Toward Autonomous LfO for Co-Bots using IRL

NRI:FND:Robust Inverse Learning for Human-Robot Collaboration (1830421 08/18/2018) Prashant Doshi (PI)¹, Yi Hong (Co-PI)¹, and Kenneth Bogert (Co-PI)²

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Challenge

 Co-bots trained by observing humans in real-world scenarios and collaborating with them

Solution

- SA-Net Detect expert trajectory from RGB-D stream with deep neural network
- Develop incremental, multitask IRL algorithms
- Manage occlusion and imperfect observations



Scientific Impact

- Generalize IRL to scenarios with imperfect data, limited resources, and multiple tasks
- Methods for spontaneous collaboration using LfO
 Broader Impacts
- Expand capabilities of co-bots using customizable autonomy and enable spontaneous collaboration with humans
- Enrich courses in decision making and robotics

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Incremental and Multi-Task Max-Causal Entropy IRL

- Online IRL reduces computation time in comparison to batch while maintaining accuracy
- As more observations received, proved:
 - Convergence of log likelihood of demonstrations
 - Reward weights approach expert's true
- Expert may utilize a mixture of task behavior
 - E.g.: Onion sorting: (1) pick inspect for blemishes
 - place (2) roll pick place
- We label trajectories using a Dirichlet process, find a MaxEnt reward function for each cluster of trajectories



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