Center for 3 Dimensional Ferroelectric Microelectronics Manufacturing (3DFeM^2)

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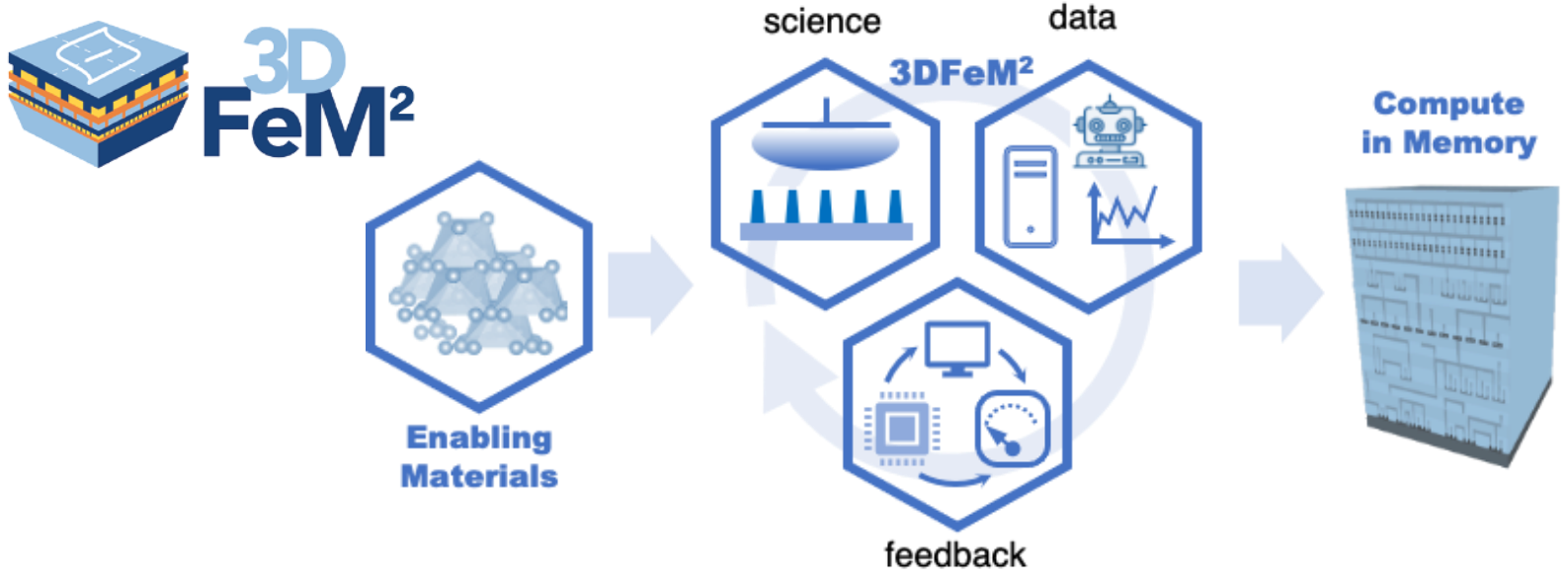
MISSION: To integrate reliable, scaled ferroelectric films for 3D memory using next generation manufacturing practices. Autonomous experiments and machine learning (ML) will expedite optimization; digital twins accelerate innovation through virtual experiments.



RESEARCH PLAN: 3DFeM^2 will ***i.*** understand crystal chemistry design rules and boundary conditions that regulate ferroelectricity, ***ii.*** control ferroelectricity-enabling and lifetime-limiting defects in next-generation ferroelectrics, ***iii.*** identify descriptors for defect chemistry, structure, and property evolution during processing, ***iv.*** utilize ML and *in situ* microscopy to identify phases, switching mechanisms, and scaling trends, ***v.*** enable autonomous workflows for 3D film growth and etching, ***vi.*** generate novel device concepts, and ***vii.*** establish predictive digital twins based on device configuration, manufacturing process history and system-level operation.

https://3dfem.psu.edu/

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