Project Argus

The Future of Procedural Tracking

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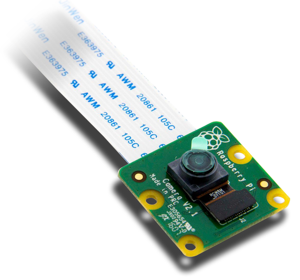
Overview

As innovations are being made in the field of space exploration and organizations are seeking to send individuals to planets like Mars, ground control guidance for maintenance and assembly procedures are becoming less ideal. The communication delay and bandwidth limitations will hinder astronauts performing procedure during their journey through space.

Project Argus aims to address this issue by utilizing Machine Learning and Computer Vision concepts to develop a system that can track and validate each step of a procedure performed by astronauts. The system communicates with a wireless camera on the user to perform object detection and stage validation. To emulate a procedure, the assembly of a PhantomX Robot Turret will be used. Project Argus runs on a Jetson Nano and utilizes KivyMD to provide an easy to use GUI for individuals working on a procedure.

Parts

NVIDIA Jetson Nano

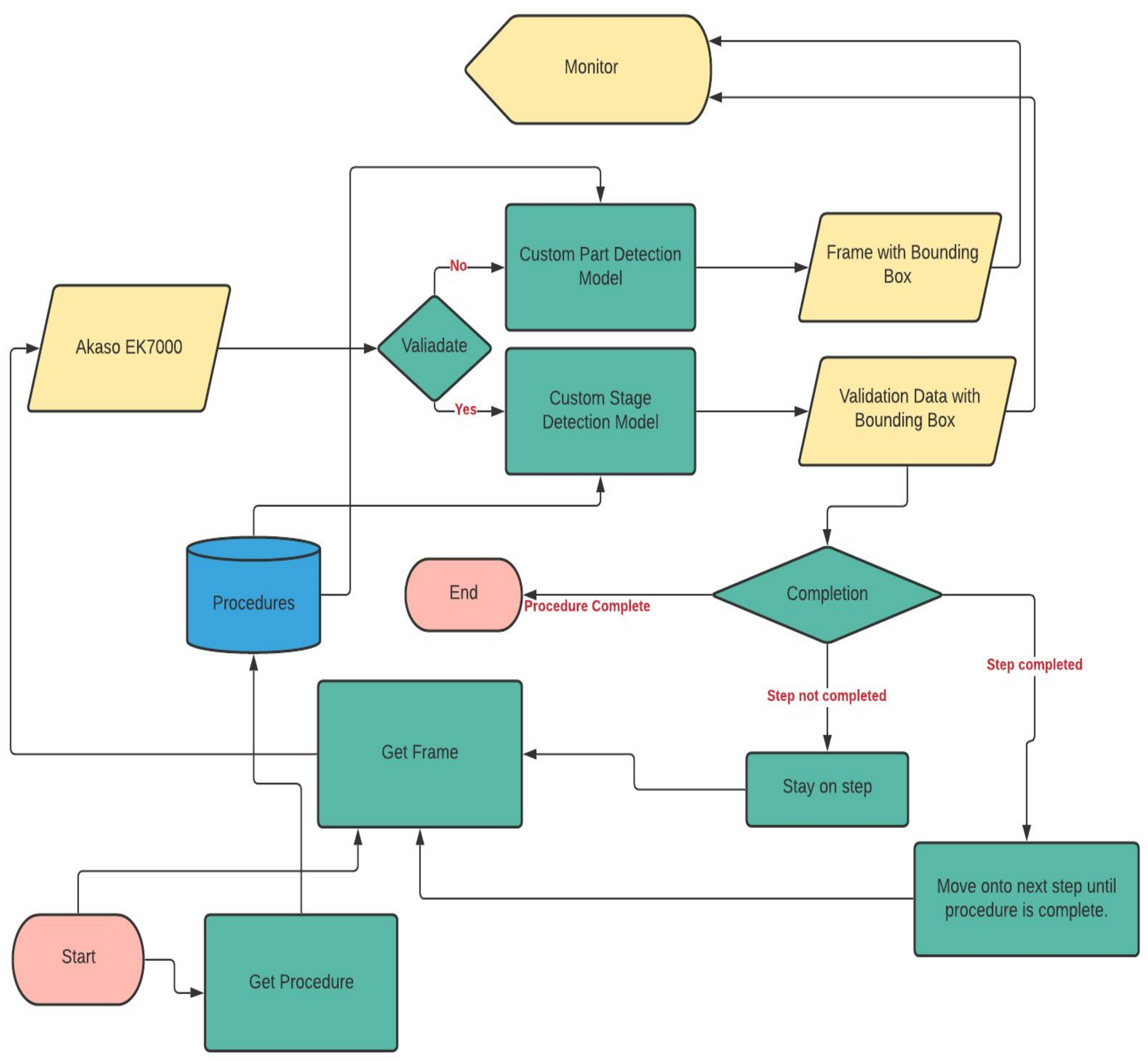


Raspberry Pi Camera

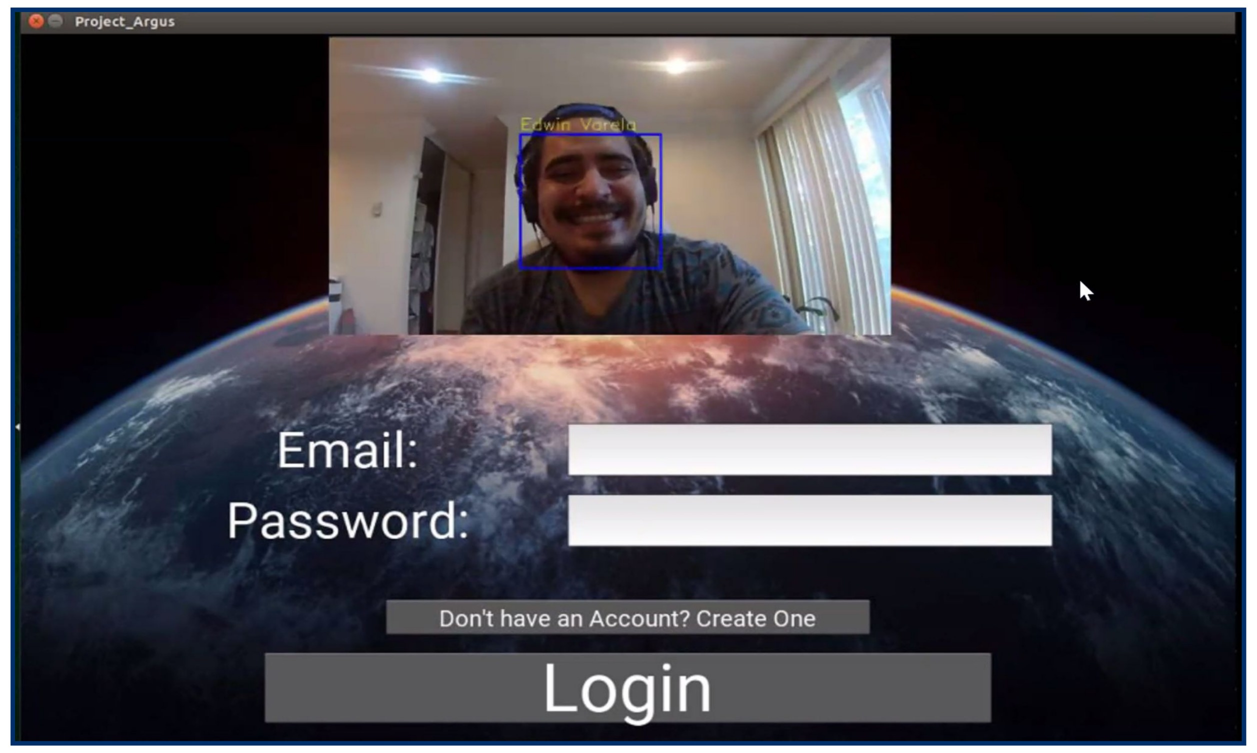
PhantomX Robot Turret Kit

Akaso EK7000 Camera

Architecture & Software Flow



Graphical User Interface

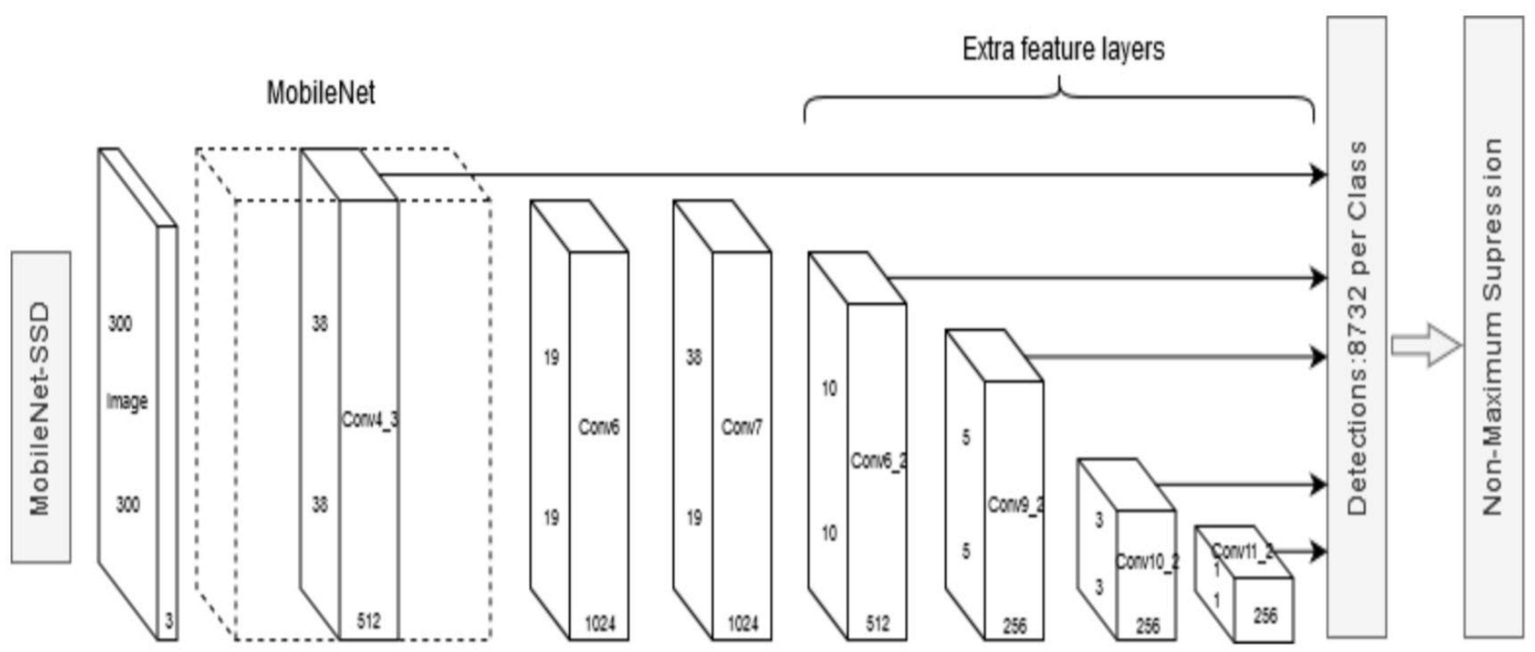


Login Screen

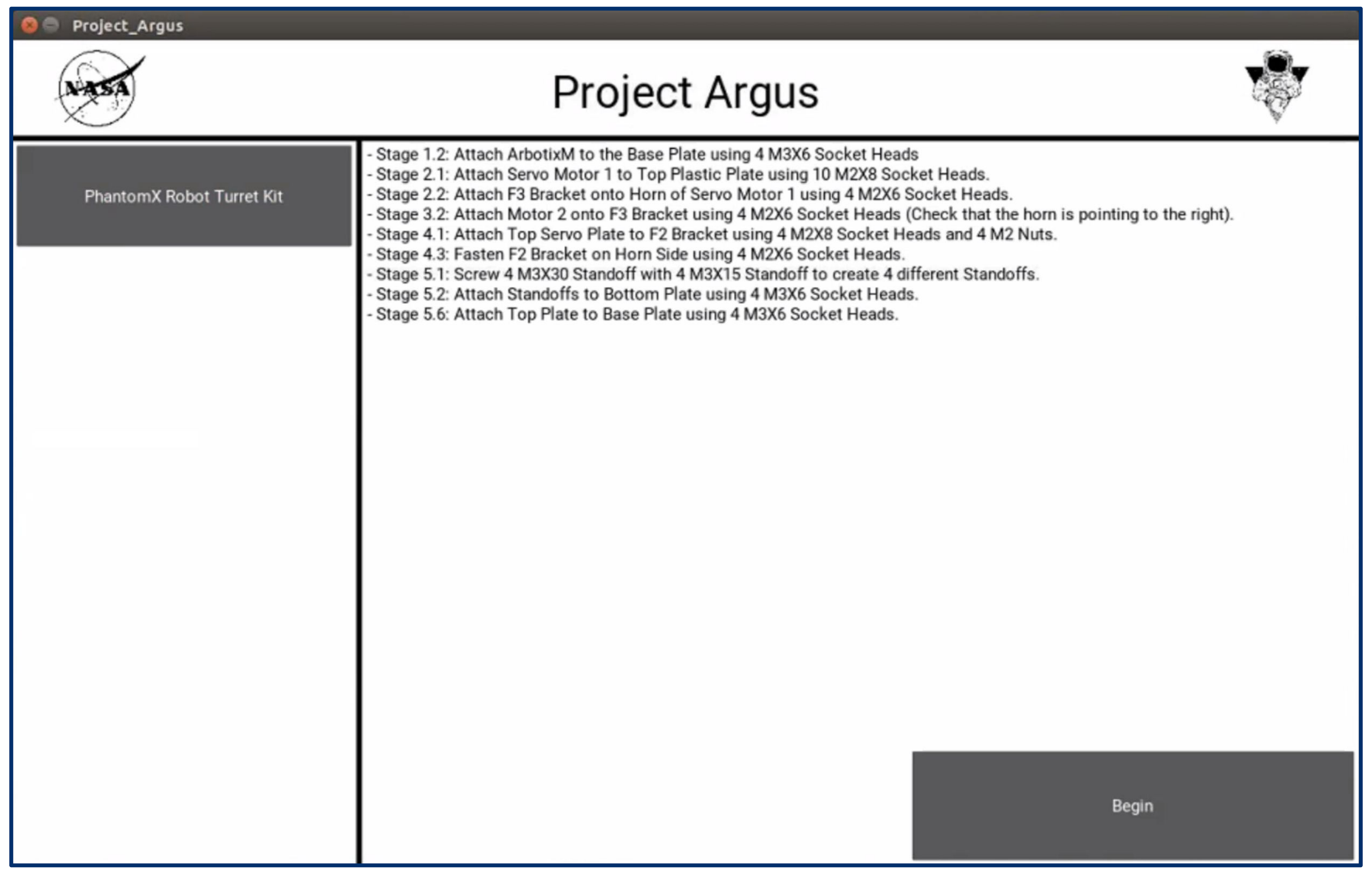
Training

- **Image Dataset**
  - Consists of 500 images (taken through smartphones) for each part/stage
- **Bounding Boxes**
  - Bounding boxes had to be wrapped around each part/stage for training
  - Labels were defined for each bounding box for each part/stage
- **Training on Jetson**
  - Trained on the Jetson Nano using Jetson-Inference package
  - Training lasted 7+ days for 5000+ images with limited epochs
  - Training to model deployment time needed to be improved
- **Google Colab**
  - Switched to Google Colab to train our models
  - Custom notebooks were written in Bash to perform training
  - Each model took 22 hours+ to train 5000+ images with larger epochs

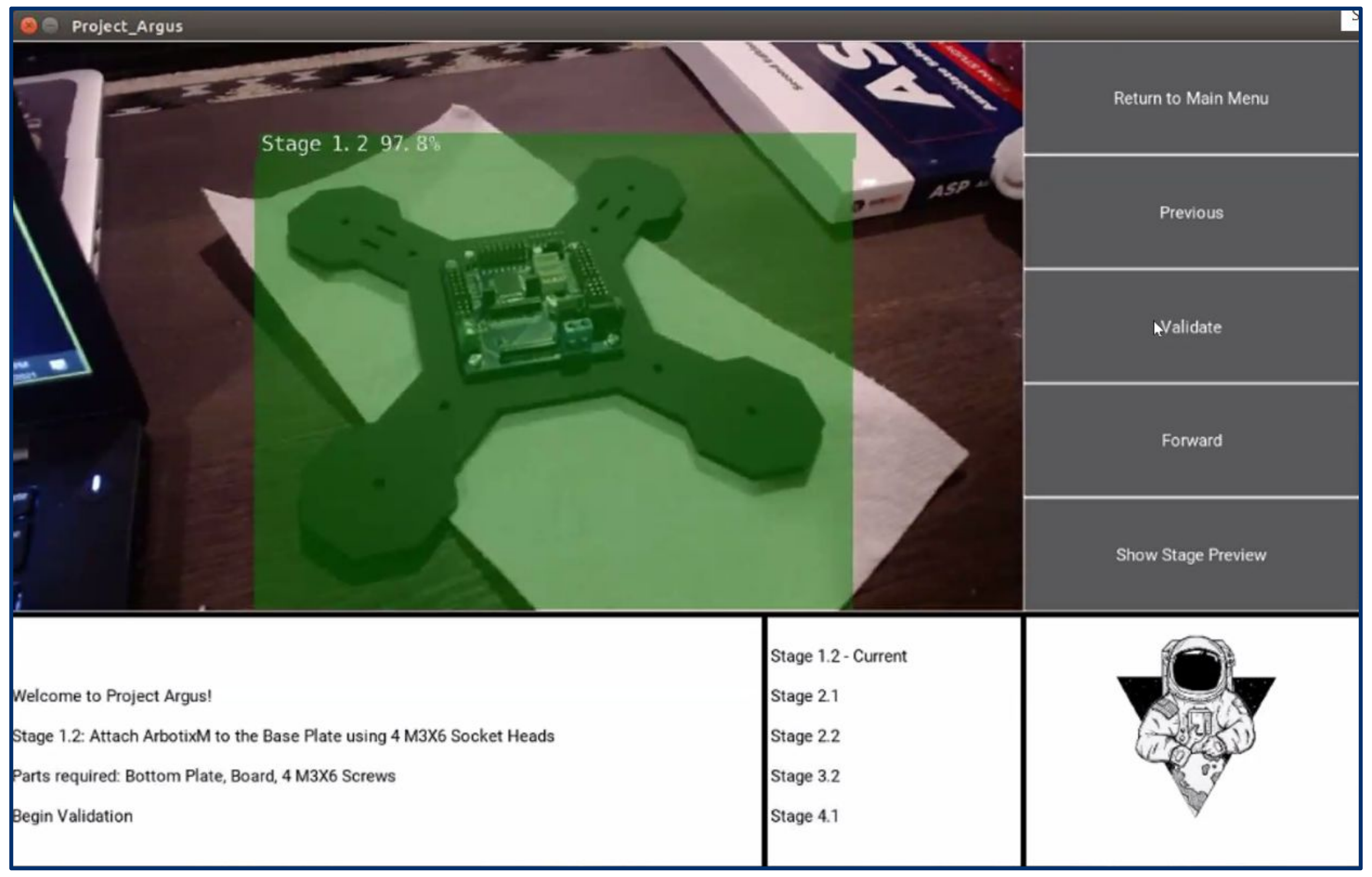
Object Detection Model (SSD)



Graphical User Interface (cont.)



Main Menu



Procedure Screen

References & Acknowledgments

References:

- Package for training and object detection: https://github.com/dusty-nv/jetson-inference
- PhantomX Robot Turret Kit Assembly: https://learn.trossenrobotics.com
- Package for labeling and bounding images: https://github.com/tzutalin/labelImg

Acknowledgments:

- Dr. Yogananda Isukapalli, Professor
- John Karasinski, NASA Mentor
- Melodie Yashar, NASA Mentor
- Boning Dong and Trenton Rochelle, Teaching Assistants

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