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SenSIP Seminar Series

Class GP: Gaussian Process Modeling for Heterogeneous Functions

Presenter: Mohit Malu, Ph.D. Candidate in ECEE

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Abstract

Gaussian Processes (GP) are a powerful framework for modeling expensive black-box functions and have thus been adopted for various challenging modeling and optimization problems. In GP-based modeling, we typically default to a stationary covariance kernel to model the underlying function over the input domain, but many real-world applications, such as controls and cyber-physical system safety, often require modeling and optimization of functions that are locally stationary and globally non-stationary across the domain; using standard GPs with a stationary kernel often yields poor modeling performance in such scenarios.

In this presentation, we explore a novel modeling technique called Class-GP (Class Gaussian Process) to model a class of heterogeneous functions, i.e., non-stationary functions which can be divided into locally stationary functions over the partitions of input space with one active stationary function in each partition. We provide theoretical insights into the modeling power of Class-GP and demonstrate its benefits over standard modeling techniques via extensive empirical evaluations.

Biography:

Mohit Malu is a Ph.D student in electrical engineering at ASU, jointly advised by Dr. Andreas Spanias and Dr. Gautam Dasarathy. He joined ASU in the fall of 2018. Before this, he worked as a Production analyst at Polyplex Europa. He received his B.Tech in Electrical Engineering in 2013 from the Indian Institute of Technology, Gandhinagar, and an MS in electrical engineering from ASU in 2021.

His research interests include Bayesian optimization (BO), bandit algorithms, statistical analysis of ML algorithms and reinforcement learning. He is currently working on modeling and optimizing heterogeneous functions using the treed Gaussian process. He interned at onsemi in the summers of 2019, 2020, and 2022, where he worked on building a BO algorithm for optimal circuit design and a neural network based model to improve the efficiency of power converters. Previously, he has also worked on the Machine Learning and Signal Processing aspects of Ion Channel Sensors to improve the fidelity of the sensors as they are highly susceptible to noise.

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