18-500 ECE Capstone

Proposal Presentation: My-Flection

2/9/22

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Use-Case

The goal of our project is to create a device that will assist our users in picking an outfit for their day. By implementing AI Vision technology into a smart mirror, we can create a device that will see what shirt you are wearing as you walk in front of your mirror, and give you suggestions on how to complete your outfit.

Our project will cover:
1) Software Systems
2) Hardware Systems
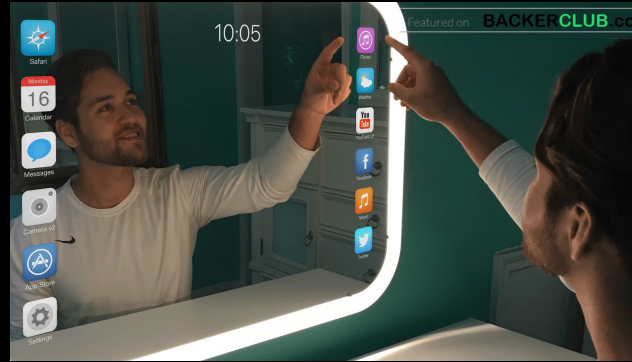
Use-Case Requirements

The major factor that we took into account when deciding our project requirements was:

● What is comfortable for the user

Long response times might make the user conceive our mirror as being slow and unresponsive, which can become a frustrating experience. In the same sense, providing a wrong outfit, or not being able to properly store the users wardrobe may also be annoying from the user's perspective.

Use-Case Requirements

Requirement	Predicted Value
App response time	< 200 ms
Outfit Recommendation	< 10s
Color Detection Accuracy	90% <
Storage Capacity for Clothes	2 GB

Technical Challenges

- Integrating the Computer Vision Technology that will allow us to analyze what the user is already wearing.
- Creating a method that can accurately provide good outfit suggestions based on the information we have gathered.
- Providing the user with their outfit suggestion in a timely manner.
- Providing a smooth user experience via our app when inputting clothes into database.
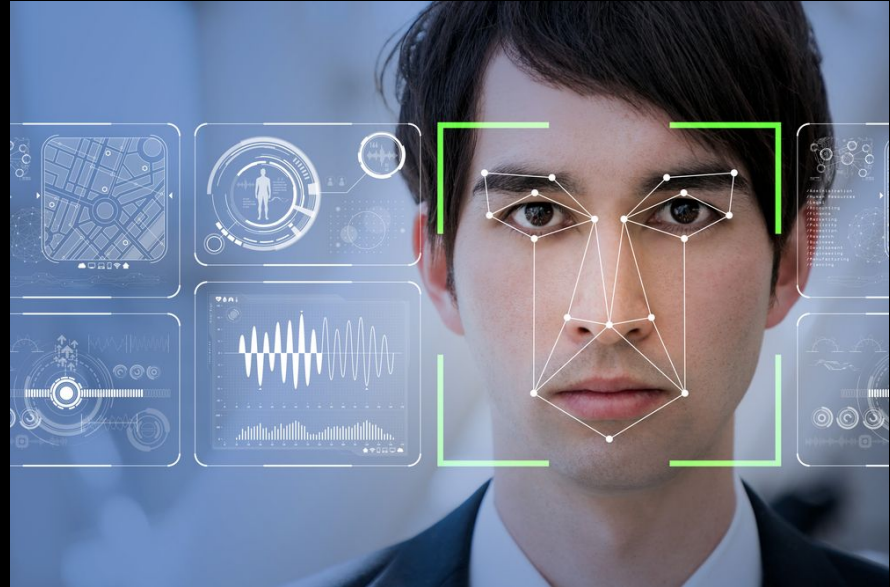
Solution Approach

Our plan is to create a smart mirror that our users can interact with in order to find an outfit that suits them. Using an Nvidia Jetson Xavier nx and a camera, we can capture images of the user and analyse them to learn what they are already wearing, and what else they should wear with their current shirt.

Necessary for Solution Approach

Hardware:
Jetson Nano/Xavier
- Computation times and processing speeds well under our use case requirements
Arducam
- Plays a part in accuracy of analyzing appearance because camera quality needs to be good enough
Display monitor
- Decent resolution for display

Software:
Node.js
- Steady internet connection for real-time weather database to the mirror
National Weather Service API
- Hourly weather database
Python, OpenCV, Pandas
- Color detection using computer vision libraries

Solution Approach Diagram
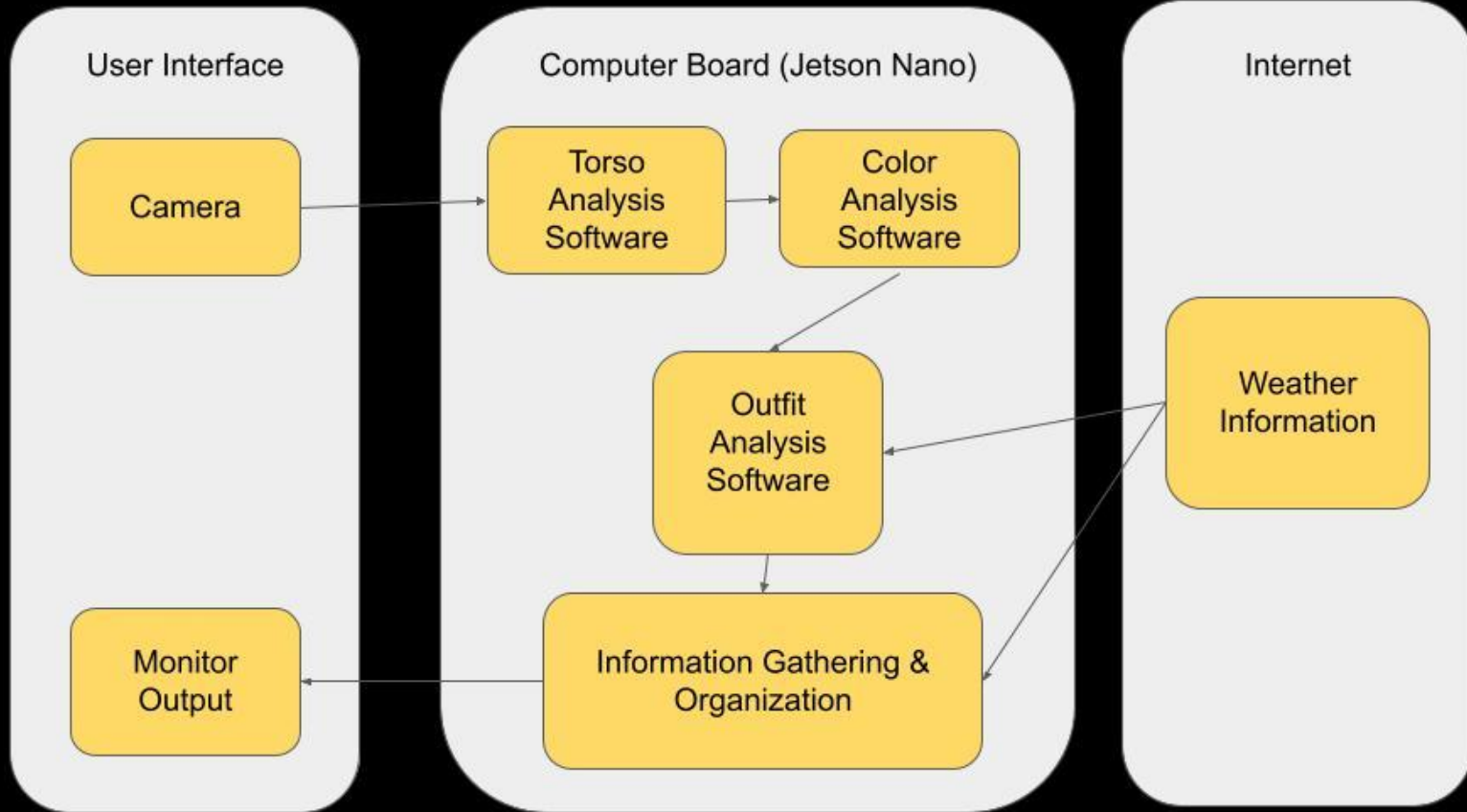
Testing and Metrics

First, to test the low latency app response, we will test the difference between the input signal timestamp and the output signal timestamp. Color accuracy can be determined by using a percentage similarity algorithm based on color. Other requirements such as size, weight, and power can be easily measured using their respective methods.

Division of Labor

Torso & Color Analysis

Jeremy Ryu
Yun Lee

Outfit Analysis

Wonho Kang
Jeremy Ryu
Yun Lee

Information Gathering & Output

Wonho Kang
Ramzi Hamdalla

Hardware Applications

Ramzi Hamdalla
Wonho Kang

Schedule

Week 1-3

- Project Research
- Proposal documentation

Week 4-9

- Software & Hardware modular implementation

Week 9-15

- Testing
- Demo Prep

Phase 1: Proposal

Phase 3: Implementation

Phase 5: Demo

Phase 2: Design

Phase 4: Integration

Week 3-6

- Parts Research
- Budget Analysis
- Design Plan

Week 6-10

- Integrate Software & Hardware modules
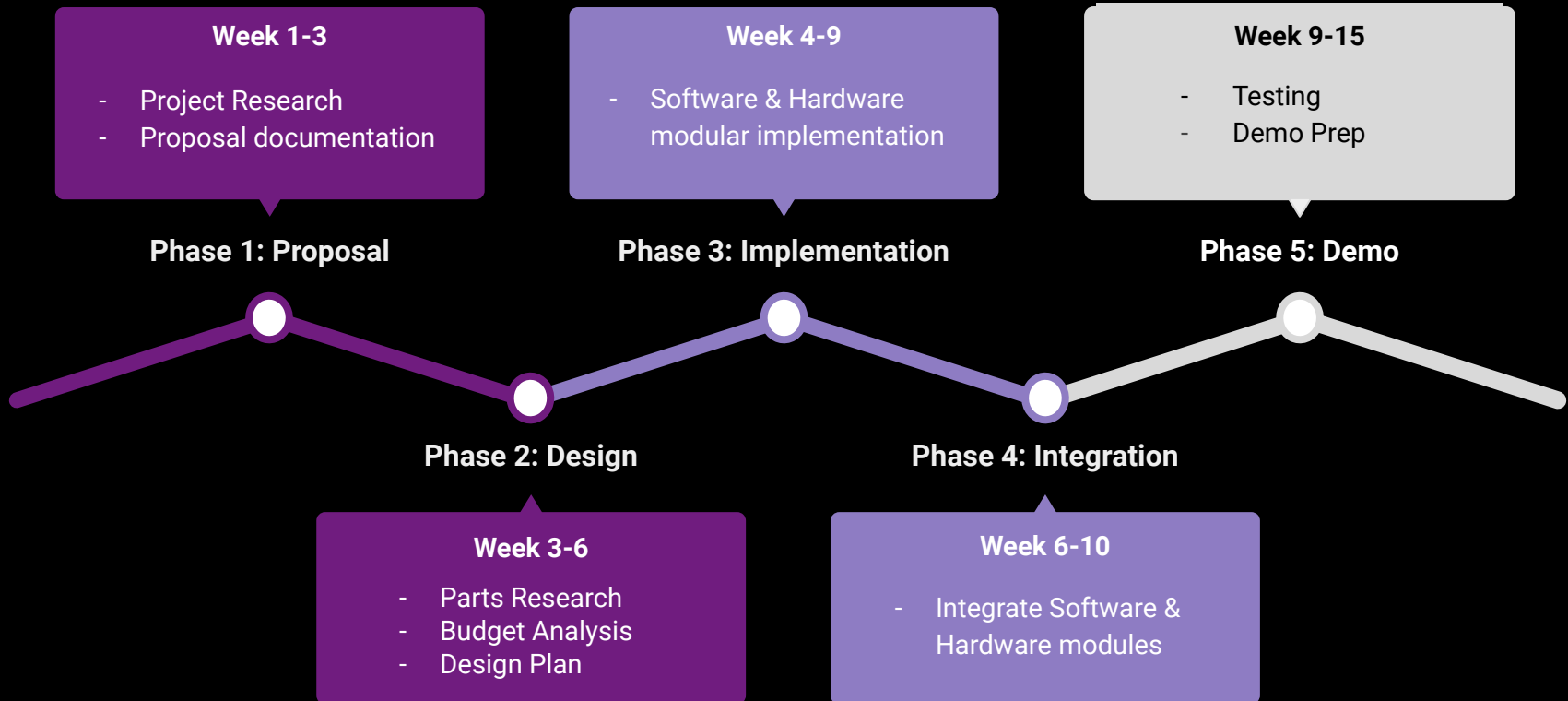
Detailed Schedule

TASK TITLE	TASK OWNER
Date	
Phase 1: Proposal	
Problem identification	
Solution Ideation & Project Research	All
Abstract Proposal	All
Proposal Presentation Slides / Prep	All(Ramzi)
Phase 2: Design	
Finalize Design Plans based on Proposal	All
Hardware Parts Research	All
Software API & Tool Research	All
Budget Analysis	All
Purchase Materials	Wonho
Design Presentation	All(Jeremy)
Phase 3: Implementation	
Color recognition	Jeremy, Yun
Database buidling for user closet	Jeremy, Yun
Outfit recommendation based on color	Wonho, Jeremy
Outfit recommendation based on weather	Wonho, Jeremy
Color + Weather based recommendation	Yun, Wonho
Familiarize with App development(Swift)	Yun, Ramzi
App backend	Yun, Ramzi
App frontend	Yun, Ramzi
Mirror UI Software	Wonho
Phase 4: Integration	
Camera & Circuit Integration	Ramzi
Fabricate Frame Parts	Ramzi, Wonho
Frame Integration	Ramzi, Wonho
Color detection + Outfit recommendation	Jeremy, Yun
App + Software Integration	Yun
Phase 5: Testing and Demo	
Hardware Component Testing	All
Software Modular Testing	All
Full system testing	All
Requirements Check	All
Improve based on requirements check	All
Final Presentation Slides & Prep	All
Demo Prep	All
Final Demo & Poster Prep	All
Final Demo, Poster, and Report	All

Weeks 1–15 (columns M T W R F), Dates: 17 18 19 20 21 24 25 26 27 28 31 1 2 3 4 7 8 9 10 11 14 15 16 17 18 21 22 23 24 25 28 1 2 3 4 7 8 9 10 11 14 15 16 17 18 21 22 23 24 25 28 29 30 31 1 4 5 6 7 8 11 12 13 14 29 18 19 20 21 22 25 26 27 28