



“Human and Multi-Agent collaboration in a human-AI teaming framework”

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Abstract:

Summary: The main focus of this talk is “human-AI teaming”, specifically the mode of “human-AI collaboration” where humans and AIRL-based agents accomplish tasks together in a multi-agent system. Therefore, the objective cannot be achieved by just a lone human or agent, and the responsibilities in the environment are partitioned and/or shared between humans and agents.

Collaborative multi-agent reinforcement learning (MARL) as a specific category of reinforcement learning (RL) provides effective results with agents learning from their observations, received rewards, and internal interactions between agents. However, centralized learning methods with a joint global policy in a highly dynamic environment present unique challenges in dealing with large amounts of information. This study proposes two innovative solutions to address the complexities of a collaboration between human and multiple RL-based agents (referred to hereafter as “Human-MARL teaming”) where the goals pursued cannot be achieved by a human alone or agents alone. The first innovation is the introduction of a new open-source MARL framework, called COGMENT, to unite humans and agents in real-time complex dynamic systems and efficiently leverage their interactions as a source of learning. The second innovation is our proposal of a new hybrid MARL method, named Dueling Double Deep Q learning MADDPG (D3-MADDPG) to allow agents to train decentralized policies parallelly in a joint centralized policy. This method can solve the overestimation problem in Q-learning methods of value-based MARL. We demonstrate these innovations by using a designed real-time environment with unmanned aerial vehicles driven by RL agents, collaborating with a human to fight fires.

Biography:

Neda has completed her PhD in autonomous driving field from École de Technologie Supérieure (ÉTS), and postdoctoral studies from HEC Montréal, McGill University and Polytechnique Montréal. She has been ma-



chine learning (ML) researcher, applied research scientist and data scientist in different research teams. She is also an expert in deep learning, reinforcement learning, supervised / unsupervised learning, natural language processing, computer vision, and time series data. She now works in AI research and development at AI Redefined Inc.

Publication of speakers:

1. Neda Navidi, Developing Equations to Predict Waist Circumference Measurements based on the National Heart, Lung, and Blood Institute Method from the World Health Organization Method, *Annals of Epidemiology*, Available online 22 August 2020, In Press, Journal Pre-proof. What are Journal Pre-proof articles?
2. Takahashi Hiroshi , Masahiro Nakajima , Kouichi Ozaki , Toshihiro Tanaka , Naoyuki Kamatani1 , Shiro Ikegawa (2010).: Prediction model for knee osteoarthritis based on genetic and clinical information. *Arthritis Research & Therapy* 12:R187.
3. Teitel A.D, Zieve D. MedlinePlus Medical Encyclopedia. National Institutes of Health. “Osteoarthritis.” Last updated: Sept 26, 2013. <http://www.nlm.nih.gov/medlineplus/ency/article/000423.htm>
4. World Health Organization. “Chronic Rheumatic Conditions.” Chronic diseases and health promotion. 2014. <http://www.who.int/chp/topics/rheumatic/en/>

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