

Efficient Lifelong Machine Learning: an Online Multi-Task Learning Perspective

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Abstract

Lifelong learning is a key characteristic of human intelligence, largely responsible for the variety and complexity of our behavior. This process allows us to rapidly learn new skills by building upon and continually refining our learned knowledge over a lifetime of experience. Incorporating these abilities into machine learning algorithms remains a mostly unsolved problem, but one that is essential for the development of versatile autonomous systems.

In this talk, I will present our recent progress in developing algorithms for lifelong machine learning for classification, regression, and reinforcement learning, including applications to optimal control for robotics. These algorithms approach the problem from an online multi-task learning perspective, acquiring knowledge incrementally over consecutive learning tasks, and then transferring that knowledge to rapidly learn to solve new tasks. Our approach is highly efficient, scaling to large numbers of tasks and amounts of data, and provides a variety of theoretical guarantees. I will also discuss our work toward automatic cross-domain transfer between diverse tasks, zero-shot transfer learning from task descriptions, and applications of these methods to autonomous robots.

Bio

Eric Eaton is a non-tenure track faculty member in the Department of Computer and Information Science at the University of Pennsylvania, and a member of the GRASP (General Robotics, Automation, Sensing, & Perception) lab. Prior to joining Penn, he was a visiting assistant professor at Bryn Mawr College, a senior research scientist at Lockheed Martin Advanced Technology Laboratories, and part-time faculty at Swarthmore College. His primary research interests lie in the field of machine learning, with applications to service robotics and personalized medicine.

Faculty Host: Vladimir Pavlovic