PHYSICS COLLOQUIUM:

Physics (and Mathematics) for Machine Learning for Physics (and Biology)

Dr. Eric Mjolsness
Department of Computer Sciences and Mathematics
University of California, Irvine

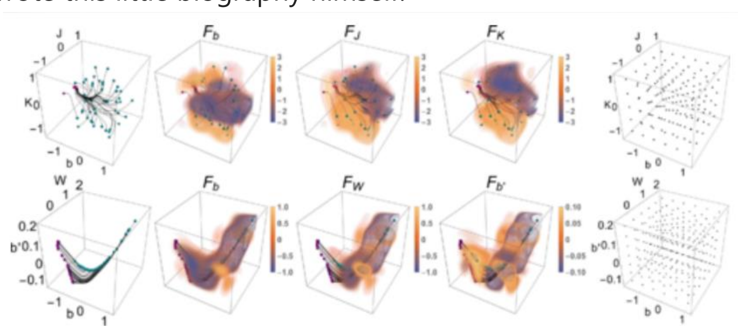
Date:
2/16/2024

Time:
10:30 AM – 11:50 AM

Location:
GRANITE PASS 135

About The Speaker:

Eric Mjolsness received a PhD in physics for work in neural networks from Caltech in 1986. He then became an Assistant Professor at the Yale University Computer Science department, where he worked on Hopfield-style optimizing neural networks for high-level vision and for gene regulation models and developed overarching dynamical grammar approaches to each of these domains. After stops at UCSD and the Jet Propulsion Laboratory, Mjolsness joined the Computer Science faculty at UC Irvine in 2002 and never left. He became a Fellow of the American Association for the Advancement of Science in 2014 and was a Leverhulme Fellow in plant modeling at the Sainsbury Laboratory Cambridge University in 2015 among other honors. He is a most amiable, agreeable and humble fellow, as we can be sure since he wrote this little biography himself.



Abstract:

I will share a few snapshots of my group's efforts in the area of artificial intelligence for the natural sciences, focused on their overlaps with physics. These overlaps are in the areas of mathematical approaches, biophysics, and most recently plasma physics. Mathematical approaches include "dynamic Boltzmann distributions" that learn to approximate the stochastic dynamics of reaction-diffusion networks in biology, and the development of an operator algebra for the "dynamical graph grammar" (DGG) expressive high-level quantitative modeling language. Biophysical applications of DGGs include cytoskeleton dynamics in developing plant tissues and in synaptic spine head structures that underlie learning in neuroscience. Improving the machine-learning inference of partial differential equation coarse-scale models over particle-in-cell fine scale toy models in plasma physics is the subject of our most recent effort.

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