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# Thoughts for dynamic systems

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Our team's activities center around dynamic systems, predominantly for scientific inquiry. Our interest is in the
physics-informed construction and use of digital twins in real-time control systems. Why? Our complex systems
can have millions of process variables, change over time, and the subsystems can influence one another. Further, on
top of controlling these systems as understanding of anomalies/prognostics (e.g. a component failing) we also want to analyze in near real-time, for example, in one immediate project funded by EPSCoR, the materials properties of what the tool is probing. We are active users of the Argonne Leadership Computing Facility (ALCF) and are establishing our real-time connection between one of these analytical tool systems for both control and analysis. We will be soon deploying an edge-computing-based sub-system digital twin at the Facility for Rare Isotope Beams (FRIB) supported by the DOE SBIR program in Nuclear Physics. Scaling and realization of deep-learning aided digital twins on cloud and HPC systems. Here, I will present a few examples of aspects of these dynamic systems, including, an ion-based quantum information science (QIS) system, particle accelerators, and the precise formation of a 2-CubeSats satellite system. In this way, we hope to share our activities thus far and find synergies with others in the community here during the workshop and beyond to mutually enhance our goals in the deployment of digital twins.

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