Fire Protection Engineering Department

Seminar Speaker

All are Welcome

Tuesday, January 29, 2019
12:00-1:30 pm
FPE, 50 Prescott Street, Gateway Park II, Room 50P1226

Light Lunch will be provided at 11:45am - RSVP to dpoirier@wpi.edu if you are able to attend

Crowd-sourced wildfire spread prediction with remote georeferencing using smartphones- A Citizens Science approach

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Abstract
Wildfires are natural hazards with severe consequences worryingly worsening for many climate-change affected regions of the planet, including the western US states and Southern Europe. Unfortunately, technologies that can provide real-time fire-line information, such as satellites, in-field sensors and social media texts, either exhibit low spatial/temporal resolution or cannot be used cost-effectively in widespread geographical areas. The *CITISENS* service (CITIzens as SENSors) we are developing aims to improve the quality and quantity of the available wildfire hotspot data by enabling ordinary citizens to participate in a socially beneficial Citizen Science activity. The *CITISENS* reporter application exploits smartphone sensors that enable citizens to easily georeference a fire-line in real-time while photographing a wildfire and report the fire-line coordinates. The phone's location, orientation and camera sensors are used to compute the view-ray of the smartphone, and a digital elevation model is employed to estimate the ray's intersection with the topography. *CITISENS* generated wildfire hotspots can feed *FLogA* (Fire Logic Animation), our previously developed web-based, flexible and user-friendly wildfire spread prediction tool, which allows for automated wildfire simulations anywhere in Europe, by generating on the fly all the input data layers required (topography, fuel model, weather related) without depending on any proprietary data sources. The output of *FLogA* is an interactive geo-animation of the evolving wildfire under different weather conditions, with color representing a fire property of interest, such as the forest cells burn probability or the expected flame length. In addition, *FLogA* provides drawing tools for easy editing of the forest's spatial properties (e.g. change fuels, define cleanings zones etc.) to generate alternative "what-if" simulation scenarios that are also useful for fire behavior education purposes. In order to improve

the wildfire simulation accuracy for long lasting wildfires we are currently building into *FLogA* Dynamic Data Driven ASsimilation capabilities. Using DDDAS the wildfire spread model can be calibrated dynamically based on the available wildfire monitoring measurements. When combined into a closed-loop system, *CITISENS* and *FLogA* services can offer the following unique advantages to citizens: real-time prediction of burn probabilities based on crowd-sourced data, assimilation of citizen-reported hotspots into ongoing simulations for improved predictive accuracy, and decision support for alarming citizens for the estimated time-dependent risk at their location due to an approaching wildfire. It is our intention to extend the use of the approach to more areas including the US.

Bio:

Dr. Elias S. Manolakos is a Professor of biomedical data science with the Department of Informatics and Telecommunications, University of Athens. His expertise is in statistical data / image / signal analysis, predictive modeling, machine learning, high performance and embedded computing. What Elias likes the most is branching out, putting the extra effort required to understand the science of "the other side" and applying an analytical and computational lens to challenges from other disciplines, and especially in the life and environmental sciences. He is currently a Visiting Scholar at Northeastern University's Bouve' College of Health Sciences in Boston, working on mathematical modeling and simulation of dynamic brain circuits relevant to psychotic disorders. He has also been a Visiting Scholar at Harvard's Wyss Institute for Biologically Inspired Engineering, doing research on machine learning and systems microbiology. Before returning to Europe, Dr. Manolakos was a tenured Professor with the ECE Dept. of Northeastern U., where he has also directed the Communications and Digital Signal Processing, Center for Research and Graduate Studies, promoting student-centered innovation through academia-industry collaborations in the Boston area. His interdisciplinary research has attracted substantial research support from both US and EU funding agencies. He holds a Ph.D. degree in Computer Engineering from University of Southern California, M.Sc. in EE from University of Michigan, Ann Arbor, and Diploma in ECE from the National Technical University of Athens. Elias has authored, or co-authored with his students, more than 130 refereed articles in scientific journals and conference proceedings. Dr. Elias Manolakos is a Senior Member of the IEEE and has been an elected Member of the IEEE Technical Committee on Machine Learning for Signal Processing (MLSP).

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