

Team SAAP - TechDojo Proposal

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1. Summary:

A Social Educative Platform for New Gen-TechEd (Tech Dojo)

We are building an **AI-driven social educational platform** that **personalizes** learning for **tech enthusiasts** through **lowcode**. Our platform ensures **responsible tech education** by integrating lessons on **cyber safety, ethical AI, and inclusive coding practices** within all learning modules. In a generation where we believe learning to code is less important compared to **learning how to write quality code**; we focus on not only the technical skills, but also the **holistic knowledge** that comes along with it. We will be developing a **website and mobile application**. Here is a list summary of our features with our key features being expanded on further below:

1. Personalized and Adaptive Programming Roadmaps with certification
2. 3 x AI Based Games for Capstone of Programming Roadmaps, Cybersafety, and Responsible AI
3. Classroom based Leaderboard, Discussion Panels, and Posts with an in-built Cyber Real time digital safety feature
4. Downloadable SaaS-Bot for teachers to regulate their external classroom discussion channels (discord, telegram, and slack real time cyber safety bot)

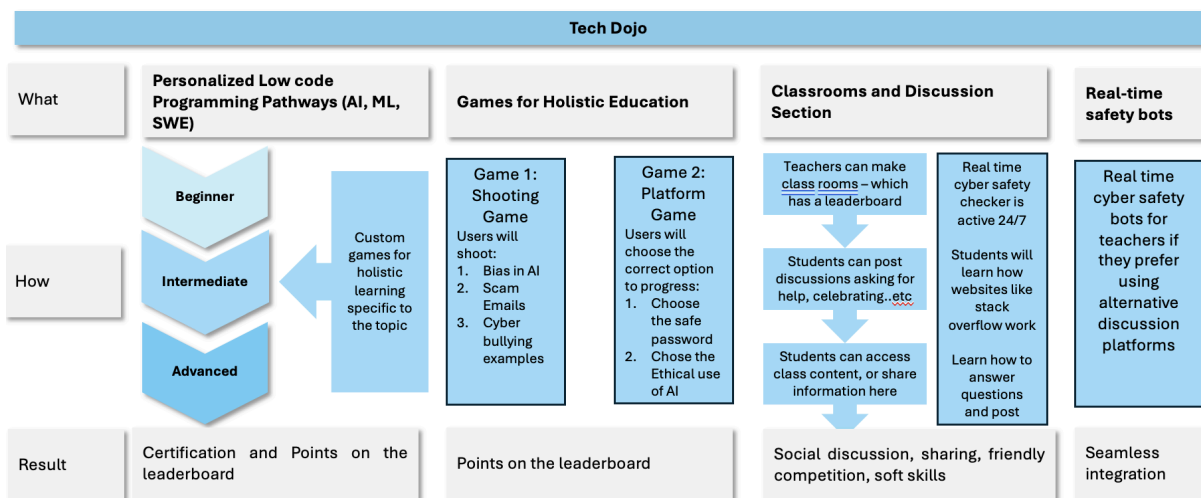
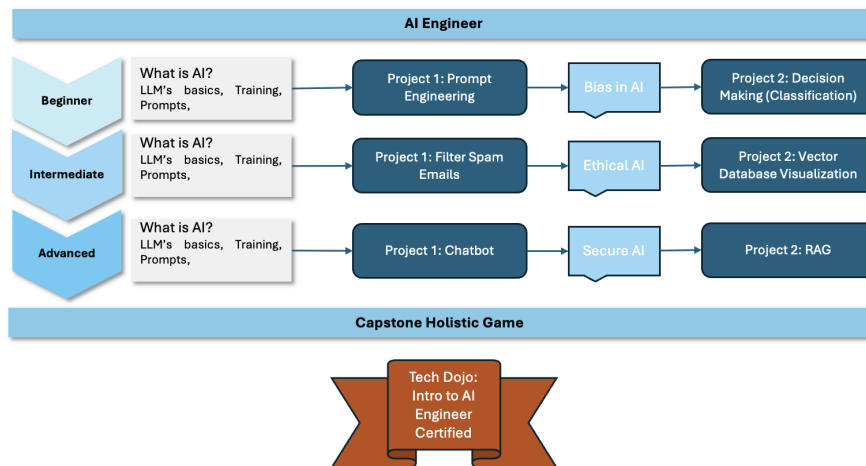


Figure 1.1 Website Feature Flowchart

Personalized and Adaptive Programming Roadmaps:

Users take an interest assessment, and our AI dynamically generates a custom roadmap based on their background, placing them in one of three tracks and difficulty levels:

1. AI Engineer
2. ML Engineer
3. Software Engineer



*Figure 1.2 - AI Engineer Roadmap
(Roadmaps for the other tracks are in the appendix)*

This is unique, because users will be using our specially built low code platform, to implement these projects to further **democratize technology** and equip users with knowledge.

The highlight of this is the personalized syllabus, the projects in the diagrams are just placeholders, they will be customized to the initial user analysis, however, the projects will be more or less based on the topics of cybersafety, cyberbullying and effective AI use.

Our teaching method is not only **personal** but also **theoretical, practical and holistic**. This iterative and reinforcement of personalized learning journey learners has been developed through a literature review of best practices from Atikah Shemshack, John F. Pane, Ambroise Baillifard. The users will be taught the theory about the project before starting development.

Once these roadmaps are completed, learners complete interactive ethical AI based games specific to their path to reinforce responsible AI, fair data use, and good code practices - upon the completion; they receive our certification.

Holistic Education through 2 other Games:

- 1 x Shoot the AI-Bias/Malicious Email Game
- 1 x Choose secure passwords, ethical AI practices platform game

Community Engagement:

Users share projects, participate in leaderboards, and discuss their learning through a safe, AI-moderated forum, teachers have the option of making classes and adding students to it

Why is this important and Impact:

65% of high-growth jobs now require coding, yet one-third of workers lack digital skills (Burning Glass, National Skills Coalition).

Our low-code platform bridges this gap, allowing non-technical users to learn coding and holistic knowledge without deep programming knowledge.

Low-code increases software development efficiency by 70% (WEF). Furthermore, industry insights reveal that approximately 40% of IT leaders believe that low-code development will enhance the diversity of their IT organizations (Radix Web). KPMG found that 81% of companies consider low-code development strategically important, with reported benefits including increased process efficiency (53%) and higher employee productivity (51%).

Our low-code platform makes learners ready for the workforce.

Sopra Steria, over half of the new staff recruited during 2023 for their low-code/no-code practice were women and individuals from minority ethnic backgrounds, highlighting the potential of these platforms to enhance workforce diversity

Our low-code platform will open more doors for less represented demographics in the tech industry

Figure 1.3 - Statistics Summary Slide

Our fun, social low code platform employs researched backed educational methods to create a safe, engaging space for learners of all levels, including experienced engineers. Personalized pathways, certification and gamification sets us apart from already existing solutions. We also have seamless cyber safety integration that further enhances accessibility, if teachers prefer using other social media platforms, as seen below.

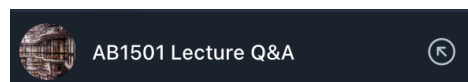


Figure 1.5 - Proof of NTU Professors using Telegram

TechDojo is the synergy of education, cyber safety and seamless integration. In addition to this, if time permits we plan on adding a feature called Pro-Pal, which takes the idea of penpalling with people in foreign languages, to write code in different languages together on one project - which further fuels diversity!

2. Summary Appendices:

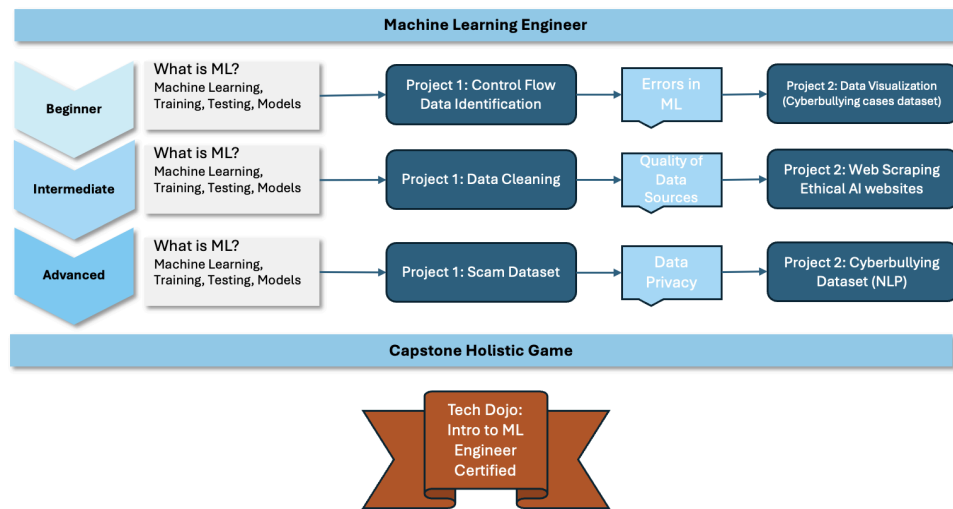


Figure 2.1 - ML Engineer

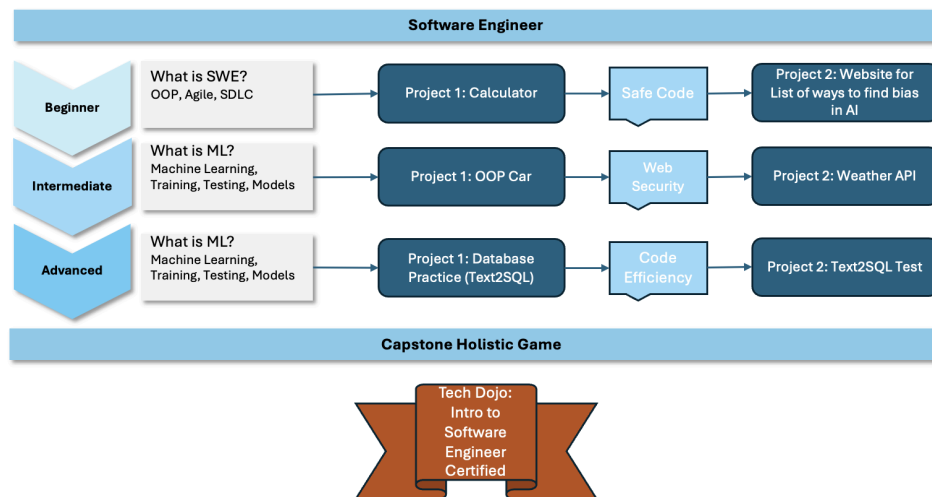


Figure 2.2 - Software Engineer

How do we fulfill the criteria

PROBLEM AREA	FOCUS	ACHIEVED AND HOW?
Education	<ul style="list-style-type: none"> - Personalize programming education with adaptive, AI-powered tools for diverse learners. - Teach ethical AI practices like fairness, bias mitigation, and inclusivity. - Make learning programming interactive and accessible for beginners. 	<ul style="list-style-type: none"> - AI generated user road maps, based on user interactions, feedback and inputs specific to their skill level - Ethical AI is integrated into syllabus, projects, and even in the additional games - We are developing a special low code platform which can be used to built advanced projects
Digital Safety	<ul style="list-style-type: none"> - Create AI systems that detect and prevent cyberbullying or toxic behavior in real-time. - Build tools to educate students about misinformation, online privacy, and secure digital practices. - Promote inclusive online interactions and digital etiquette through gamified learning. 	<ul style="list-style-type: none"> - Real Time detection on the website discussion forums, with options to integrate it into social media of teacher choice - Integrated into syllabus, projects and additional games - Discussion forum to post your projects, and programming achievements with tips and real time detection
Integration of Education and impact	<ul style="list-style-type: none"> - Develop classroom projects where students build tools for moderating online communities or identifying harmful content. - Show how AI learning can solve real-world challenges related to digital safety. 	<ul style="list-style-type: none"> - Practical learning that applies theoretical knowledge - the content of the projects are focused on cybersafety, ethical AI..etc - Various projects highlight this

Figure 2.3 - Checklist for our Idea

3. Tech Stack:

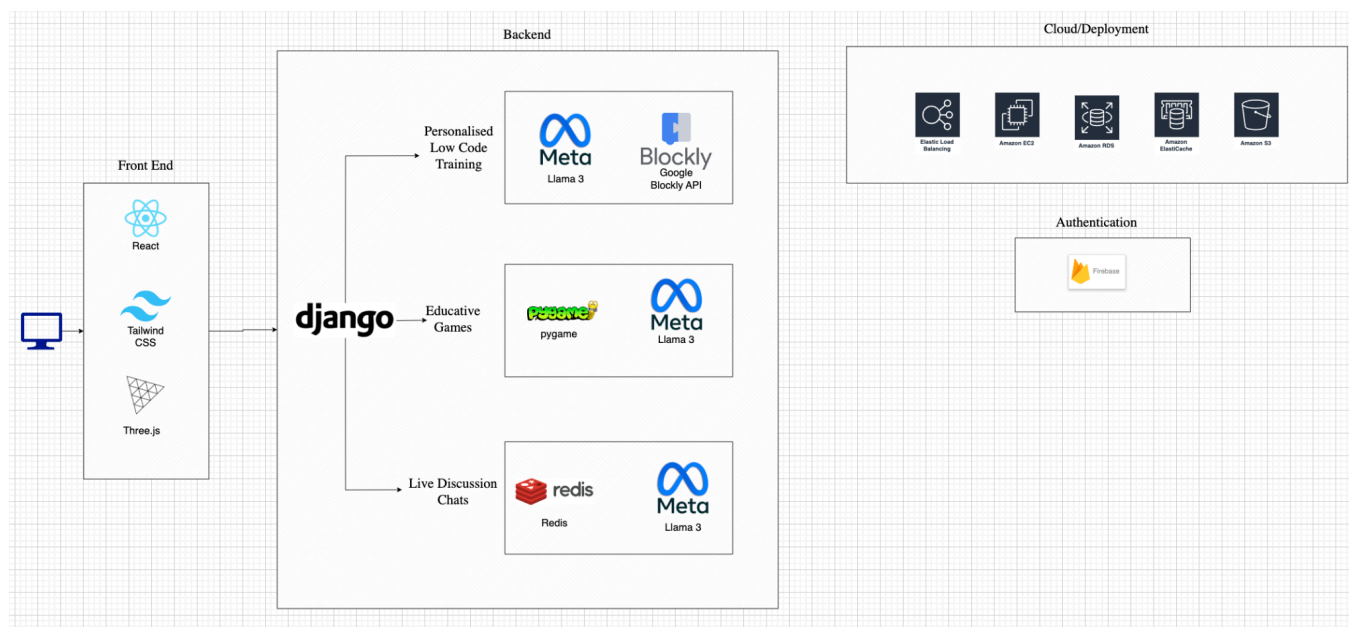


Figure 3.1 - Tech Stack Architecture Diagram

Our tech stack is strategically designed to balance scalability, cost-efficiency, performance, and inclusivity, ensuring a seamless AI-driven low-code learning experience. **Our key focus was being accessible and inclusive** - therefore we chose frameworks and tools that are

low cost, scalable and highly accessible. So that we can keep our website free of cost, and have room for expansion for more content.

Frontend: User-Friendly and Interactive Design

For the frontend, we chose React as it offers a highly responsive, component-based architecture, making it easy to scale and maintain. Tailwind CSS allows us to create a clean and accessible UI, with a utility-first approach that eliminates unnecessary CSS code all over the place in a modular manner.

This ensures fast page loads, reducing bandwidth costs, which is essential for learners accessing the platform on lower-end devices or slow networks (which is essential for our diversity)

Additionally, Three.js is incorporated for 3D visualizations and gamification, allowing us to create interactive learning elements that enhance engagement, especially for visual learners. This low-cost, high-performance frontend ensures that we can support thousands of concurrent users with minimal overhead.

Backend: AI-Powered Personalization and Low-Code Implementation

For backend processing, Django is the core framework due to its robust security, scalability, and rapid development features. Python's versatility makes it ideal for integrating AI models and handling dynamic user interactions. Since our platform focuses on AI-driven learning pathways, we leverage Meta's Llama 3 for adaptive roadmaps, AI-moderated discussions, and chatbot-assisted learning support. Llama 3 offers an open-weight AI model, **reducing long-term API costs compared to commercial AI solutions like OpenAI's GPT models.**

To support low-code learning, we use Google Blockly API, which enables users to drag and drop code blocks instead of writing full syntax. This ensures accessibility for non-technical learners while reducing the learning curve for coding concepts. We will be adding our own blocks and code to this existing API, once again using open source existing models but enhancing them for further **inclusion and accessibility.**

Additionally, Pygame is used to create interactive AI-driven coding challenges that reinforce responsible AI and cybersecurity practices.

For real-time engagement, we incorporated Redis, a high-performance caching system, to manage discussion panels and live student-teacher interactions efficiently. Since Redis is lightweight and runs in-memory, it provides low-latency responses, **ensuring real-time chat experiences without costly database queries.**

Cloud Deployment: Cost-Effective and Scalable Architecture

To ensure reliability and high availability, we opted for AWS-based cloud deployment, leveraging Elastic Load Balancing to distribute traffic efficiently. This helps manage high user loads by automatically scaling resources as needed, preventing server failures and slowdowns.

Amazon EC2: Provides flexible cloud computing power, allowing us to scale up or down based on demand, keeping costs manageable.

Amazon RDS: Chosen for database management, ensuring reliable storage of user progress, learning history, and AI recommendations.

Amazon ElastiCache: Optimizes database performance through caching, significantly reducing query response times and server costs.

Amazon S3: Stores learning materials, projects, and user-generated content, ensuring cost-efficient and durable storage.

By relying on AWS's pay-as-you-go model, we avoid upfront infrastructure costs and can scale cost-effectively as demand grows.

Authentication: Secure and Seamless User Management

For authentication, we selected Firebase, which provides secure user authentication, Google sign-in, and seamless OAuth integrations. Firebase eliminates the need to manually handle password storage and security protocols, reducing maintenance costs and ensuring compliance with industry security standards.

Cost and Scalability Considerations

This tech stack is optimized to reduce costs while maximizing scalability. By using open-source tools like Django, Llama 3, and Blockly, we minimize API fees and ensure long-term affordability. Our reliance on serverless and cloud-based infrastructure (AWS, Firebase) ensures that we only pay for what we use, keeping operational expenses low. Additionally, the AI-driven automation of learning pathways and discussions minimizes the need for manual moderation, reducing human resource costs

4. UI Mockups:

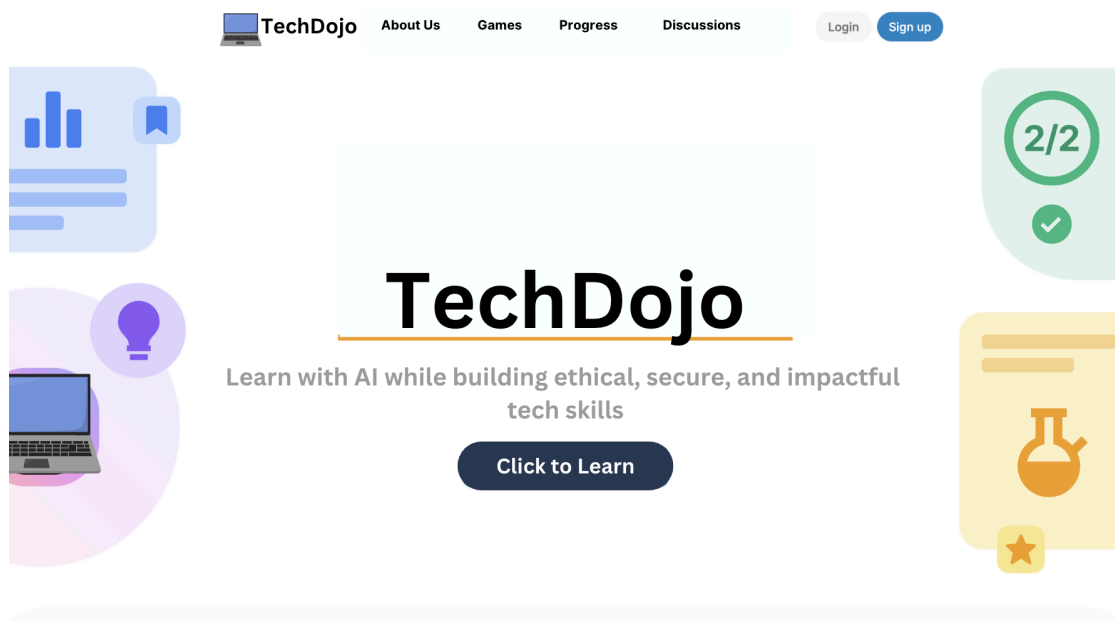


Figure 4.1 - Landing Page

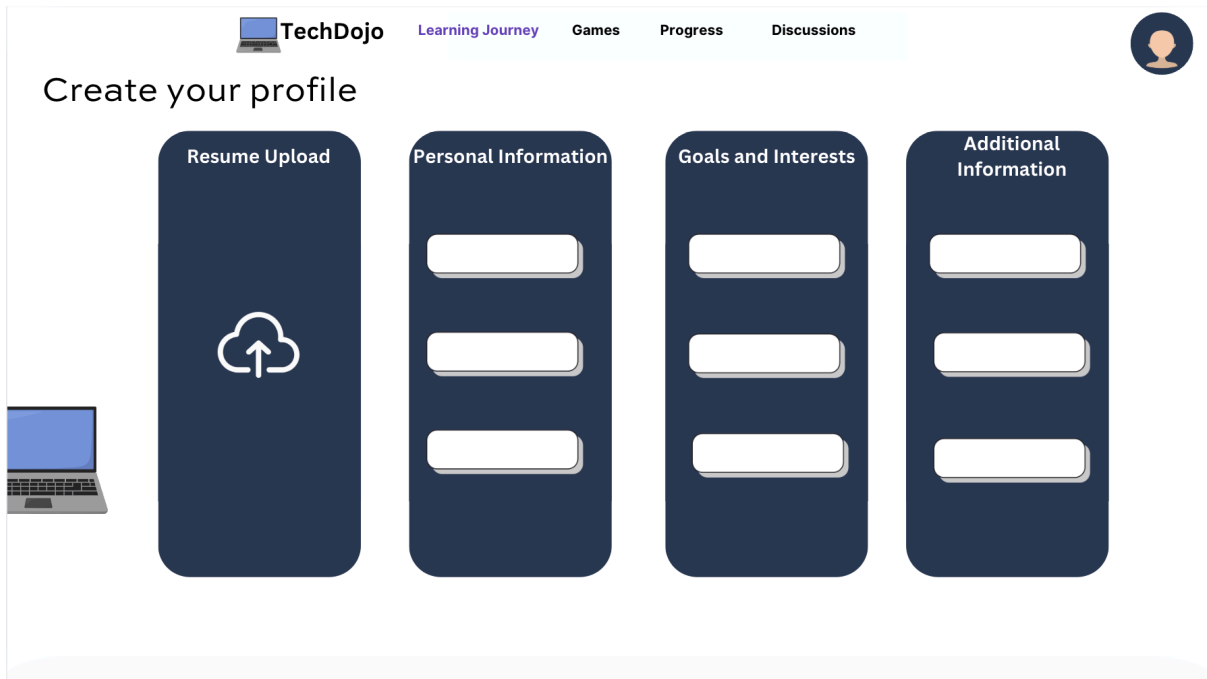


Figure 4.2 - Profile Page for User information

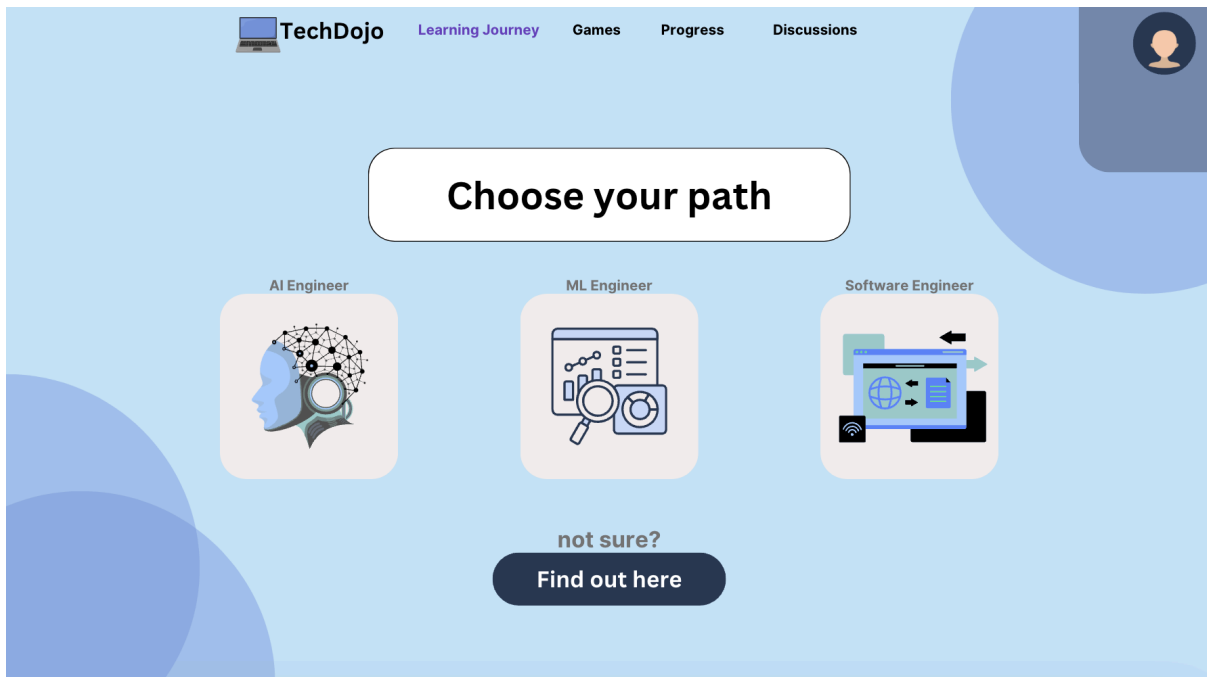


Figure 4.3 - Path Choosing

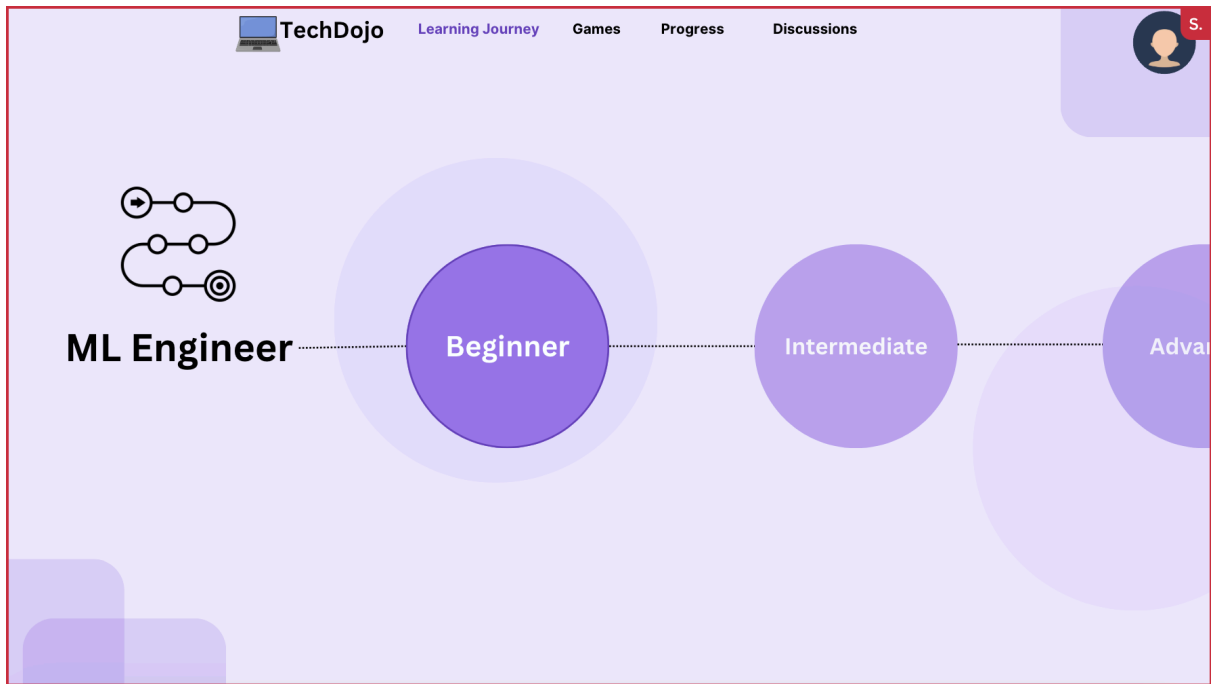


Figure 4.4 - Difficulty Levels

The screenshot shows the TechDojo interface for an 'ML Engineer' at the 'Intermediate' level. The top navigation bar includes 'TechDojo', 'Learning Journey', 'Games', 'Progress', and 'Discussions'. A progress bar shows four steps: 1 (Intro module), 2 (Ethics in Data Sourcing), 3 (Project 1: Webscraping), and 4 (locked). The main task is 'Task: Webscrape this website!'. On the left is a sidebar with categories like Automation, Web Scraping, Logic, Loops, Math, Text, Lists, Colour, Custom Button, Variables, and Functions. The central workspace contains a visual flowchart with steps: 'Start Selenium', 'Go to URL' (https://zoom.us/), 'Click Button' (Sign Up), 'Enter Input' (email), 'Enter Input' (password), and 'Generate CSV'. On the right is a code editor with Python code using Selenium and pandas. Below the code is an 'Auto-Grader' section showing '0/10 test cases passed' and a 'Finish this module to proceed' button. A 'Download' button is also present.

Figure 4.5 - Example of our LowCode Platform



Figure 4.6 - Example of holistic education game

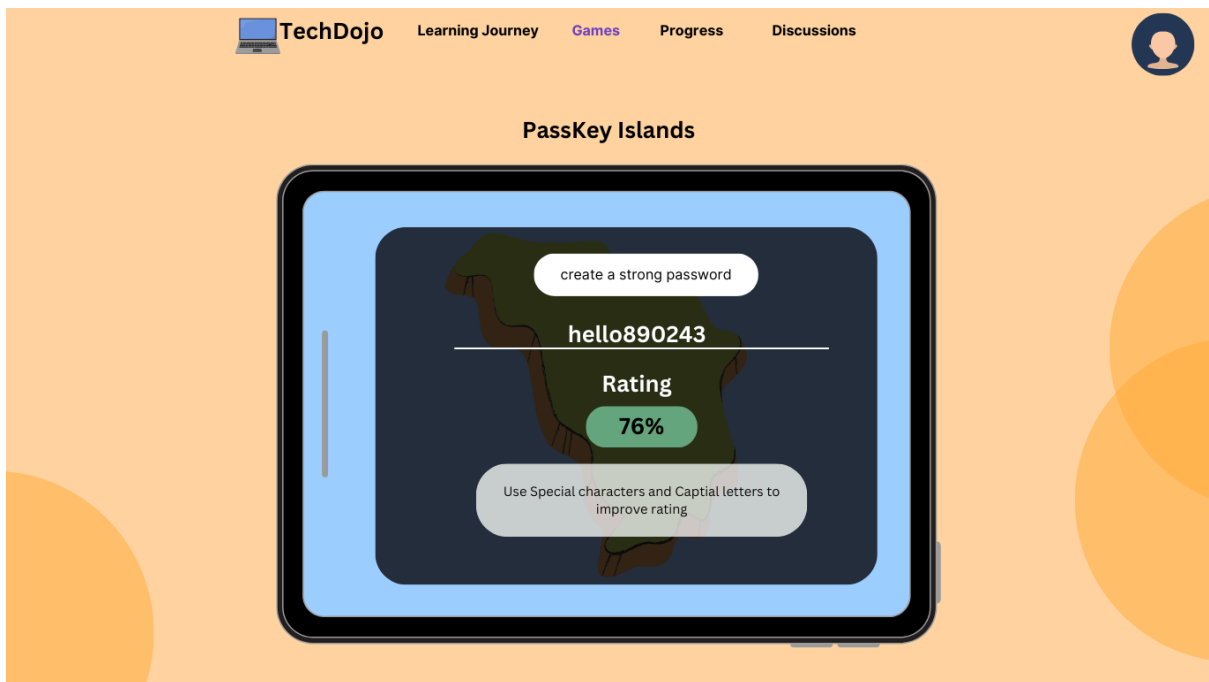


Figure 4.7 - Example of a level in the game

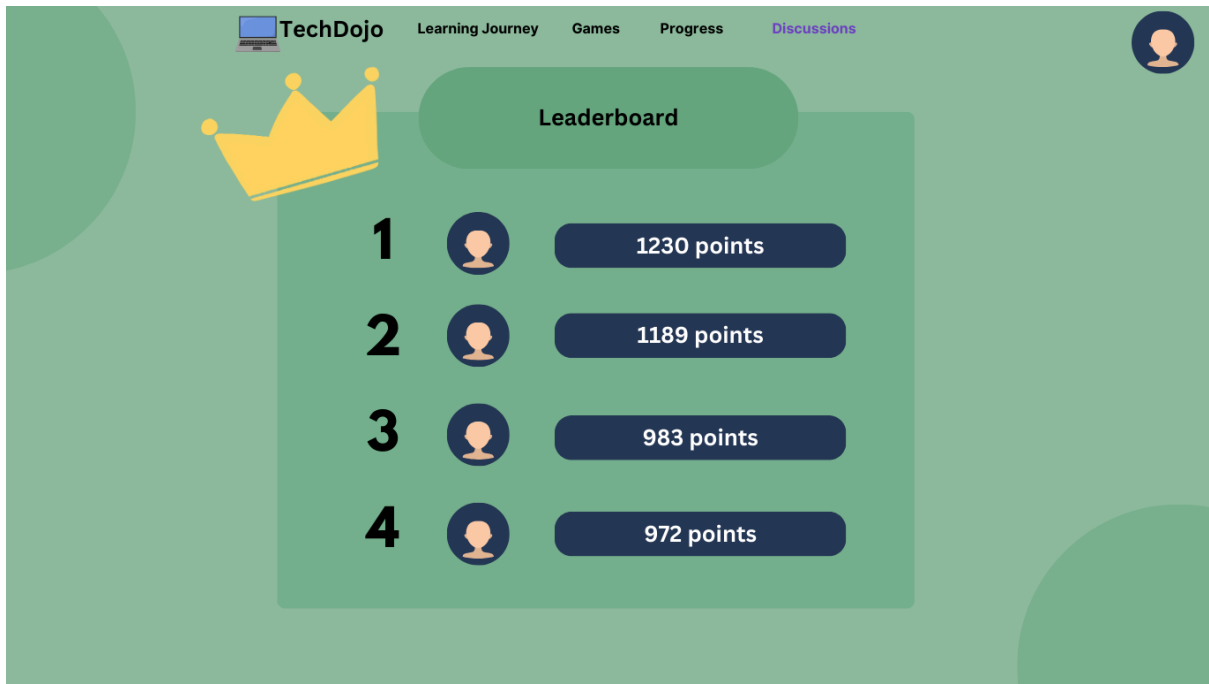


Figure 4.8 - Leadership board

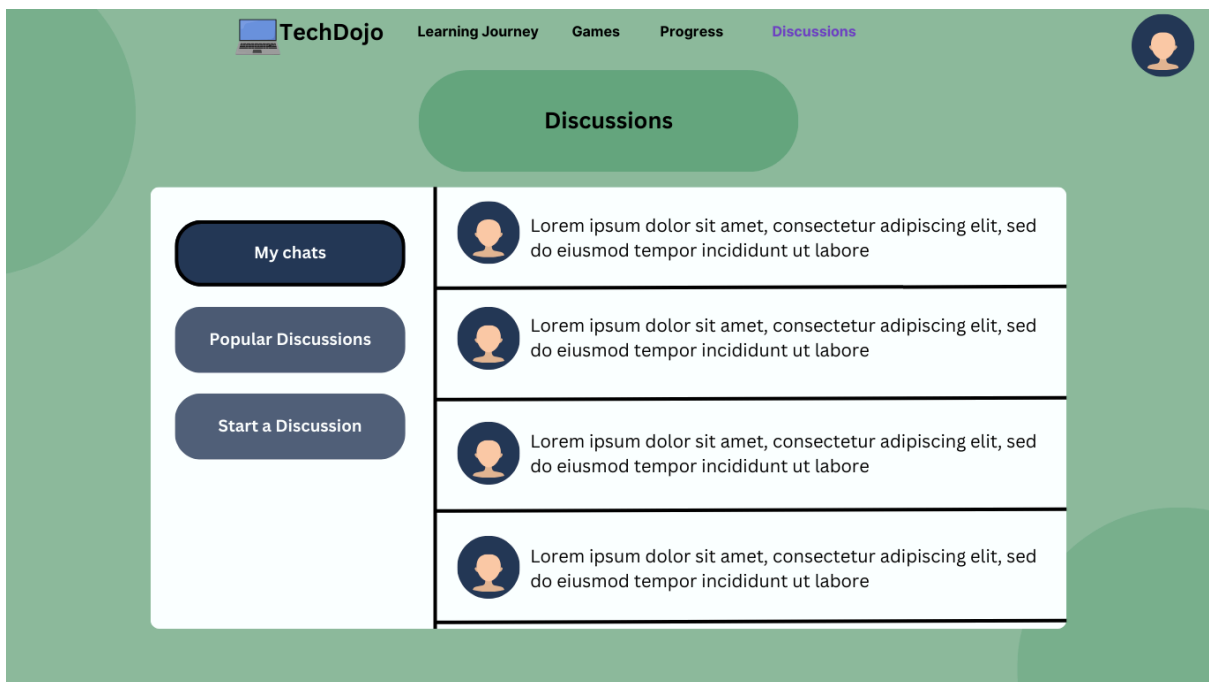


Figure 4.9 - Discussion threads and chats