Project Title: CPS: Medium: Real-Time Learning and Control of Stochastic Nanostructure Growth Processes Through in situ Dynamic Imaging

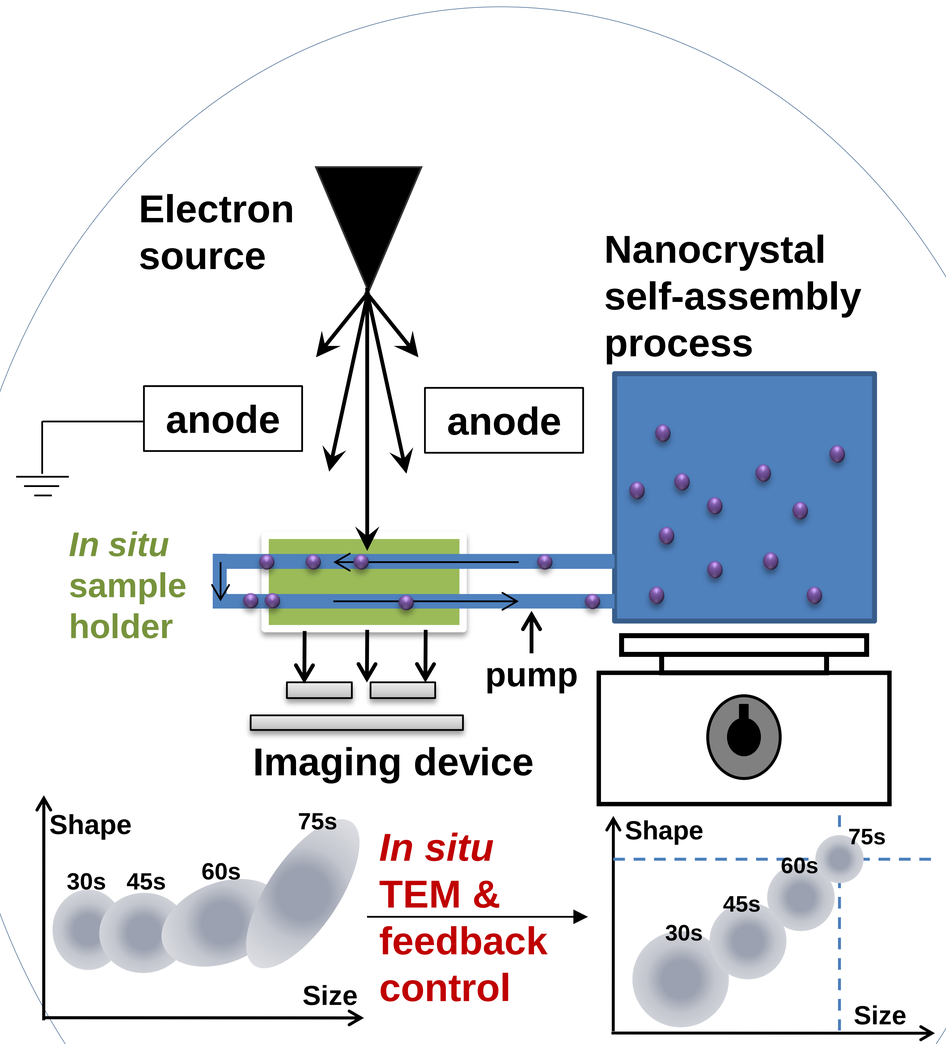
Award #2038625; **Texas A&M**; **PI/Co-PIs**: Yu Ding, Shahin Shahrampour, PR. Kumar, Jiang Hu, Sarbajit Banerjee

Challenge:

- A CPS automatically and reliably converts dynamic imaging data to machine intelligible information for process monitoring and control
- Modeling stochaticity, real-time tracking and adjustment.

Solution:

- Randomized shallow architectures to address real-time learning issues;
- Structured-shallow-networks enabled process control, one of the early applications of neural networks in real-time, dynamic settings;
- Hardware acceleration tailored to attain the real-time goals.



Project info (#2038625, 01/2021-12/2023; Texas A&M University, Email: yuding@tamu.edu)

Scientific Impact:

- This project addresses the foundational problem of real-time learning and control of a multivariate, nonparametric model of probability density functions that reflect the collective stochastic behavior of evolving objects.

Broader Impact:

- Aim at a roadblock in novel material design identified by the National Nanotechnology Initiative.
- Enable scalable production control of certain nanomaterials.
- Prepare next-generation CPS workforce blending data science and domain sciences.