Keynote Speaker

David Siegmund, who holds the John D. and Sigrid Banks Chair at Stanford University, Stanford, CA, is a statistician who is comfortable in both the airy heights of theory and the practicalities of real-world applications. He works at the interface between probability and statistics, applying the tools he develops to topics as diverse as the design of medical clinical trials and mapping the locations of genes that are involved in specific physiological traits.

His work has earned him several awards, including a Guggenheim Fellowship in 1974, the Humboldt Prize in 1980, and membership in the American Academy of Arts and Sciences in 1994. In 2002 he was elected to the National Academy of Sciences. His Inaugural Article (1), published in this issue of PNAS, reviews recent methodological developments in quantitative trait locus mapping and addresses the problem of mapping with selected, rather than random, samples.

Title: Change Detection, Estimation, and Segmentation

Abstract: I will first discuss the maximum score statistic to detect and estimate via confidence regions change-points in the level, slope, or other property of a Gaussian process and to segment the process when there appear to be multiple changes. Sequential detection is also considered. Examples involving temperature variations, levels of atmospheric greenhouse gases, temporal incidence of hate crimes, suicide rates, incidence of Covid-19, and excess deaths during the Covid-19 pandemic illustrate the general theory.

I will describe research in progress for spatio-temporal processes, where the spatial features can be either (A) unstructured vectors of observations or (B) random fields where changes of interest are geometrically clustered. Examples include low and (perhaps sparse) high dimensional cases.

I also mention the special problems posed by temporal and/or spatial dependence. Failure to account for correlations can lead to inflated false positive rates. while the change-points themselves can lead to upwardly biased estimates of correlations that result in loss of power.

Aspects of this research involve collaboration with Fang Xiao, Li Jian, Liu Yi, Nancy Zhang, Benjamin Yakir and Li (Charlie) Xia.