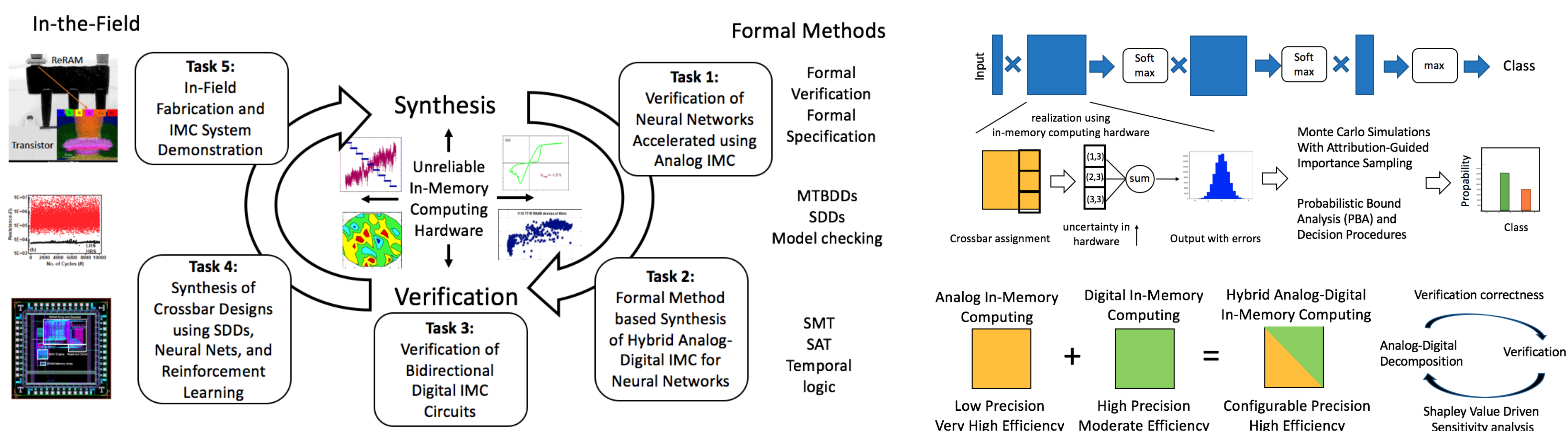


Collaborative Research: FMitF: Type I: Synthesis and Verification of In-Memory Computing Systems



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Challenges:

- Impact of Unreliable In-Memory Computing Hardware
- Non-viable Computing System Designs
- Understanding the Computational Accuracy of Analog In-Memory Computing Circuits
- Understanding the Behavior of Bidirectional In-Memory Computing Circuits
- Characterization of In-Memory Computing Hardware

Scientific Impact:

- Ecosystem of Formal Verification Tools for In-Memory Computing
- In-Field Verification of In-Memory Computing System Performance
- Synthesis and Verification Techniques for Hybrid Analog-Digital In-Memory Computing Systems
- Synthesis and Verification Techniques for Bidirectional In-Memory Computing Circuits
- In-Field Fabrication of In-Memory Computing Systems

Solution and Technical Approach:

- Re-Ordering of Sentinel Decision Diagrams using DeepRL
- Attribution Analysis and Adaptive Uninterpreted Functions for Decision Procedures
- Verification of Bidirectional Circuits using Temporal Logic and Temporal Abstractions
- Symbolic Executions using DeepRL and Neural Network Models of In-Memory Computing Systems
- In-the-Field Device Fabrication, Characterization, and Modeling
- In-Memory Neural Network Design, Fabrication, and Demonstration

Broader Impact on Society

- Research Communities on In-Memory Computing, Artificial Intelligence, and Formal Methods
- Applications of Energy-Efficient Computing
- Startups and Industry focused on Adopting Emerging Technology

Broader Impact on Education and Outreach:

- Workshops for High School Students
- Curriculum Development According to ACM Guidelines
- Undergraduate Research
- Graduate Research

Broader Impact and Broader Participation:

- Broad Application Pool for all Research Positions
- Alignment with Department's BPC plans
- Early Outreach to High School Students at Minority Serving and Hispanic Serving Institutions
- Volunteer Positions

