Department of Biomedical Informatics

Arizona State University

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Biomedical Informatics Weekly Seminar Series

Geometric methods in modeling dynamical phenomenon: Applications to video and movement analysis

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February 10, 2017 (2:45 p.m. – 4:00 p.m)
Room Sj 1-149 , Samuel C. Johnson Research Bldg.
Mayo Clinic Scottsdale

Speaker's Bio: **Pavan Turaga** is an Assistant Professor at ASU since Aug 2011. He obtained M.S. and Ph.D. degrees in Electrical and Computer Engineering from the University of Maryland (UMD) in 2008 and 2009 respectively. He was a research associate at the Center for Automation Research, at the UMD Institute for Advanced Computer Studies from 2009-11. His research includes computer vision and multimedia, with emphasis on human activity analysis. His research has resulted in new algorithms for statistical analysis on differentiable manifolds, video summarization, and applications in interactive rehabilitation systems. He participated in IBM's 'Emerging Leaders in Multimedia' workshop as a graduate student, and received the Distinguished Dissertation Fellowship in 2009. He received the NSF's CAREER award in 2015, and the IEEE Phoenix Outstanding Faculty award in 2016.

Talk Abstract: We will discuss several examples of video-based inference problems such as activity and scene analysis, where we motivate the need for mathematical approaches rooted in differential geometry and topology. We discuss recent work in non-linear dynamical analysis as applied to human activity modeling where we propose to characterize dynamical attractors via their geometric and topological properties. These methods are shown to work well in a variety of different dynamical time-series databases with minimal changes to the underlying framework. In addition, we present new tools we are currently developing to topological computing using an interpretation of topological persistence diagrams as probability density functions. We show that this approach helps reduce computational complexity of the comparison of topological diagrams thereby enabling larger-scale deployments. We also present preliminary interdisciplinary work and emerging opportunities at the intersection of geometric computing and real-time interactive feedback systems for treatment of mobility and balance related disorders.