Flex

a mobile AI gym instructor

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CS Senior Project

Flex is an AI-powered iOS application designed to help users work out anytime, anywhere, without the need for a personal trainer. By leveraging computer vision and machine learning, Flex provides real-time feedback on exercise form, helping users improve their workouts without human scrutiny or expensive coaching.

01

Opportunity

DIFFERENTIATORS

How our app is different from other workout apps

🎯 AI-Powered Exercise Guidance

- Uses computer vision to extract the user's pose in real time.
- Recognizes exercises with a classification model.
- Provides instant feedback using a deterministic algorithm.
- Provide quick answers with an AI chatbot.

🖥️ Smart Mirror Interface

- Displays a live video feed of the user.
- Overlays real-time hints to guide proper form.
- Offers customizable feedback (visual and voice guidance).
- Provides a summary and common mistakes at the end of a workout.
- Offers encouragement and rep counting.
- Detects your exercises automatically.

📚 Exercise Library & Search

- Includes a searchable exercise database with video demonstrations.
- Provides common form corrections, videos, and tips for each exercise.

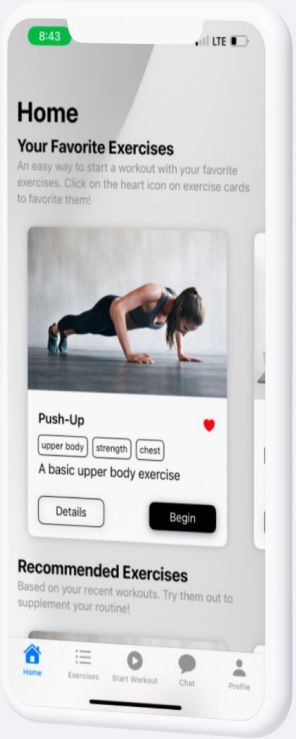
EASE OF USE

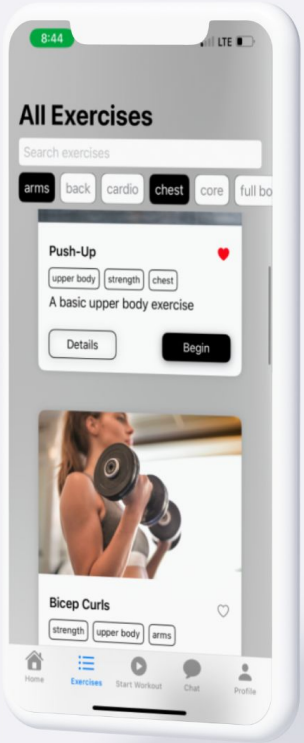
- Logs workout history and personal preferences in Firebase.
- Adjust feedback according to customized parameters.
- Provides personalized exercise recommendations based on past sessions.
- Displays user statistics to track progress over time.
- Connect with friends, share your workout progress, and encourage each other.

02

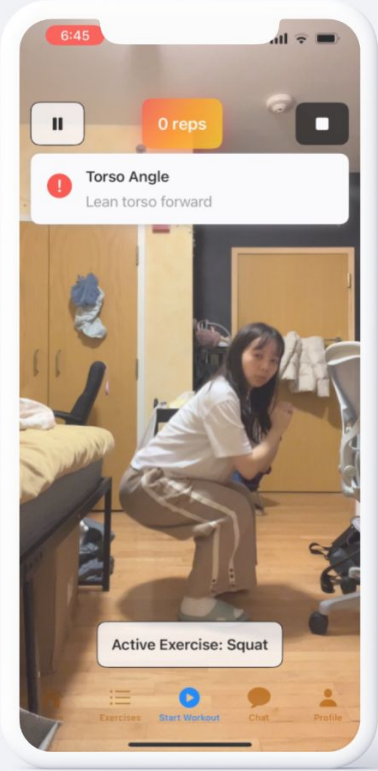
Solution

build your customized exercise bank





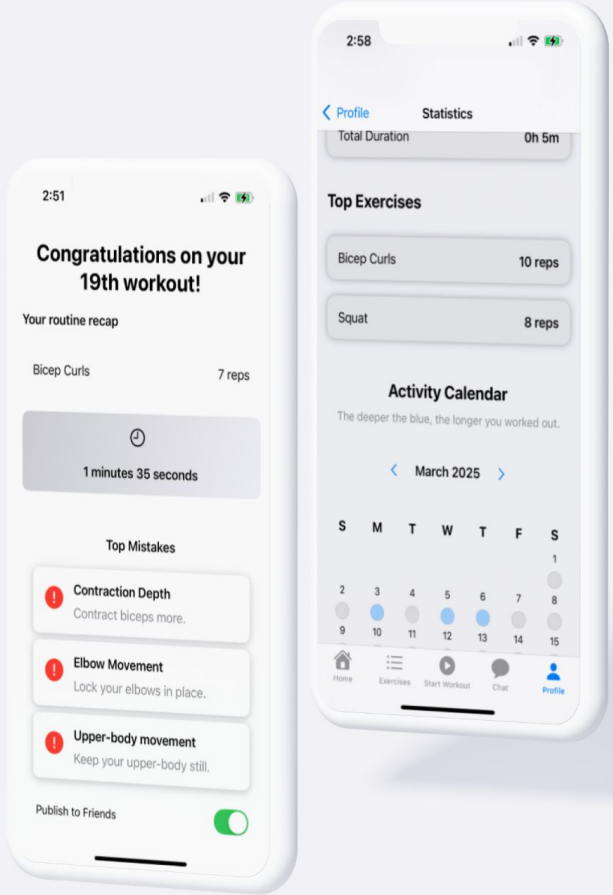
30 exercises to choose from

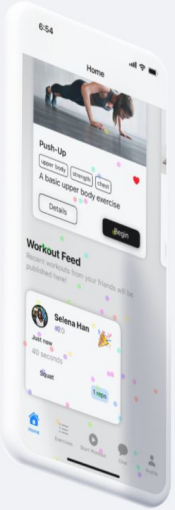


read and listen to real-time hints

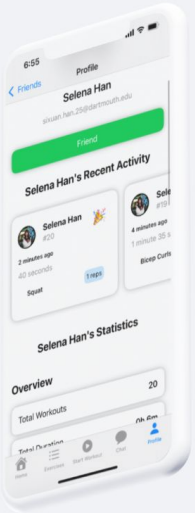
don’t worry about tracking reps

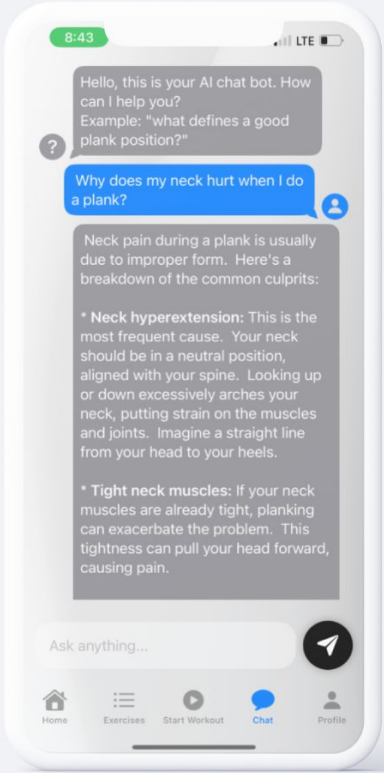
Track your progress





share your progress
with friends





ask your questions directly,
without getting judged

03

Technologies

📱 Frontend (iOS)

- Swift & SwiftUI for the user interface.
- AVFoundation for video processing.
- CoreML for on-device machine learning.

🧠 AI & Computer Vision

- Pose estimation to track user movements (MediaPipe).
- Exercise classification model for identifying exercises (PyTorch).
- Deterministic algorithm for real-time feedback.
- Google Gemini API for chat bot.

☁️ Backend & Deployment

- Firebase for workout history and user data storage.
- Python-based backend for AI inference.
- AWS EC2 (FRP tunneling) to reduce hosting costs while maintaining accessibility.
- Flask for deployment.

04

Future Work

BackEnd

- Polish hint generation and rep tracking.
- Deploy the backend entirely on an AWS EC2 instance and make it scalable.
- Arnold, our AI chatbot, should be able to pull information from the user's database and offer customized feedback.
- Mitigate delays and traffic with load-balancers and rate-limiters.

FrontEnd

- Enhance authentication, privacy, and security for logins and friends.
- Enable messaging between friends.
- Provide a tutorial for the app.
- Polish and bug fixes.