**Agency for Science, Technology and Research**
**SINGAPORE**

# THE INTRINSIC GEOMETRY OF DATA AND WHAT IT CAN TELL US

**29 Nov 2023, Wednesday**
**10 - 11 AM**
**FRANKLIN, L11 Connexis South**
**Fusionopolis**

**Speaker: Dr. Gerald Pao, Assistant Professor, Okinawa Institute of Science and Technology (OIST)**

Dr. Gerald Pao worked originally on the molecular evolution of proteins from a structural and computational perspective as an undergraduate at the University of California, San Diego. From there he went on to be mainly an experimentalist to study the epigenetics of cancer and stem cells and the development of viral vectors for basic science at the Salk institute during his PhD and postdoc. This was followed by a change of field through a postdoctoral training period in applied mathematics and data science specializing in nonlinear dynamics at the Scripps Institution of Oceanography (SIO) in the climate atmospheric sciences and physical oceanography (CASPO) department. After becoming a staff scientist at the Salk institute, he continued work on nonlinear dynamics mainly on causal inference in systems neuroscience and systems biology. Before joining OIST he had a two year stint in industry as a research director for high throughput screening data science and gene therapy at Vertex pharmaceuticals, a Fortune 500 company.

**Abstract:** In 1978 one undergraduate student and three graduate students at UC Santa Cruz discovered a method by which one can turn a time series data into a geometrical object. This method subsequently mathematically proven by Floris Takens has become what is known as the Takens theorem. The method is generic but has allowed the discovery of the intrinsic geometry of data and applications thereof have allowed prediction of future behaviors, causal inference between variables and measuring the strength of interaction between variables just from observational data. However if combined with experimental approaches these methods have become even more powerful. Here in the present seminar we will examine several examples of the utility of these data science methods and their implementation for the discovery of surprising features in data such as causality without correlation in transcription, prediction of animal behavior from neural data, downloading brains of animals into computers and their use as early warning signs for catastrophic transitions in climate change.

**Morning refreshments provided!**

**To Register:**

Questions? Contact **weel@imcb.a-star.edu.sg** or **rosa-so@i2r.a-star.edu.sg**

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