PURDUE UNIVERSITY | Elmore Family School of Electrical and Computer Engineering

Advanced Instruments and Physics-AI Symbiosis

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Thursday, September 29, 10:30am-12:00am EST
WTHR Building Rm 104

Abstract

Radiofrequency and wavelength multiplexing techniques used in telecommunication networks have inspired the invention of new sensor modalities that have extreme imaging throughput. Among these inventions is the photonic time-stretch technology that has served as the foundation for a new class of imaging and spectroscopy instruments enabling the discovery of optical rogue waves, first observations of the birth of mode-locking in lasers and soliton molecule dynamics, observation of relativistic electron microstructures in accelerators, and the world's fastest lidar. A second and related invention is the radio frequency tagged fluorescence camera which is the fastest fluorescent imaging modality and is proving transformative in cell biology. Complementing these innovations are (1) a new approach to optical acceleration of machine learning known as the Schrodinger Kernel Computing and (2) PhyCV: a new computational imaging library of algorithms that emulate the laws of physics to extract insight from digital images and video with exceptional computational speed. This two approaches are part of a larger new paradigm called Physics-AI Symbiosis.

Bio

Bahram Jalali is a Distinguished Professor Emeritus and a research professor at UCLA and the Director of the UCLA Photonics Laboratory. He is a member of the National Academy of Engineers (NAE) and the National Academy of Inventors (NAI), and a fellow of APS, IEEE, OSA (Optica), SPIE, and AIMBE. He is one of the top 10 authors in Nature Photonics and his work has been recognized in the Scientific American Top 50 and MIT Technology Review Top 10 and has received the Optical Society of America's (Optica) R.W. Wood Prize and the IEEE's Aaron Kressel Award among others. Bahram began his career at Bell Laboratories in Murray Hill, N.J. in 1988, after completing his Ph.D. in Applied Physics at Columbia University. He was the Founder and CEO of Cognet Microsystem, a pioneering CMOS fiber-optic integrated circuits provider acquired by Intel in 2001.

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