Georgian Alphabet Learning Web Application

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Our project is a web-based educational application designed to help users learn the Modern Georgian alphabet through interactive exercises.

The core problem addressed by the project is the absence of modern, interactive, user-friendly tools for learning the Georgian alphabet, particularly for curious learners, who might find traditional resources inaccessible, unexciting, or too time-consuming to explore on their own.

The application guides users through a sequence of lessons containing different letter recognition tasks, audio-supported multiple-choice questions and letter-writing exercises. These tasks are designed to gradually build familiarity and reinforce visual and motor memory of the script. The web application has integrated gamification elements, such as XP, quests, daily streak and leaderboards, as a means to sustain user motivation over time and improve user engagement and experience [1]. Moreover, as the users progress, they are awarded badges that represent Georgian cultural symbols and reveal a short description when clicked. This offers users a glimpse into the country's heritage.

One key feature of our solution is the use of a machine learning-based handwritten letter recognition component. This component uses a convolutional neural network (CNN) trained on a dataset of handwritten Georgian characters using Python. When users draw a letter in their browser, the canvas input is processed as an image and passed to the model, served separately via a Flask API. This feature is grounded in research indicating that handwriting, as opposed to typing, promotes better memory retention, particularly due to its higher demands on cognitive and motor skills [2].

The broader solution architecture combines modern web development and design practices. The frontend is built using React and Next.js, which enables both responsiveness and server-side rendering for improved performance. The PostgreSQL database operations are handled via Drizzle ORM. The modular structure of the application supports scalability, future extension and additional content types.

References

[1] G. Zichermann and C. Cunningham, Gamification by Design: Implementing game mechanics in web and mobile apps, O'Reilly Media, Inc, 2011.

[2] M. Longcamp, M.-T. Zerbato-Poudou and J.-L. Velay, "A comparison between handwriting and typing," *Acta Psychologica,* vol. 119, no. 1, pp. 67-79, 2005.