Safe Learning and Control with $\mathcal{L}_1$ Adaptation

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Learning-based control paradigms have seen many success stories with various robots and co-robots in recent years. However, as these robots prepare to enter the real world, operating safely in the presence of imperfect model knowledge and external disturbances is going to be vital to ensure mission success. In the first part of the talk, we present an overview of $\mathcal{L}_1$ adaptive control, how it enables safety in autonomous robots, and discuss some of its success stories in the aerospace industry. In the second part of the talk, we present some of our recent results that explore various architectures with $\mathcal{L}_1$ adaptive control while guaranteeing performance and robustness throughout the learning process. An overview of different projects at our lab that build upon this framework will be demonstrated to show different applications.

Bio: Naira Hovakimyan received her MS degree in Applied Mathematics from Yerevan State University in Armenia. She got her Ph.D. in Physics and Mathematics from the Institute of Applied Mathematics of Russian Academy of Sciences in Moscow. She is currently W. Grafton and Lillian B. Wilkins Professor of Mechanical Science and Engineering at UIUC. She has co-authored two books, eleven patents and more than 450 refereed publications. She is the 2011 recipient of AIAA Mechanics and Control of Flight Award, the 2015 recipient of SWE Achievement Award, the 2017 recipient of IEEE CSS Award for Technical Excellence in Aerospace Controls, and the 2019 recipient of AIAA Pendray Aerospace Literature Award. In 2014 she was awarded the Humboldt prize for her lifetime achievements. She is Fellow of AIAA and IEEE. She is co-founder and chief scientist of Intelinair. Her work was featured in the New York Times, on Fox TV and CNBC.