Artificially Intelligent Medical Assistant Robot (AIMAR)

Paulos Daniel, Nina Horne, Ben Jacobsohn, Kevin Kuo, Michelle Marsandi, Natalie Offenberg, Dana Ronin, Ryan Utz, Johan Vandegriff

Mentor: Dr. Anil Deane

UNIVERSITY OF MARYLAND HONORS COLLEGE

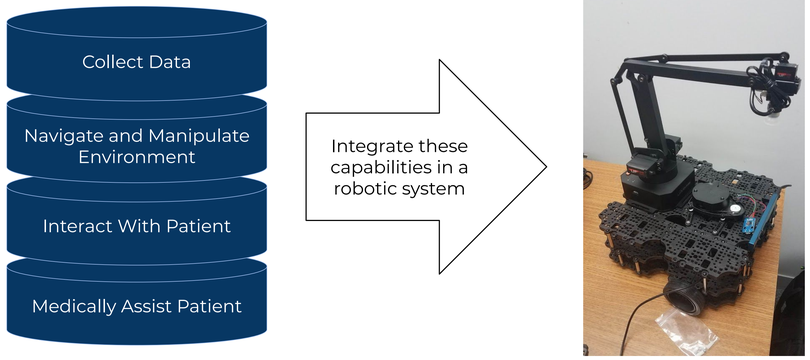
GEMSTONE Honors College University of Maryland

PROBLEM STATEMENT

- Healthcare providers face financial, regulatory, and logistical obstacles in supplying quality care.
- Applying robotics and artificial intelligence (AI) to healthcare could reduce demands on providers, increase accuracy by supplementing medical diagnoses, and improve patient outcomes.

OBJECTIVE

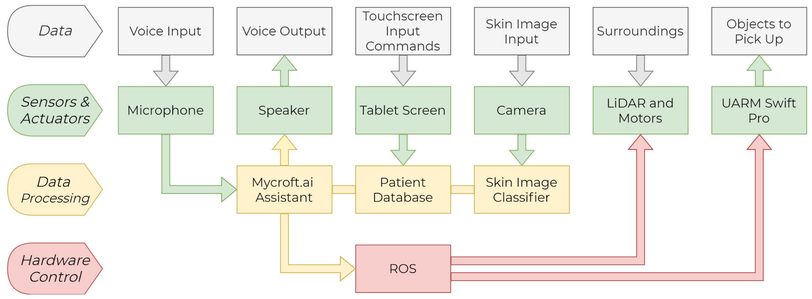
- Team AIMAR will:
  1. Construct a modular robotic healthcare system with diagnostic features as supplements to a generic base
  2. Focus on analyzing images with machine learning to identify skin conditions.



RESEARCH QUESTIONS

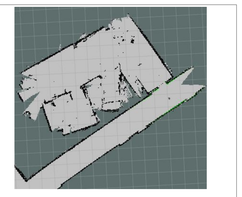
1. How can machine learning algorithms be leveraged to provide accurate diagnoses of specific diseases?
2. How can natural language interaction and user interface software be integrated with a robotic system to streamline patient interaction and data collection?
3. How can robotic components be paired with skin imaging instruments to assist medical professionals?

METHODS

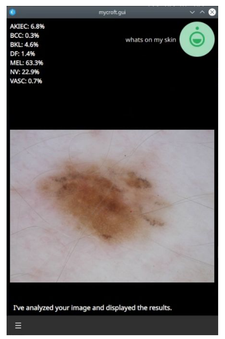


RESEARCH STATUS

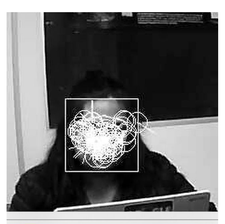
- **Navigation**
  - Controlling robotic components with Mycroft voice input
  - Autonomous movement through the use of SLAM navigation
- **GUI**
  - Basic user interaction for patients to maneuver through various options and prompts
- **Skin Image Classification:**
  - AIMAR uses interchangeable classifiers exported by the Keras deep learning framework.
- **OpenMV Camera**
  - Implementing object/facial detection on the robot in order for the bot to authenticate users.
- **Arm**
  - Use the arm to help with user tasks such as object manipulation



Turtlebot generated map of environment



AIMAR's analysis of a skin image



Camera extracts face's key points

REFERENCES & ACKNOWLEDGMENTS

IPST/LCV Lab

Gemstone Honors Program

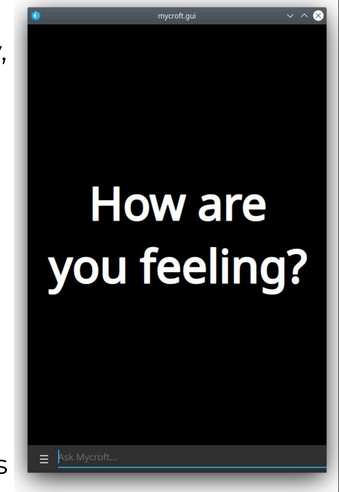
Citations

CONCLUSIONS

- Through integrating various software tools with robotic hardware, AIMAR is developing an assistive robot in the healthcare field that will:
  - save time
  - decrease costs
  - and improve patient outcomes.

FUTURE RESEARCH GOALS

- **Face Authentication:**
  - For additional patient security, we hope to add facial authentication and an "are you still there" feature using the OpenMV Camera.
- **Online access to AIMAR symptom screening:**
  - AIMAR can be implemented as an online virtual advisor for medical diagnosis (such as determining if your symptoms align with that of COVID-19).



AIMAR asking a patient a question

- **U-Arm:**
  - Tasks such as handling medicine containers, using measuring instruments, and administering tests.
- **Turtlebot Autonomous Navigation:**
  - "Follow me" function
  - Simultaneous Localization and Mapping (SLAM)
  - Remember points of interest
- **Full Integration:**
  - At the end of our project, we aim to have a prototype which can demonstrate all the desired functions.