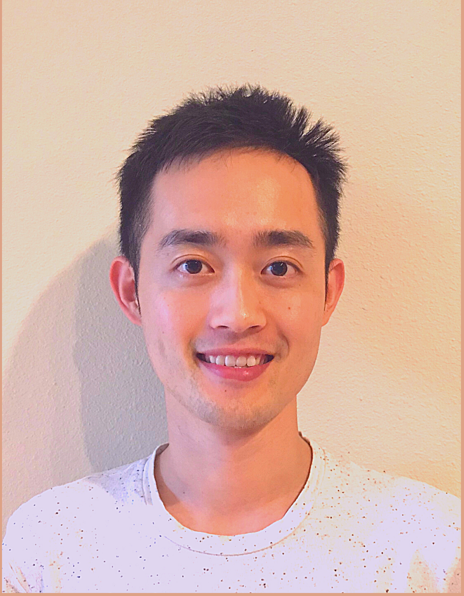
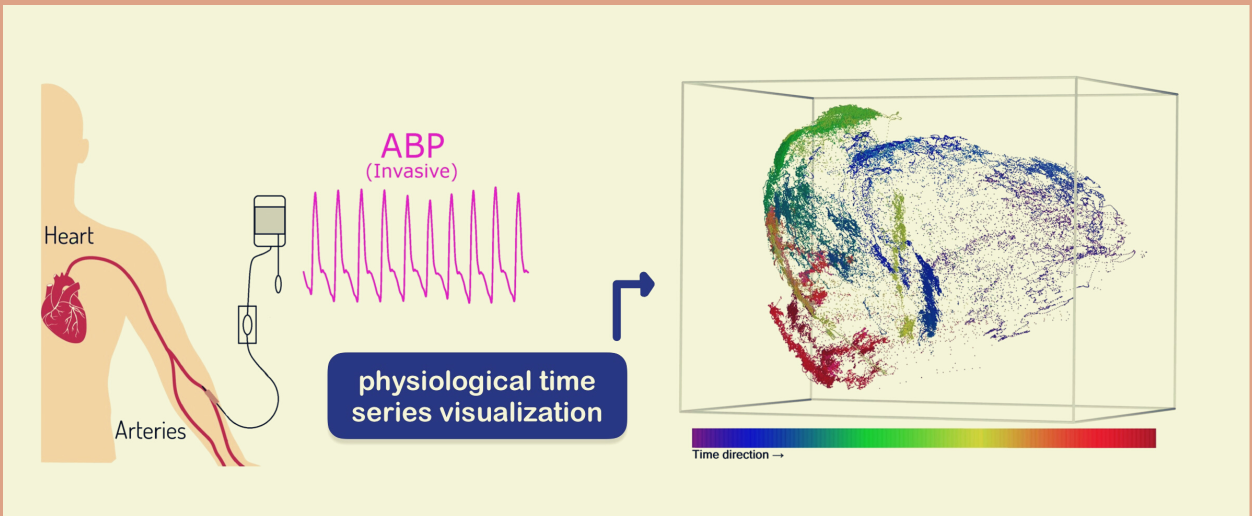


PhD Thesis

Robust and Scalable Embedding via Landmark Diffusion

Chao Shen

Biomedical time series contain rich information about human systems, however, effective algorithms for analyzing long-term physiological time series have not yet been developed because of the huge volume size, high dimensionality and large noise nature of the data. Motivated by such challenging task, we proposed a novel spectral embedding algorithm, which we coined Roseland. The algorithm is applied to study the arterial blood pressure (ABP) waveform dynamics during a liver transplant operation lasting for 12 hours long.



The algorithm is generic and not limited to analyze physiological waveforms. We show that Roseland is not only numerically scalable, but also preserves the geometric properties via its diffusion nature under the manifold setup; that is, we theoretically explore the asymptotical behavior of Roseland under the manifold setup, and provide a L^∞ spectral convergence with a rate. Moreover, we offer a high dimensional noise analysis with the help of Gaussian approximation, and show that Roseland is robust to noise.

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