NRI: Hierarchical Representation Learning for Robot Assistants

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The goal of this project is to introduce an a “just-in-time” robot assistant by integrating vision, NLP and planning. The system is able to recognize a person’s goal, and provide them the right object at the right time, thereby helping people perform complex activities, such as cooking, object repair, and housekeeping.

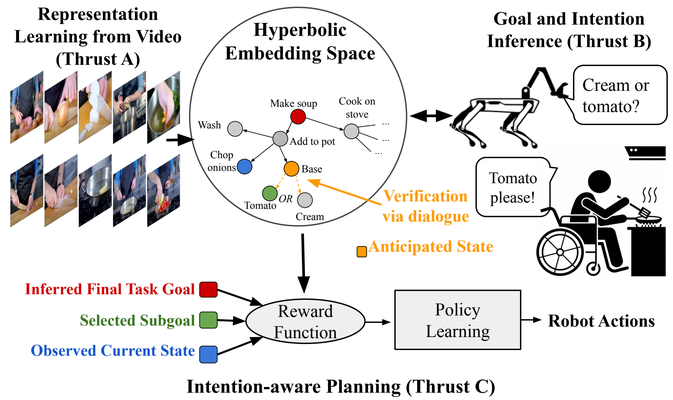
Key challenge:

- How to learn a hierarchical task representation from videos.
- How to predict and verify human intentions or instructions from visual and language data.
- How to plan robot actions according to human intention and task representation to provide assistance.

Technical Approach:

We introduce a hierarchical representation learning framework for assistive robots, which we leverage as a common interface to drive integration between robotics, computer vision, and NLP. Our representation is able to anticipate human intention, support effective human-robot communication, and enable efficient action planning for just-in-time object delivery.

Scientific Impact: This project introduces a novel hierarchical representation learning framework for assistive robots, which serves as a common interface to drive integration between robotics, computer vision, and natural language understanding. This representation is learned from large-scale unlabeled instructional videos, making this approach flexible and adaptable to the many real-world applications



Border impact on Society:

More than eighteen million people in North America have a physical disability due to limited mobility, restricting their independence, lifestyle, and ability to perform daily activities. The proposed system would provide new assistive technologies that provide timely assistance to people with disabilities, and drive improvements to their quality of life, independence, and productivity.

Border Impact on Education:

Outreach to K-12 through AI4All summer camps.

Undergraduate student research through Summer@SEAS and REU.

Technology transfer for Research and Education are integrated by a series of systematically designed curriculum (Vision, NLP and Robotics) and annual capstone projects for assistive robotics.

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