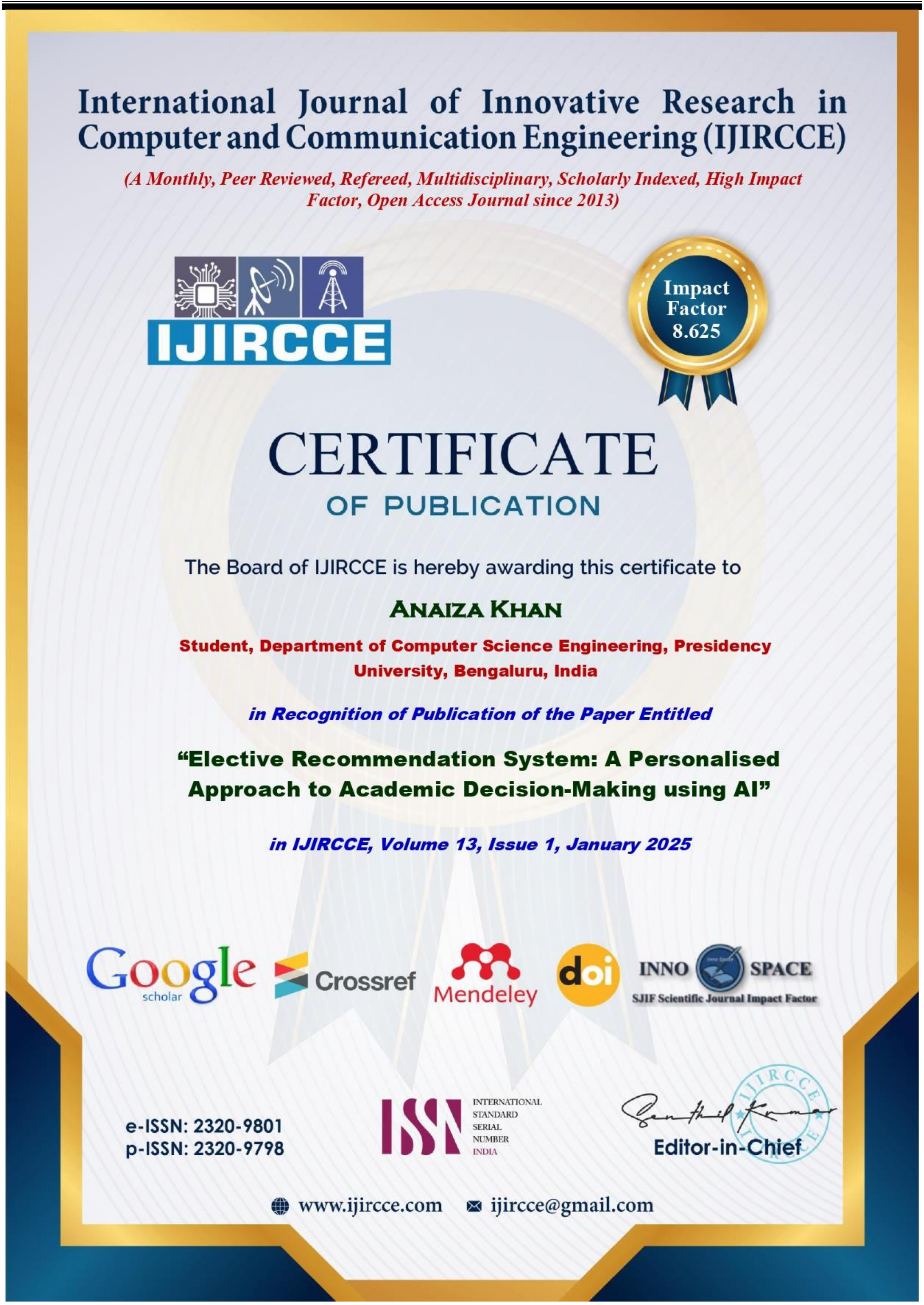

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