Astronomers are boldly confronting fundamental questions: “What is the nature of exoplanetary systems?”, “How do galaxies form and evolve?”, and “What are the basic building blocks of our Universe?”. To differentiate between competing hypotheses, we now resort to numerical simulations, more sophisticated modeling and analysis, and the acquisition of more data by building new experiments, such as the Petascale Large Synoptic Survey Telescope (LSST) project, whose data will be processed and archived at Illinois. The synergy of these three techniques is known as data-driven astrophysical investigations, a growing area in need of interdisciplinary collaboration. In order to explain this new scientific approach, I will introduce the burgeoning field of synoptic astronomy and highlight the difficulty inherent in analyzing incomplete and heterogeneous time series data that are often censored with non-Gaussian noise. In this manner, I will highlight opportunities for new contributions from interdisciplinary collaborators.

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