AI Code Explainer: An Intelligent Platform for Code Interpretation Using Gemini Flash 2.0

Abstract

This paper presents "AI Code Explainer", an intelligent web-based platform that utilizes the Gemini Flash 2.0 language model to interpret and explain source code in natural language. Aimed at developers and learners, the system provides line-by-line or block-wise code explanations with a clean, responsive UI. The application supports user authentication, features dark and light modes for enhanced accessibility, and gracefully handles irrelevant user inputs with instructive feedback. This project showcases an integration of large language models with modern frontend and backend technologies to create a smart assistant for programming education and debugging.

1. Introduction

Understanding source code is a core skill for developers, yet it remains a challenge for beginners. With the rise of large language models (LLMs), it is now possible to automate the explanation of code logic in plain English. This project, AI Code Explainer, leverages Gemini Flash 2.0 to create an interactive and user-friendly tool for code interpretation and debugging.

2. Objectives

- To provide clear, natural language explanations of code.
- To support multi-language input (optional/extendable).
- To provide a responsive design compatible with mobile and desktop.
- To integrate authentication for personalized user sessions.
- To implement dark and light themes for better accessibility.
- To detect and gracefully handle irrelevant or off-topic prompts.

3. Methodology

3.1 Technology Stack:

- Frontend: HTML, CSS (Tailwind), JavaScript, React
- Backend: Node.js / Express
- AI Model: Gemini Flash 2.0 API

- Authentication: JWT, bcrypt
- UI Themes: Dark Mode and Light Mode toggle
- Prompt Filtering: Simple regex and keyword-based filters

3.2 Workflow:

1. User signs up or logs in to access the interface.
2. The user submits source code as a prompt.
3. The backend sends this prompt to Gemini Flash 2.0.
4. The AI returns a structured explanation, displayed in the UI.
5. If the input is not code or irrelevant, the user is prompted with a polite clarification message.

4. Features

Feature	Description
Code Interpretation	Explains logic and functions of input code.
Responsive Design	Works seamlessly across devices and screen sizes.
Authentication	Secure user login and registration with JWT.
Dark/Light Mode	Toggle available for user comfort.
Prompt Filtering	Identifies and responds to off-topic or irrelevant user inputs.

5. Results and Discussion

The system was tested with multiple code snippets (JavaScript, Python, etc.). It accurately explained logic, including loops, functions, and conditionals. The prompt filter was effective in redirecting users from unrelated prompts. The UI responded well on both mobile and desktop screens, with smooth transitions between dark and light themes.

6. Conclusion

AI Code Explainer demonstrates the effective use of modern LLMs in educational tools. It reduces the learning curve for new programmers by providing clear and fast feedback. Future improvements can include code execution previews, multi-language support, and advanced AI fine-tuning.

7. References

1. Gemini Flash 2.0 API Documentation.
2. React Documentation – https://reactjs.org
3. Tailwind CSS – https://tailwindcss.com
4. Node.js and Express – https://expressjs.com 5. JWT Authentication – https://jwt.io