KenyAInspire: An Adaptive Learning Platform. Project Plan and Task Allocation

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Date: 28th September 2024

1 Project Overview

1.1 Project Start Date

27th September 2024

1.2 Key Milestones

- Mini Hackathon: 11th October 2024
- Hackathon: 18th October 2024

2 Task Breakdown

1. Donnelly: UI/UX Development (Accessibility Features focused UI)
2. Alex: Backend Development (Databases, Integration and Management System)
3. Hassan: AI Models Development (Machine Learning & Natural Language Processing Models)

3 Project Timeline & Weekly Breakdown

3.1 Week 1: 27th Sept – 30th Sept

3.1.1 Donnelly

- Create wireframes and UI mockups.
- Set up the basic ReactJS project structure.

3.1.2 Alex

- Establish the backend architecture (Node.js).
- Design the database (MongoDB) schema for the platform.
- Implement authentication and user management system.

3.1.3 Hassan

- Choose machine learning models and NLP algorithms.
- Research Adaptive Learning Algorithms and Multimodal NLP.
- Start the implementation of the personalization engine (ML).

3.2 Week 2: 1st Oct – 10th Oct

3.2.1 Donnelly

- Develop the frontend interface for student, teacher, and admin portals.
- Add accessibility features (e.g resizable buttons/elements for the visually impaired etc)

3.2.2 Alex

- Set up API endpoints to connect the backend to the frontend.
- Implement database queries for student data, learning paths, and performance tracking.

3.2.3 Hassan

- Develop the initial ML and NLP models for adaptive learning.
- Implement basic text-to-speech and speech recognition features.
- Prepare a draft review of Adaptive Learning and Multimodal NLP for supervisor approval.

3.3 Mini Hackathon: 11th Oct

- Showcase working UI, basic backend integration, and initial AI model functionality.
- Gather feedback and refine the platform.

3.4 Week 3: 12th Oct – 17th Oct

3.4.1 Donnelly

- Polish the UI based on feedback from the mini hackathon.
- Complete all the accessibility featured UI elements.
- Add final interactive features.

3.4.2 Alex

- Finalize all backend functionalities (data synchronization, offline mode).
- Ensure seamless integration with AI models.

3.4.3 Hassan

- Ensure seamless integration with the Backend
- Complete the AI models for personalized learning and accessibility features.
- Finalize adaptive learning recommendations based on student progress.
- Refine NLP models for multimodal learning (text, voice).

3.5 Hackathon: 18th Oct

- Final presentation with complete platform functionality (UI, Backend, AI integration).

4 Algorithms & Models

4.1 Adaptive Learning (Machine Learning Algorithms)

We will use Reinforcement Learning for adapting learning paths based on student performance. The algorithm continuously assesses the student's progress and tailors the educational content accordingly. Key techniques:

- Q-learning: Helps in selecting the most suitable learning material for each student by analyzing their prior responses.
- K-Nearest Neighbors (KNN): Used to group students with similar learning patterns to provide tailored content.

4.2 NLP Algorithms (Multimodal NLP)

For NLP, we will implement:

- BERT (Bidirectional Encoder Representations from Transformers): Fine-tuned for contextually relevant translations and language comprehension.
- Text-to-Speech & Speech Recognition: Models like Google's WaveNet will be used for text-to-speech, and DeepSpeech for speech recognition, providing accessibility for disabled students.
- Multimodal NLP: We'll explore CLIP (Contrastive Language-Image Pre-training) for integrating text and image content, making the platform more engaging through multimedia learning.

5 Data Sources

- Kenyan Curriculum: Online resources, books, and open-source materials will be used for developing the content aligned with the Kenyan education system.
- Local Language Datasets: For NLP, datasets from African languages, especially Swahili, will be sourced from platforms like Masakhane and Nairobi-based linguistics research.
- Student Data: Historical student performance data (if available) or simulated data will be used for training the ML models.

6 Potential Partnerships

- Edutab Africa: They focus on AI in education and could offer data and insights.
- St. Paul's University: To provide Student grades and Learning resources (from library)

7 Project Document

The project document will be refined continuously, with daily and weekly updates on the progress of algorithms, UI design, backend integration, and AI model improvements.