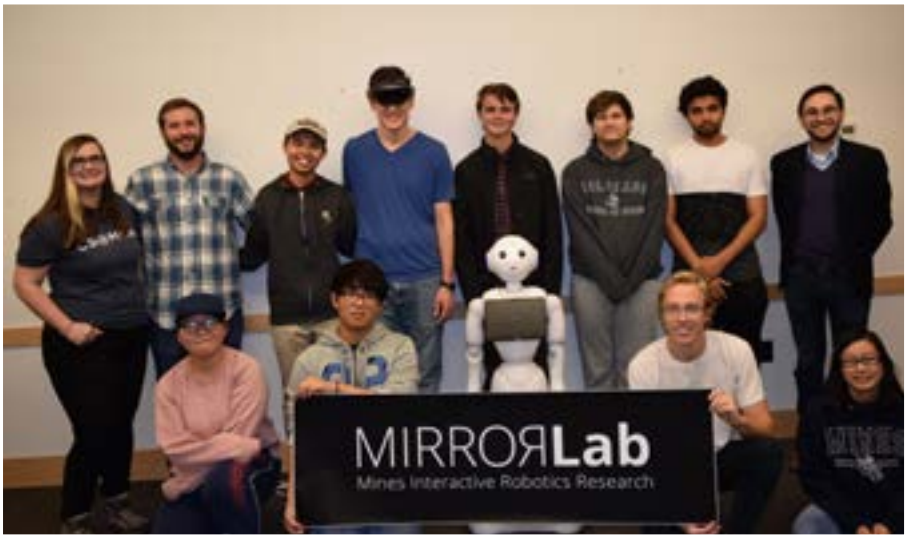

Welcome to the MIRRORLab!

Each day, as robotics, AI, and augmented reality become more and more advanced, ever greater challenges arise regarding the interaction between human beings and the technology they create. With this in mind, the purpose of the MIRRORLab is to help make these interactions as natural and productive as possible.

This purpose ranges from enabling robots to develop and make use of effective language and social norms to improving how NASA Astrobee robots relay information back to Earth. Throughout all of the lab's research endeavors, an emphasis is placed on creating and maintaining trust that will allow for greater autonomy and reliance on robots performing tasks not feasible for humans. In simpler terms, the MIRRORLab is hoping to avoid the apocalyptic robot-human conflicts of so many sci-fi films.

Right now, various research projects in the MIRRORLab are looking at enabling robots to generate and understand natural language descriptions, endowing robots with human-like models of memory, and enabling robots to communicate more politely. Only time will tell, however, whether or not certain things – such as politeness – will come more naturally to robots than humans.

The MIRRORLab isn't just an excellent place for robots to learn, however. It is also home to several undergraduate researchers getting acquainted with the finer aspects of research in academia.

Shania Jo Runningrabbit (left) and Jon Serrano (right)

Currently, Shania Jo Runningrabbit (junior) and Jon Serrano (first-year) are working on a project aiming

to enable autonomous robots to send progress reports to human co-workers and robot peers. The goal of this project is to allow greater autonomy for robot workers on the International Space Station. In other words, when robot workers complete tasks assigned to them – tasks not feasible for humans to complete – they will be able to send progress reports to humans and robots alike so that work progress may be pursued with maximum efficiency and minimal transaction costs. The final product will hopefully be implemented in NASA's Astrobee, helping to improve human-robot trust and overall efficiency of the ISS.

Shania and Jon collaborating in the MIRRORLab

When asked what the most rewarding part of their research is, Shania and Jon pointed out how it is exciting to explore the realm of computer science in a way that they never thought they would be capable of doing. Both researchers repeatedly emphasized how one doesn't need to be a "hardcore" researcher to make meaningful progress. Rather, one needs only be passionate and committed to making progress one step at a time.

William Culpepper (first year) is another extraordinary undergraduate researcher working at the MIRRORLab. Will's research aims to modelling human-like short-term memory in robots. Will is currently in the experimentation phase of research and is looking at two different pathways for modelling short term memory.

When asked why his research matters, Will explained how enabling robots to operate using human-like short-term memory will encourage greater levels of trust between humans and robots. Not only will these new short-term memory models potentially enable better conversational skills for robots, but they will also introduce an element of "humanity" to robots. The more fallible and relatable robots are, the more humans will invariably trust them, creating more effective working environments.

Will Culpepper in the MIRRORLab

For Will, involvement with the MIRRORLab came after a Mines Computer Science dinner, where Dr. Tom Williams – Director of the MIRRORLab – introduced undergraduates to several research opportunities. At first, Will was worried to join the team due to his limited knowledge of computer science and, more specifically, Linux. But, Will found that doing research doesn't mean that one needs to be done learning. In fact, research opportunities often catalyze incredible learning opportunities. From the time he started at the MIRRORLab to now, Will has gained confidence with Linux and his ability to build memory structures.

Dr. Tom Williams, Director of the MIRRORLab

The MIRRORLab is one of those extraordinary places on the Mines campus where students push the envelope every day, expanding what humanity is capable of. And, as shown by Shania, Jon, and Will, it provides a learning experience no matter how far along one is in their educational career. By getting undergraduates involved with research like this, the MIRRORLab is cultivating new, young perspectives and developing polished researchers that will one day change the way we interact with robots.

For more information about the MIRRORLab, feel free to visit the MIRRORLab webpage at https://mirrorlab.mines.edu/