



# Team B8 - Smart Mirror

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# Application Area



Lulu Lemon's MIRROR



HiMirror Vanity



DIY Smart Mirror

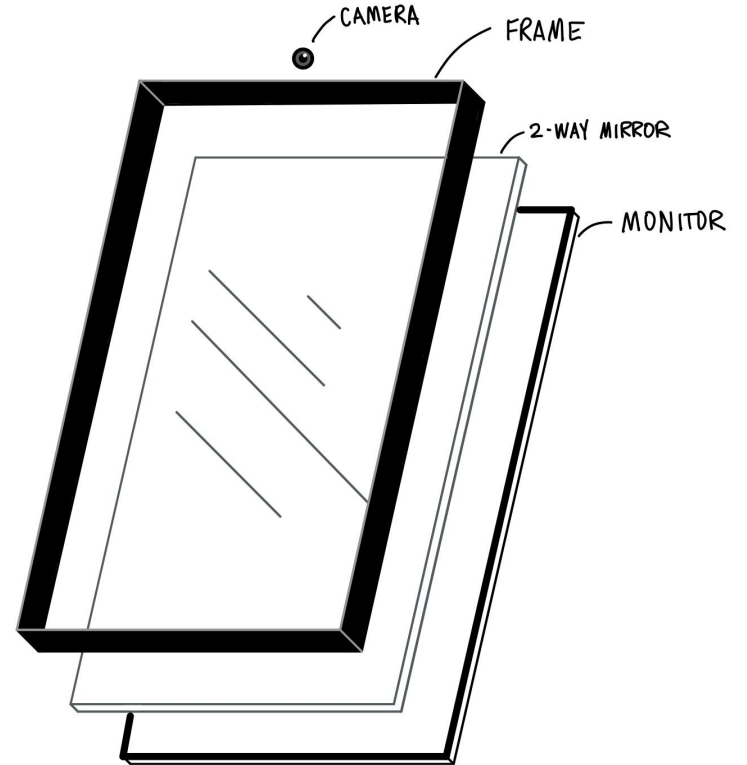
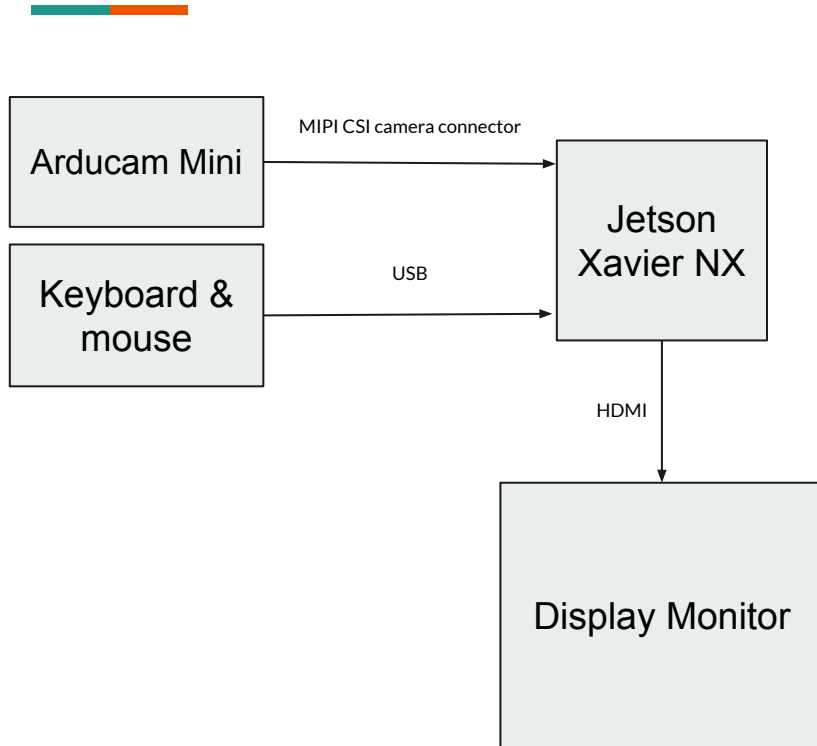


## Solution Approach (overall)

*We want to make a simple, inexpensive and accessible smart mirror that utilizes a torso\* recognition computer vision algorithm to allow users to select and try on tops.*

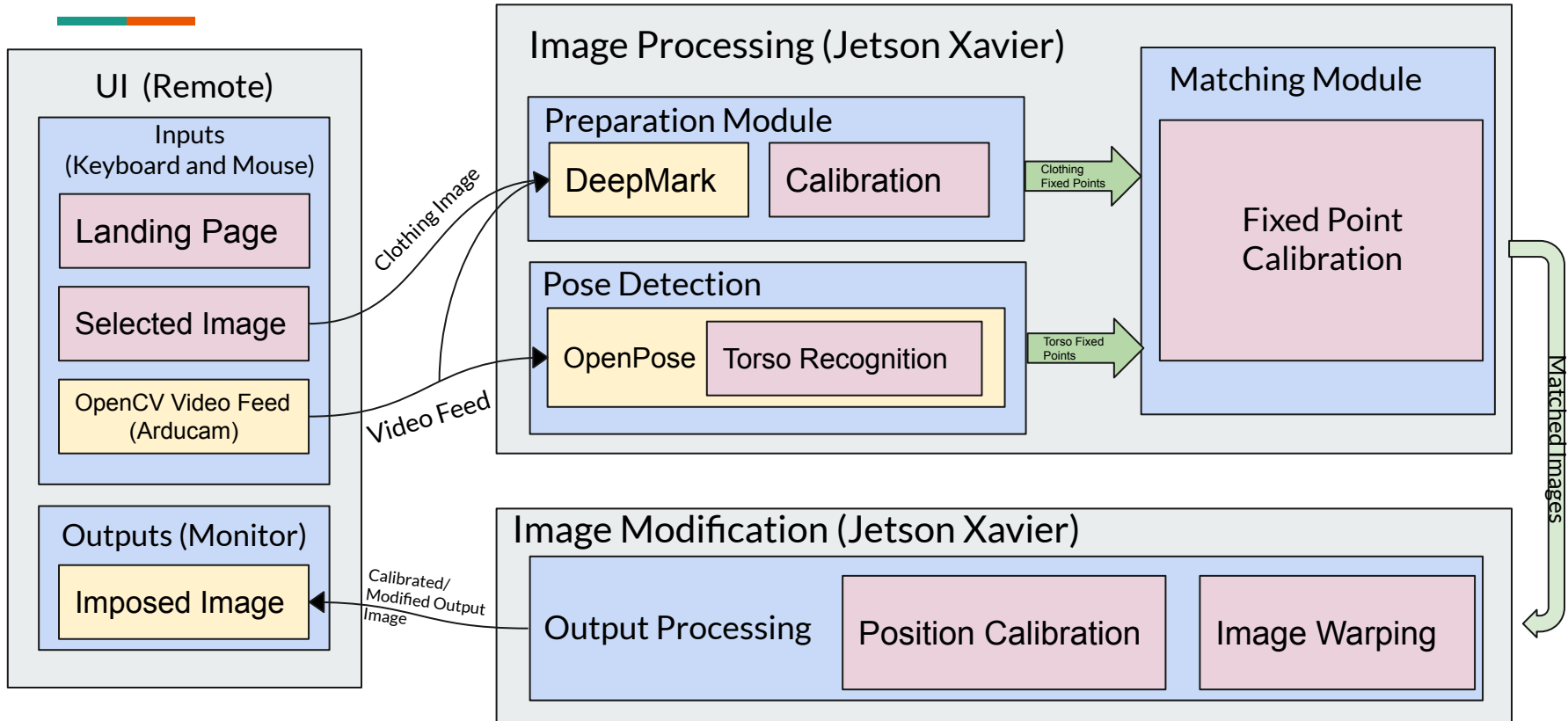
\*Note: to maintain manageable scope, we are limiting our recognition algorithm to tops only.

# Block Diagram (hardware)



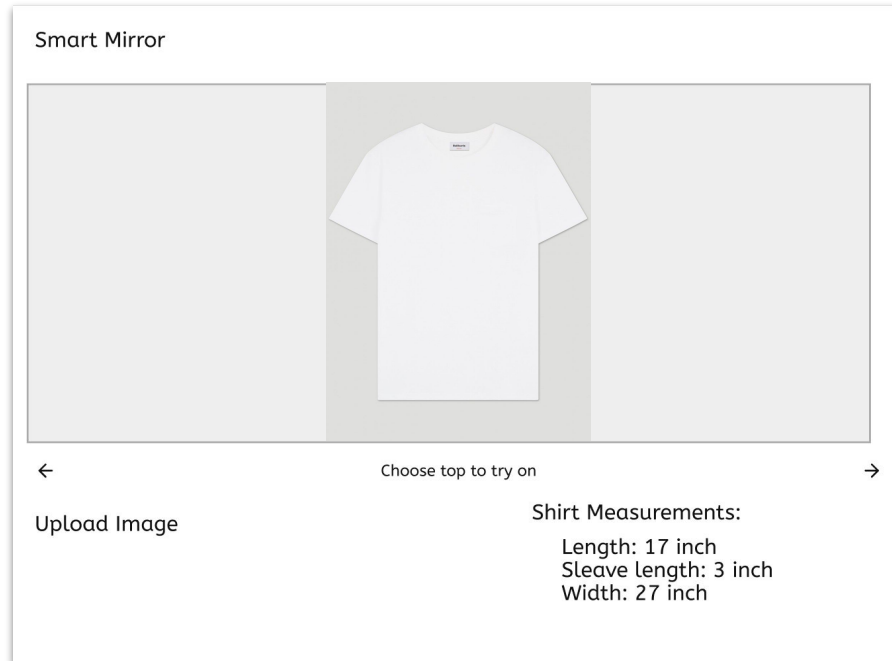
# Block Diagram (software)

- Legend**
- Module
  - Sub-module
  - Package/Library





# User Interface





# System Specification

| Item                                  | Specification                | Price          |
|---------------------------------------|------------------------------|----------------|
| NVIDIA Jetson Xavier NX Developer Kit | 8 GB Memory                  | \$399.00       |
| 32 inch Monitor                       | 32 inch                      | \$108          |
| Arducam Mini                          | 30 fps at 4K, 60 fps at 1080 | \$64.99        |
| Two-way acrylic mirror                | 24 inch x 36 inch            | \$89.99        |
| <b>Total:</b>                         |                              | <b>~ \$662</b> |



# Implementation Plan

## Hardware:

- Jetson Xavier NX integrated with Arducam
- Two way mirror placed in front of monitor
- External computer where the user interface will be and will be used to upload images onto the smart mirror
- Connect keyboard and mouse directly to the Jetson Xavier NX to control the mirror

## Software:

- OpenPose - find the measurements as well as key points on the body
- DeepMark - find key points on images of clothes
- Integrate the key points found using OpenPose with the key points found on DeepMark
- User interface for user to input images of clothes to put into mirror as well as measurements of clothes





## Testing, Verification, Metrics

| Requirement                     | Test   | Metrics  |
|---------------------------------|--|--|
| Clothing Image Processing Speed | Time Decorator/Stopwatch                       | < 3.5 seconds  |
| OpenPose Torso Detection        | Analyze fixed points                           | 100% precision   |
| DeepMark Clothing Detection     | Analyze fixed points                           | 100% precision   |
| Clothing/Torso Matching         | Analyze fixed point calibration with 2cm slack | 80% precision with image warping, 50% precision with superimposing |
| Camera/Mirror Calibration       | Display video feed over mirror                 | 30 fps   |



# Risk factors

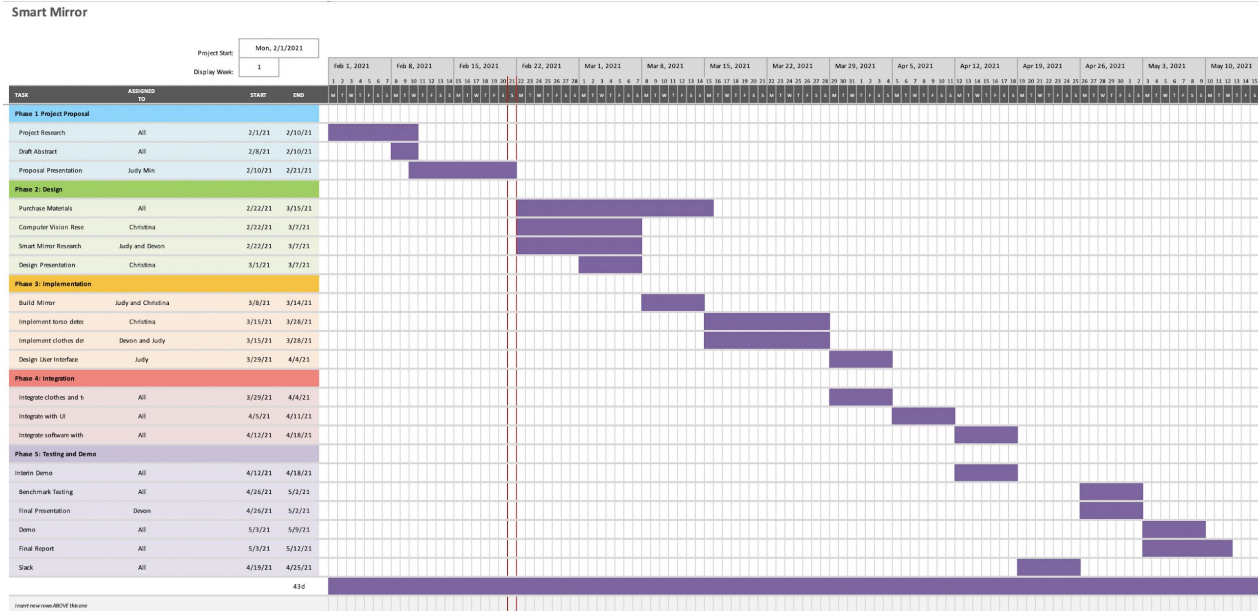
## Hardware:

- Cost (calculated cost is greater than budget)
  - Solution: More research into cheaper alternatives
- Jetson SDK and software compatibility
  - Solution: More research into integration

## Software:

- Image matching algorithm
  - Solution: Analyze output points of OpenPose and DeepMark
- Too much user movement
  - Solution: Restrict movement by offering suggested outline to stay in
- Monitor/Mirror Calibration
  - What the camera sees should be exactly what the user sees in the mirror
  - Solution: Adjust frame rate, outline

# Schedule





## Division Of Labor

