George K. Atia
Department of Electrical and Computer Engineering
University of Central Florida

Friday, April 13, 2018
3:30pm – 4:30pm, Center for Urban Transportation Research, CUTR 102

Directions of innovation for subspace clustering

Abstract
Subspace clustering seeks to cluster data points to their respective linear subspaces with many applications in computer vision, robotics, gene expression analysis, and image processing, to name a few. In this talk, we present a new scalable approach to subspace clustering termed Innovation Pursuit (iPursuit). iPursuit rests on a new geometrical idea whereby subspaces are identified based on their relative novelties. The subspaces are identified successively by searching for directions of innovation in the span of the data obtained as solutions to a series of convex optimization problems. Our mathematical analysis establishes sufficient conditions for iPursuit to correctly cluster the data. Moreover, the proposed direction search approach can be used to build a neighborhood set for each data point, and therefore can be naturally integrated with spectral clustering to yield a new variant of spectral-clustering-based algorithms. A remarkable characteristic of iPursuit is its ability to yield exact clustering even when the subspaces have significant intersections. The simulations with both synthetic and real data demonstrate that iPursuit can often outperform the state-of-the-art subspace clustering algorithms – more so for subspaces with significant intersections – along with substantial reductions in computational complexity. The spectral-clustering variant also yields the state-of-the-art results for face clustering using subspace segmentation.

Biography
George K. Atia (S'01- M'09) received the B.Sc. and M.Sc. degrees from Alexandria University, Egypt, in 2000 and 2003, respectively, and the Ph.D. degree from Boston University, MA, in 2009, all in electrical and computer engineering.

He joined the University of Central Florida in Fall 2012, where he is currently an assistant professor in the Department of Electrical and Computer Engineering. From Fall 2009 to 2012, he was a postdoctoral research associate at the Coordinated Science Laboratory (CSL) at the University of Illinois at Urbana-Champaign (UIUC). His research interests include statistical signal processing, machine learning, stochastic control, wireless communications, detection and estimation theory, and information theory.

Dr. Atia is the recipient of many awards, including the UCF Reach for the Stars Award in 2018, the Dean's Advisory Board Fellowship and the UCF Luminary Award in 2017, the NSF CAREER Award in 2016, and the Charles Millican Faculty Fellowship Award (2015-2017). He also received the Aftab Mufti Medal for Best Paper in the Journal of Civil Structural Health Monitoring in 2017. He organized and chaired the first IEEE GlobalSIP Symposium on Controlled Sensing for Inference in 2013.