

VisionFit Proposal

Group 5: Emre Guvenilir, Julian Tseng, Jack Bray, Harsh Desai
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1 Introduction

Describe briefly what the project is about, answering the following questions:

- What is the title of your project?
 - VisionFit
- What is the goal of the project?
 - VisionFit is a web application that leverages computer vision and video analysis to provide users with comprehensive feedback on their workouts. Our platform is designed to assess, based on the user's video input, the barbell speed, velocity, form, fatigue, and injury risk, with a particular focus on the three compound lifts: squat, bench, and deadlift. Beyond movement analysis, VisionFit incorporates user input (bulk vs. cut, etc.) to generate personalized diet recommendations as well as warm-up and cool-down strategies, ensuring a holistic approach to fitness and injury prevention. Lastly, we plan to implement a feature enabling trainers to review the performances of their athletes.
- What is the motivation for this project?
 - One of our team members is an experienced olympic weightlifter and another member is an experienced powerlifter. This project not only provides a learning opportunity on software design, it aligns with our passion for physical activity as well. Ultimately, we hope to develop a software that goes beyond the classroom setting and benefits other athletes with their training. All members are also interested in learning how to develop computer vision products.
- Who are the customers/users?
 - Athletes and their trainers
- What development process will you be using?
 - We will be using the iterative process as our project contains a number of different components including video analysis, diet and workout plan generation.

Given the time constraints, this approach will allow us to continuously review our work and potentially adjust the scope of our project.

2 Novelty

- Describe the novelty about the project. For example, what's new about the project compared to existing Software? Having a fancy UI is NOT a novelty. A novelty in research/project refers to the introduction of a new idea or a unique perspective that adds to the existing knowledge in a particular field of study. It involves bringing something fresh and original to the table that has not been done before or exploring an existing topic in a new and innovative way.
 - Our project will be unique compared to alternatives on the market by being a complete app for athletes in their training. This project will analyze lifts done in the gym by athletes and measure bar speed, acceleration, time under tension, form analysis such as range of motion and symmetry. The app will also be able to do repetition consistency to measure breakdown over time. In addition to these things, the app will differentiate itself not only from the video analysis but by giving exercise recommendations based on inputs not typically accounted for, such as training goals and a rate of perceived exertion during lifts (RPE). The app will also give exercises for warm up and cool downs and utilize APIs to do diet analysis and give suggestions, making the app a complete one-stop-shop for athletes.
- For this project, select two comparison software programs. Study the software and develop an idea of how you do better than them. Again, simply having a fancy button is not a novelty. It needs to be important, such as why implementing new features lacking in the existing software is important.
 - One software competitor is Kemtai, <https://kemtai.com/product/exercise-library/>, but their demo system only allows users to get feedback on their lifts and provides basic feedback. Our app will be much more expansive and be targeted towards athletes, with the benefits added above. Many such apps on the market allow the functionality done in this app, so we are differentiating ourselves by being a one stop destination for comprehensive athlete needs.

- Another software is the Nike Training Club which provides many of the benefits we are proposing including nutrition advice and a database of workout programs, including warm ups. However, this app does not provide lift feedback by AI usage. Our app combines both the models of the respective software companies, providing the most complete version of a fitness app.

3 Customer Needs

- Who is the primary customer outside the team?
 - Athletes and Trainers
- Who are the secondary stakeholders?
 - Physical therapists, gym owners, equipment manufacturers, professional lifting federations
- What do the stakeholders want? Why?
 - Accurate feedback on exercise form and personalized recommendations for training and nutrition. Intuitive interface that integrates seamlessly into fitness routines. Reliable and scientifically backed recommendations to improve athletic performance. A tool to complement coaching by providing additional data and analysis on their athletes' performance.
- What is their desired overall experience?
 - An intuitive interface that integrates seamlessly into their fitness routines and reliable and scientifically backed recommendations to improve athletic performance
- 3.1 User Requirements
 - Write at least 5 SMART user stories based on the stakeholder's needs and wants:
 - As an athlete, I want to receive a percentage-based breakdown of how well I perform each phase of a lift (e.g., setup, execution, and lockout) so that I can focus on improving specific areas of my form.
 - As a powerlifter, I want weight suggestions for my next set based on my rate of perceived exertion (RPE) from the last set so that I can optimize my training intensity.

- As a user aiming to bulk, I want meal suggestions that meet my caloric surplus goals and include foods I enjoy so that I can stay consistent with my diet.
 - As an athlete recovering from an injury, I want the software to monitor and compare my current lifting performance against my pre-injury benchmarks so that I can track my recovery progress.
 - As a coach, I want the ability to review my athletes' feedback reports and adjust training plans directly through the platform so that I can better manage their progress.
- 3.2 Acceptance Tests
 - Write at least 5 acceptance tests for the user stories using the template:
 - When the video is received and analysis is completed, the system provides detailed form suggestions with visual and textual feedback.
 - Given the athlete's previous set data, when the next set is calculated, then the system recommends an appropriate weight adjustment based on the athlete's performance and goals.
 - Given the user's entered fitness goals (bulk or cut), when the diet module is accessed, then the system generates a detailed meal plan with caloric and macronutrient breakdowns.
 - Given a user requests their weekly summary, when the system retrieves their data, then it provides graphs and metrics showing changes in strength, form consistency, and diet adherence.
 - Given a bar path analysis, when the bar deviates significantly from an optimal vertical trajectory, then the system displays a graph and explains how to correct the movement.

4 Project Goals

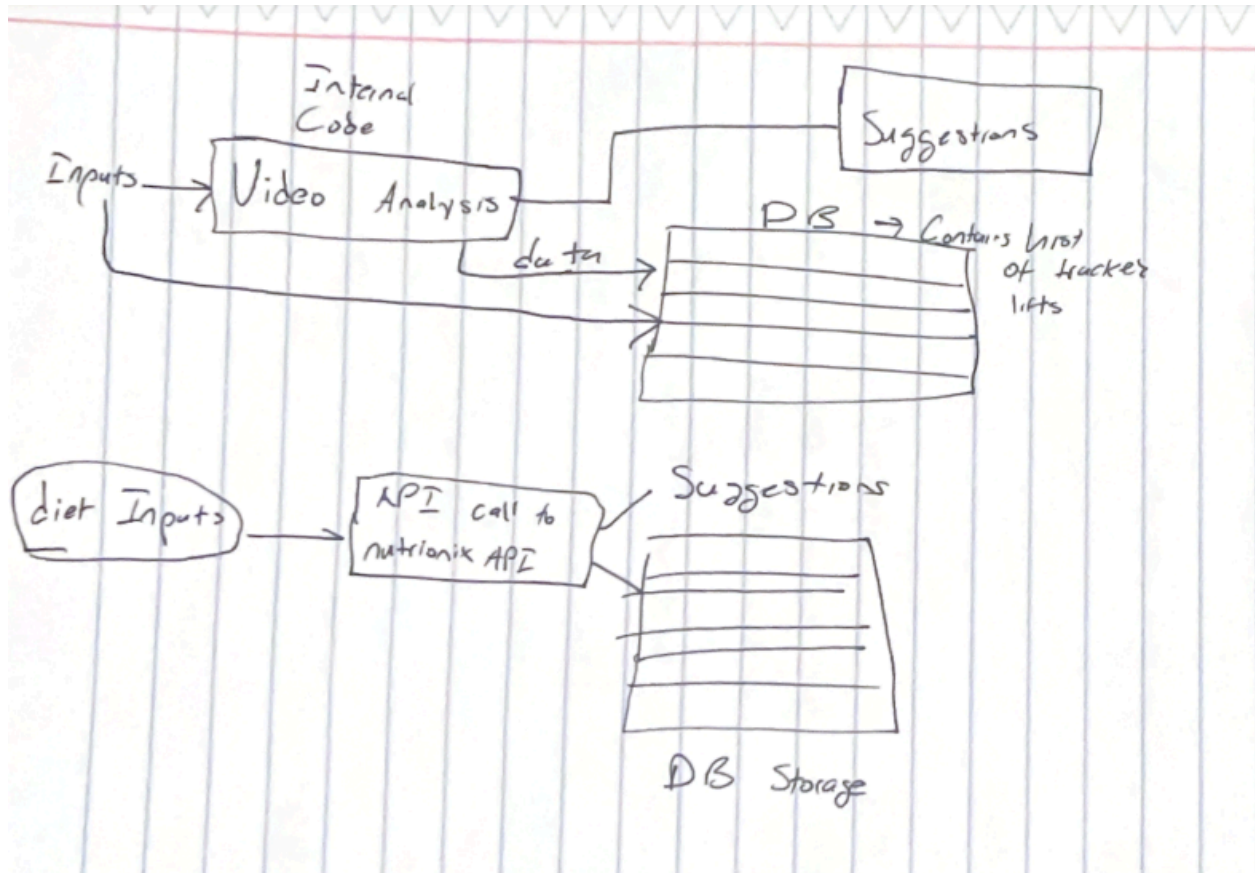
- 4.1 Customer Problems and Benefits
 - What customer problem have you chosen to address?

- Workout apps often provide generic instructions that lack specificity and personalization, making it difficult for users to improve their form, optimize their training, or achieve their fitness goals efficiently.
- In implementation-free terms, what user benefit will the system provide? How will the benefit support the customer's desired overall experience?
 - The system will provide personalized, actionable feedback on form, weight recommendations, and dietary plans tailored to individual needs and goals (e.g., bulk, cut). By offering clear, specific guidance and tracking progress, users will feel more engaged and supported in their fitness journey. For coaches, the app would provide supplemental tools, allowing them to deliver better results to their athletes and enhance trust in their coaching.
- 4.2 Measure of Success
 - Who outside the team have you tested the idea on?
 - 4 athletes: (2 wrestlers, 1 baseball, 1 football). Additionally, we talked to 2 doctors and 1 gym trainer/strength coach.
 - How will you know whether the customer got their desired benefits?
 - Collect reviews from users on whether the app's feedback improved their workouts. Monitor app engagement levels, including repeated use of feedback features and adherence to recommendations. Analyze improvements in users' lifts (e.g., weight lifted, form metrics) and diet adherence over time.
 - What are your customer-centric measures of success?
 - Achieving an average satisfaction score of 4.5/5 or higher in surveys after a week of usage. Over 80% of users report measurable improvement in strength, form, or diet goals within 3 months. At least 60% of users return to the app weekly after the first month.

5 System Description

For this proposal, a rough draft of this section is enough.

- Draw a block diagram to show how the proposed system will interact with external services, databases, etc. Clearly mark the boundaries of the system?



- Use the above diagram to introduce the system.
 - The user will see a variety of inputs after logging into the system and choosing the process they want to go through. In addition to those inputs, the user will upload a video and the code will run in the backend. The user will then see the results outputted and those results will be put into the database. Separately, there will be a hub for trainers to view their assigned athletes, where they can extract data and videos from the database.
- What are the main elements of the proposed system?
 - The main elements are the input system, database management system, and computer vision that will need to be implemented.
 - Front end UI system, backend, API connections also are elements of the proposed system.

6 Solution Approach

For this proposal, a rough draft of this section is enough.

- Briefly describe how the system will work.
 - Vision Fit is a web application that integrates AI and Computer Vision for fitness tracking and training. The system features an intuitive UI built with HTML, CSS, and JavaScript, seamlessly connected to a backend powered by Python and an extensive database managed via AWS or Firebase. Users can log in with their credentials and upload workout videos, which will be analyzed using Python libraries such as OpenCV and AI models like MediaPipe or TensorFlow. The system will process the videos asynchronously and provide detailed feedback on form, technique, movement, and pace to help users refine their workouts. Additionally, AI-powered training and diet plans—generated using APIs like GPT-4o mini—will offer customizable, week-long programs tailored to individual needs. The system will also track user progress by retrieving past data from the database. The system will also update the inputs made by users and suggestions in real time, allowing users to access them later. Finally, the platform will include trainer and user dashboards, enabling trainers to monitor their assigned athletes' progress and provide personalized guidance.

- What technologies (platform, tools, libraries, programming languages) will you use and why?
 - We will be using Jira as a project management tool. Emre has used this tool before and demonstrated to other team members how helpful it was with organizing and keeping track of our progress.
 - We will also use mainly python for the implementation of computer vision needs. We will utilize JS, JQuery, SQL, Amazon DBs/Firebase, OpenCV and Tensorflow/MediaPipe for the software development side of the project. Lastly, HTML, CSS and JS for web development

- How will you test and measure the adequacy of your test strategy?
 - Ensure system accurately tracks movements and forms when performing three core lifts and is able to compare it with the ideal form
 - Ensure the database is being updated in real time with it keeping track all user's past inputs and generated feedback and suggestions
 - Ensure system is capable to handling multiple users simultaneously
 - Ensure design elements such as responsive UI and dashboards work across devices
 - Ensure the accuracy of AI models and diet plans using expert advice such as doctors.
 - Ensure appropriate user customization are recorded such as allergies or particular demands and kept in mind when generating suggestions

7 Project Management

- What development process will you use (Scrum, XP, Scrum+XP, etc.)? What are the reasons behind your choice?
 - We will utilize the scrum development process. We will use JIRA to track our progress and sprints. JIRA allows us to set up a board, have a backlog, effectively move items in and out of sprints (does 2 week intervals), assign story point values, breakdown tasks into cards, and assign them on a board where everyone can see their own and others' progress. We chose scrum over XP because it is less rigid in the development practices such that each member is given autonomy to complete their work. We also want the developers to choose the priority of tasks in a given sprint, especially given the constraints of the class. In a small window of development time, delivering functionality is more important than bug free software.
- Describe your (brief) goals for each iteration (Proposal-Report 1, Report 1 - Report 2, and Report 2 - Final)

- Proposal to Report 1:
 - Finalize the Tech Stack and initial scope of the project in correlation with the existing time constraints
 - Have a front-end framework for Vision fit with UI and design elements planned out. In addition, get the backend setup using Python connected to a database
 - Get started on the computer Vision aspects started with libraries like OpenCV and TensorFlow/MediaPipe initialized and integrated in the project
- Report 1 - Report 2
 - Combine the front-end and backend components to get a working web-app
 - Integrate computer vision aspects into the web-app
 - Refine the models for effective and accurate analysis of form and techniques of the lift
 - Testing: Login credentials
 - Testing: Database updating and retrieval
 - Testing: Video inputs
 - Testing: Analysis and Feedback
 - Customer: Improve or revise acceptance tests if user needs change
- Report 2 - Final
 - Final refining of models and expanding range of exercises
 - UI: dashboards for Users and Trainers
 - Final Overall Testing of Functionalities
 - Customer: Review of Product and any last changes
 - Deployment and launch of Vision Fit

8 Team Management

- 8.1 Roles
 - What are the planned roles for the team members?

- Jack Bray: Product Owner, Developer
 - Emre Guvenilir: Scrum master, Developer
 - Julian Tseng: Developer
 - Harsh Desai: Developer
- What are the reasons for your decision?
 - Since Jack has the most connections to our customer base, Davidson College athletes, we thought it would be best that he takes on the role of product owner and be the main representative of our team.
 - Emre has the most experience in Computer Science as well as experience in the industry, so we decided he would be the Scrum Master for this project.
- 8.2 Scheduling
 - How often will the team meet?
 - The team will hold weekly meetings on Monday and a spring planning session every 2 weeks.
 - How will you meet as a team? Zoom? In-person?
 - We will meet in person and on Zoom for sprint planning.
 - How often are you planning to meet your customer(s)?
 - We plan on meeting with the customers once every two weeks.
 - How will you meet with your customers? Zoom? In-person? Is this agreed with your customer(s)?
 - We will meet with our customers in person and this has been agreed upon by both parties.
- 8.3 Background
 - Write brief introductions of each team member related to the experience and background of the project. For example, student A has experience developing Android mobile applications using Java. Simply having an experience in certain programming languages is fine as well. Consider this section an opportunity to determine who can be responsible for what part of the system (e.g., experience in JavaScript can do a front-end development while Java can do a back-end, etc.
 - Jack Bray: Proficient in Python, Java. Currently taking CS250 (C++).

- Emre Guvenilir: Experience in full-stack for web based software development, database management, and other relevant areas. Java and C++ on backend, JQuery, HTML, CSS, etc on frontend
- Julian Tseng: Proficient in Java and Python
- Harsh Desai: Experience in front-end development. Proficient in web dev tools, JSON, Python, Java and C.

9 Constraints and Risks

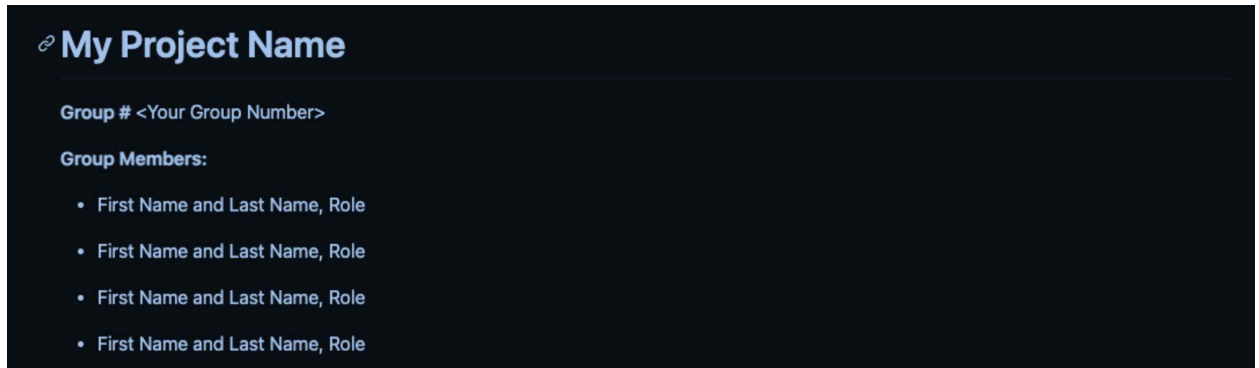
- Are there any social, ethical, policy, or legal constraints?
 - Users may be reluctant to share personal data, such as videos of themselves or dietary preferences, due to privacy concerns. Ensuring secure data handling is crucial to build trust.
 - The app must cater to users of diverse backgrounds, fitness levels, and abilities to ensure inclusivity.
 - Algorithms must avoid biases that could lead to incorrect or unsafe advice. Feedback must be accurate and validated to prevent harm.
 - Compliance with regulations like GDPR or CCPA is essential for handling user data responsibly. This includes securing video uploads, personal information, and dietary preferences.
 - The app must include disclaimers to clarify that its recommendations are for informational purposes and should not replace professional medical or fitness advice.
- Will you have access to the data, services, and resources you need?
 - Yes, we can train and validate the movement analysis algorithms using a diverse dataset of squat, bench press, and deadlift videos from volunteers who we know. Once we have the training data, we can use that to inform the beginning of new users' data and build from there. We can scrape the web for dietary advice or nutritionist advice directly from the coach.
- Is there anything else you might need?

YouTube tutorials, also may need to pay for API access or DB services.

10 GitHub

Follow the instructions below:

1. One person creates a GitHub repository.
2. Add other members to the repository as collaborators.
3. Update your README.md file with the title of your project, group number, and group members with roles. Example below:



4. Add me (username: hlim1) to the repository as a collaborator.
5. Create a folder called "Reports" in the main branch.
6. In the folder, add this proposal. You will add all the reports to this folder in addition to the submission to Moodle.
7. Take a screenshot of the 'Collaborators' page and add it to this section.