

CAREER: Towards an Intermittent Learning Framework for Smart and Efficient Cyber-Physical Autonomy

Submitted by kyriakos13 on Tue, 05/07/2019 - 2:28pm

Project Details

| | |
|----------------------------|--|
| Lead PI: | Kyriakos G Vamvoudakis |
| Performance Period: | 08/01/18 - 04/30/23 |
| Institution(s): | Georgia Tech Research Corporation |
| Sponsor(s): | National Science Foundation |
| Award Number: | 1851588 |

367 Reads. Placed 503 out of 803 NSF CPS Projects based on total reads on all related artifacts.

Abstract: This project expands how reinforcement learning frameworks can be used for Cyber-Physical Systems (CPS) for autonomy. The research utilizes intermittent reinforcement, where a reward is not given every time the desired response is performed. This differs from traditional reinforcement learning mechanisms, in which a reward is given for each point during online training. What is novel in this framework is that it can demonstrate how reinforcement learning can be used when rare events, or noisy and adversarial data, can affect the training and performance of these algorithms. The work will be validated on collaborative road freight transport and collaborative robotics testbeds, through international partnerships with Sweden and the United Kingdom. The project includes activities that integrate high-school students into challenging problems in machine learning areas, motivated through drone racing competitions. The goal of this research is to expand foundational knowledge through deepened ties between the learning, control, game theory, and CPS communities. The approach is to, (i) unify new perspectives of learning in engineering with respect to resiliency, bandwidth efficiency, robustness, and other aspects that cannot be achieved with the state-of-the-art approaches; (ii) develop intermittent deep learning methods for CPS that can mitigate sensor attacks and can handle cases of limited sensing capabilities; (iii) incorporate nonequilibrium game-theoretic learning in CPS with components whose decision-making, rationality, and information usage are fundamentally different; and (iv) investigate ways to transfer learning to new platforms. The project's education and outreach component includes internships that will lead to technology transfer, summer camps with a special focus on reaching out to underrepresented minorities and women, and collaboration with institutions in Sweden and the United Kingdom through student exchange programs.

Related Artifacts

Presentations

- [Intermittent Learning Framework for Smart and Efficient Cyber-Physical Autonomy | Download](#)

Posters

- [Towards an Intermittent Learning Framework for Smart and Efficient Cyber-Physical Autonomy | Download](#)

Videos

- [Towards an Intermittent Learning Framework for Smart and Efficient Cyber-Physical Autonomy](#)
-