FormCoachAI

Personal Project Plan

Open Learning 2025

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Introduction

FormCoachAI is a personal project aimed at creating an AI-powered web application that helps users improve their gym exercise form through video analysis. This project plan outlines the vision, technical implementation, timeline, and learning objectives for developing a solution that solves a real life fitness problem. As a student in the Fontys ICT Open Learning (Delta), this project will allow me to demonstrate my technical capabilities while solving a practical problem I've observed firsthand.

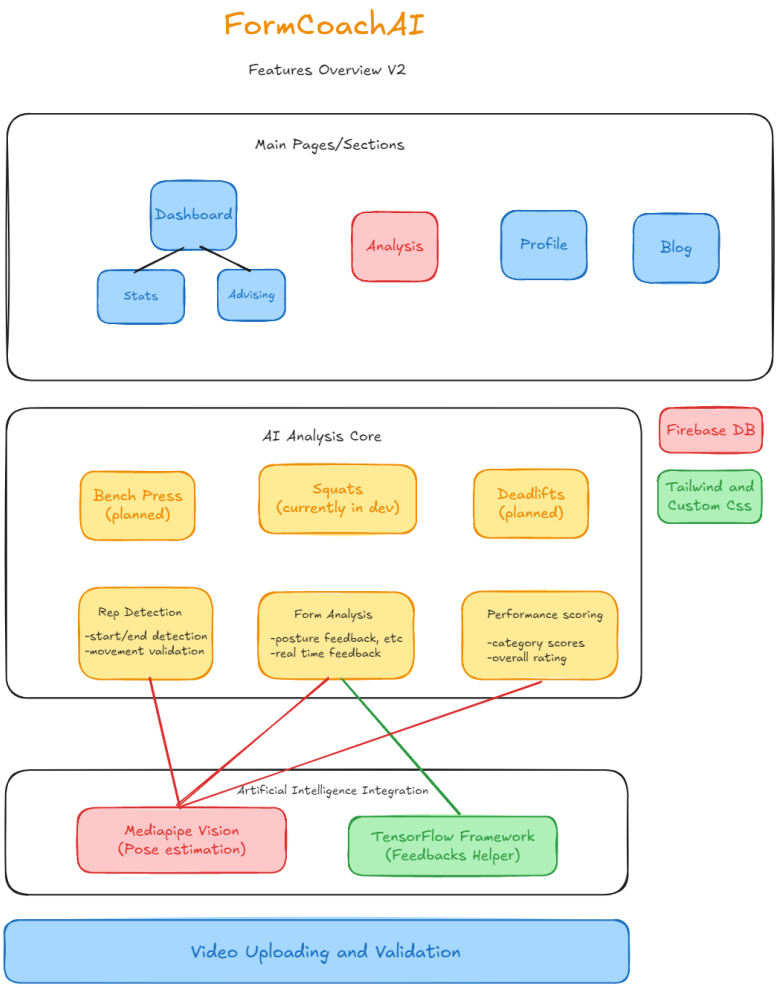
Project Vision & Goals

FormCoachAI will be an AI-powered web application that helps users improve their exercise form through real-time analysis and feedback. This project will allow me to deepen my skills in modern web development, AI implementation, and creating user-centered solutions.

Through this project, I aim to develop expertise in React/TypeScript development and gain hands-on experience with AI integration using MediaPipe and possibly other technologies. I want to build a complete application from concept to deployment while creating something that actually solves a real problem I've noticed at the gym.

Project Features Overview

Form Coach AI is a web app built with React that provides gym exercise analysis on technique.



The diagram above provides a visual overview of the key features and components of FormCoachAI.

This visual representation serves as a roadmap for development, helping to prioritize MVP features and maintain focus on the core functionality throughout the implementation phases.

Project Background & Motivation

As someone passionate about both technology and fitness, I've noticed many people at the gym struggling with proper exercise form. Incorrect form not only limits workout effectiveness but can lead to injuries. While personal trainers can help, they're expensive and not always available.

Target Users:

- Beginner weightlifters who can't afford personal training
- Intermediate lifters training alone without spotters
- Fitness enthusiasts wanting to refine their technique in main exercises

Current digital solutions in this space have limitations in user experience, accuracy, and accessibility. This project gives me an opportunity to create something valuable while developing my technical skills.

Technical Learning Plan

Technology Stack

For the frontend, I'll build with Next.js using React and TypeScript. I'm planning to use global CSS for styling and implement both server and client components architecture. For state management, I'll work with Context API or possibly React Query if the data fetching gets complex.

The AI part of my app will use MediaPipe for pose estimation, and I'll write custom algorithms to analyze exercise form. I might also integrate TensorFlow.js later if I need more advanced machine learning capabilities.

On the backend side, I'll use Firebase for authentication, Firestore for the database, and Firebase Storage for saving videos. I'll also need to implement proper security rules to protect user data.

For the actual development work, I'll use GitHub for version control and project management, Mermaid for creating architecture diagrams, and Excalibur for making flowcharts and general overviews. I'll do all my coding in VS Code with TypeScript and ESLint extensions to keep my code clean.

Frontend Development

I'll use React with TypeScript to build the user interface. This combination will help me learn component architecture best practices, develop type-safety skills crucial for complex applications, and gain experience with modern state management techniques.

For styling, I'll use Tailwind CSS with DaisyUI components. This approach will teach me utility-first CSS methodology, help me develop responsive design skills and also user experience best practices.

AI Implementation

Working with MediaPipe will expand my knowledge in manipulating information given from body pose estimation techniques, real-time data processing and analysis, and implementing AI libraries in web applications.

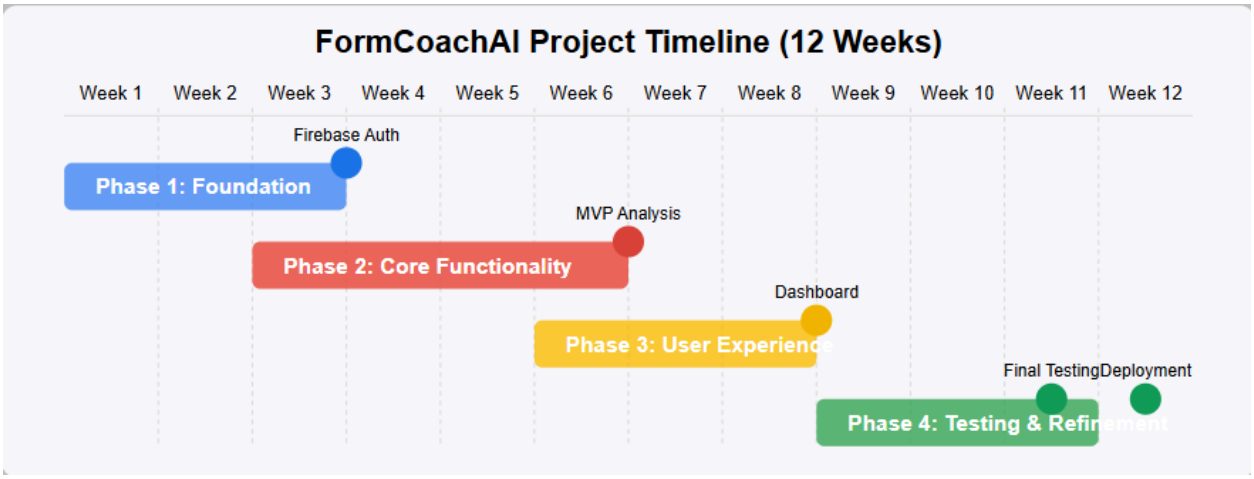
Additionally, I plan to explore integrating more advanced AI approaches:

- Using machine learning models to improve form detection accuracy
- Potentially using TensorFlow.js for custom model training
- Use AI in the video validation

Backend & Infrastructure

Using Firebase for the backend will develop my skills in cloud-based application architecture, authentication and security implementation and database design for user data and analytics.

Timeline



Each phase includes specific milestones and deliverables:

Phase 1: Foundation (Week 1-3)

- Development environment setup
- React/TypeScript skeleton
- Firebase integration
- Uniform AI

Phase 2: Core Functionality (Week 4-7)

- MediaPipe integration
- Form analysis algorithms for at least 2/3 exercises

- Feedback generation system
- Possible TensorFlow integration in the logic

Phase 3: User Experience (Week 8-10)

- User dashboard implementation
- Progress/Error tracking features
- Responsiveness on mobile
- Other New Possible Features

Phase 4: Testing & Refinement (Week 11-12)

- Comprehensive testing
- Performance optimization
- Final bug fixes

Key Milestones:

- Week 3: Complete Firebase Authentication
- Week 6/7: MVP Exercise Analysis Working
- Week 9: User Dashboard Complete + MVP improvements
- Week 11: Finalize User Testing
- Week 12: Final Deployment

Learning Resources

Throughout this project, I'll be drawing on a diverse set of resources to improve my skills and knowledge. The React and TypeScript videos/information available online will serve as my foundation, allowing me to build a robust frontend with type safety. Since exercise form analysis requires computer vision capabilities, I'll be deeply exploring MediaPipe tutorials and examples to understand pose estimation and skeleton drawing. For more advanced machine learning components, I'll learn about TensorFlow.js framework to see

if it can help with the main logic of the app, as it is quite complex. Firebase will be essential for the backend infrastructure, so I'll be following their guides and best practices to implement authentication functionalities, database, and storage solutions correctly. To stay updated with AI/ML approaches, I'll regularly check learning platforms and forums where people discuss the same approaches, as the “wheel dont need to be reinvented”. When facing specific implementation challenges, I'll also utilize AI chatbot tools to brainstorm potential solutions.

Expected Challenges & Solutions

Technical Challenges

- Accurate pose estimation: Will require testing multiple techniques and angle calculations
- Video validation: Video angles, quality, and landmarks tracking failure validation
- Accurate feedback: The feedback needs to be as accurate as a personal trainer.
- ML model training: Collect data and understand how the model can be integrated to improve the feedback logic.

Risk Assessment & Mitigation

While the technical challenges section outlines potential hurdles, this project faces various risks that require specific mitigation strategies.

Technical Risk Mitigation

To tackle pose estimation accuracy challenges, I'll implement multiple validation methods and test different angle calculation approaches to find the most reliable technique. I'll start with simplified models before adding complexity to ensure a solid foundation. Video validation issues will be addressed through research of already existing methods that check video quality, lighting, and camera angle before analysis begins. I'll also provide clear recording guidelines to help users capture usable footage.

For feedback accuracy concerns, I will start with simple and use progressive refinement of algorithms. Some sections of the feedback big area will include confidence scores so users understand the reliability of different suggestions. The ML model training complexities will be managed by starting with rule-based approaches first, and later adding some real usage training.

Project Management Risks

Beyond technical concerns, several project management risks require attention. Scope creep is a significant risk, as the desire to add features beyond the MVP could derail the timeline. To mitigate this, I'll define a clear MVP with prioritized features and maintain a separate backlog for future enhancements. Time management might become challenging as academic projects compete with project development time. I'll use personal weekly planning calendars and regularly check current timeline goals to ensure consistent progress throughout the project timeline. Unexpected technical blockers often cause delays in development. Resource limitations working within constraints of Firebase/AWS plans will be addressed by designing the architecture to optimize resource usage, excluding lots of data storage where it is not needed and upgrading plans if needed.

Learning Curve Challenges

I know I'll face some significant learning challenges with this project. MediaPipe implementation is completely new territory for me, and I'll need to figure out how to extract and use the pose data it provides. I'll also need to research and develop more advanced TypeScript algorithms than I've written before.

Going beyond the basic AI libraries to create a genuinely useful system will be challenging, as will developing accurate form analysis algorithms that actually help users improve. I'm excited about these challenges though - they're why I chose this project in the first place.

User-Centered Design Approach

FormCoachAI's development will be guided by user needs at every stage. I'll start by talking with friends that have a strong connection to gym/sports. This informal research will help shape the most intuitive ways to present feedback. When designing the feedback system, I'll focus on making information actionable rather than technical. Users don't need to know complex biomechanics - they need clear guidance on what to adjust. I'll use simple and concise language.

The goal of the main functionality page is to have the exercise analysis page fit in one computer screen, displaying a lot of valuable information in a small amount of pixels. The content of that page will mainly be the video player next 2/3 feedback sections with evaluation parameter scores, AI/algorithm form analysis messages and more.

The interface will be designed with accessibility in mind, using high contrast colors, readable fonts, and intuitive navigation that works well on both mobile and desktop. The goal is to have complexity behind simplicity. Since users will be viewing this after a work out, ease of understanding will be a priority.

Success Criteria

This project will be successful if:

1. The application successfully analyzes the technique of exercises (squats/ bench press/ possibly others..)
2. Users receive meaningful feedback and scores for each parameter of the evaluation
3. The interface is intuitive and responsive
4. I significantly improve my skills in React, TypeScript, AI integration and others

Documentation & Reflection

Throughout development, I'll:

- Maintain detailed documentation and upload it on canvas
- Keep a structured Git repository with structured commits
- Reflect on challenges and solutions

This project represents an ideal opportunity to combine my interests in fitness and technology while developing valuable skills for my future in software development.

Conclusion

FormCoachAI represents a combination of modern web development, AI technologies, and fitness expertise. Through this project, I expect to develop valuable technical skills while creating a practical solution to a real-world problem. The phased approach will allow for iterative development and continuous learning, with fitness user feedback guiding improvements throughout the process. By the project's completion, I aim to have not only a functioning application but also a comprehensive understanding of the entire development lifecycle, from concept to deployment, that will serve me in future professional environments. This personal project aligns perfectly with the self-directed learning approach of the Fontys ICT Open Learning program, allowing me to pursue both technical improvements and practical innovation.