

The Institute of Electrical and Electronics Engineers (IEEE) Galveston Bay Section Meeting



Organized by Communication Society and Joint Societies Chapters

February 27, 2019 (Wednesday) Luncheon Meeting

TOPIC: "Classification of Cocaine-Addicted Patients from Functional MRI Activation Maps Using Features Obtained from Hilbert Space-Filling Curve"

Speaker: Dr. Unal "Zak" Sakoglu, Assistant Professor, Computer Engineering, University of Houston Clear Lake

Abstract: Functional magnetic resonance imaging (fMRI) is a widely-used brain imaging technique which allows us to create 3D brain activation maps . Usually, an ordering/mapping of the 3D data to 1D is required for further analyses, which often includes classification of different groups of participants, in multi-group studies. The conventional mapping method is linear ordering, which results in a 1D vector that has a high amount of discontinuity which does not preserve the structure of the brain. A Hilbert space-filling curve, on the other hand, can better preserve the structure of the brain after the mapping. Features obtained after a mapping based on Hilbert space-filling curve should lead to better classification performance. In this talk, I will present results from a 3D Hilbert space-filling curve mapping of fMRI activation maps from 59 cocaine-addicted and 25 age-matched control participants, classifying them as controls vs. patients using machine learning algorithms. Classification based on features from Hilbert space-filling curve ordering results in significantly higher classification accuracy of cocaine-addicted patients vs. controls than those of conventional linear ordering. I will also discuss the idea of finding an optimal space-filling curve that can better track the brain's structure, which is an open problem and computationally impossible to solve exactly, but only possibly by some heuristics approximations.

Speaker Bio:

Dr. Unal "Zak" Sakoglu is currently an Assistant Professor of Computer Engineering at University of Houston - Clear Lake. Prior to his position, he was a faculty member the Computer Science Department, Texas A&M University - Commerce. He had his BS in Electrical-Electronics Engineering from Bilkent University, and MS & PhD degrees in Electrical and Computer Engineering from University of New Mexico. His graduate research involved developing signal/image processing and nonuniformity correction algorithms for better multispectral classification with infrared array sensors developed at UNM Center for High Technology Materials; where he worked on projects that were supported by NSF and DARPA. He did his post-doctoral training at UNM Neurology Department BRAIN Imaging Center, and Mind Research Network in Albuquerque, where he developed and applied data analysis & classification techniques to functional magnetic resonance imaging data on NIH-supported projects. Subsequently, he worked as Research Scientist at UT-Southwestern Medical Center Neuroradiology Dept, at Abbott Laboratories Translational Neuroimaging Group, and UT-Dallas Center for Vital Longevity, where he analyzed different modalities of medical imaging data such as PET/CT, SPECT/CT, MRI and fMRI, during these positions. He is currently working on development and application of dynamic multivariate pattern classification, datamining and machine-learning methods to functional neuroimaging data in order to help advance our understanding of how the brain functions under different conditions. He is also working on developing better brain mapping, fMRI signal simulation and visualization techniques for improved dynamic analysis and classification of multidimensional neuroimaging data. He also continues his research interests in pattern recognition and classification for remote sensing. Dr. Sakoglu's research has been supported by grants from DoD, AFOSR/AFRL, and private industry.

University of Houston Clear Lake, Delta Building, Room D234

Interested non-IEEE engineers, technicians, scientists, IEEE Members and guests alike are welcome! 11:30 PM – 1:00 PM - Program and Q&A

11:30 AM – Complimentary Lunch Pizza (RSVP highly appreciated)

Please RSVP to Mr. Alan Currie at j.a.currie@nasa.gov, Before Noon Tuesday Feb 26, 2019

FREE PARKING: If you do not have valid UHCL parking permit, FREE PARKING TICKET will be provided, please come a little early if possible. Parking map on the next page.

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PARKING MAP: Visitors must parking in one of the visitor parking lots. For visitors, **Lot J** and **Lot G** have easy access to Delta building, where the IEEE meeting will be held. **Free parking ticket** will be available at the meeting.

