U.S. DEPARTMENT OF ENERGY

Office of Science

Vision for a Machine Learning Framework Enabling End-to-End Earth System Predictability Research

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DOE Regional and Global Model Analysis (RGMA) Principal Investigator (PI) Virtual Meeting

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Developing Vision Enabling AI from Obs to Earth System Models

- Define the paradigm shift required to employ artificial intelligence and machine learning across field, lab, modeling, and analysis activities
- Multi-lab team working with the EESSD community
- Vision targets 5–10 year timeframe
- Non-incremental advancement built with the future of EESSD programs in mind
- Workshop & meeting reports over next 9–18 months

Team Members
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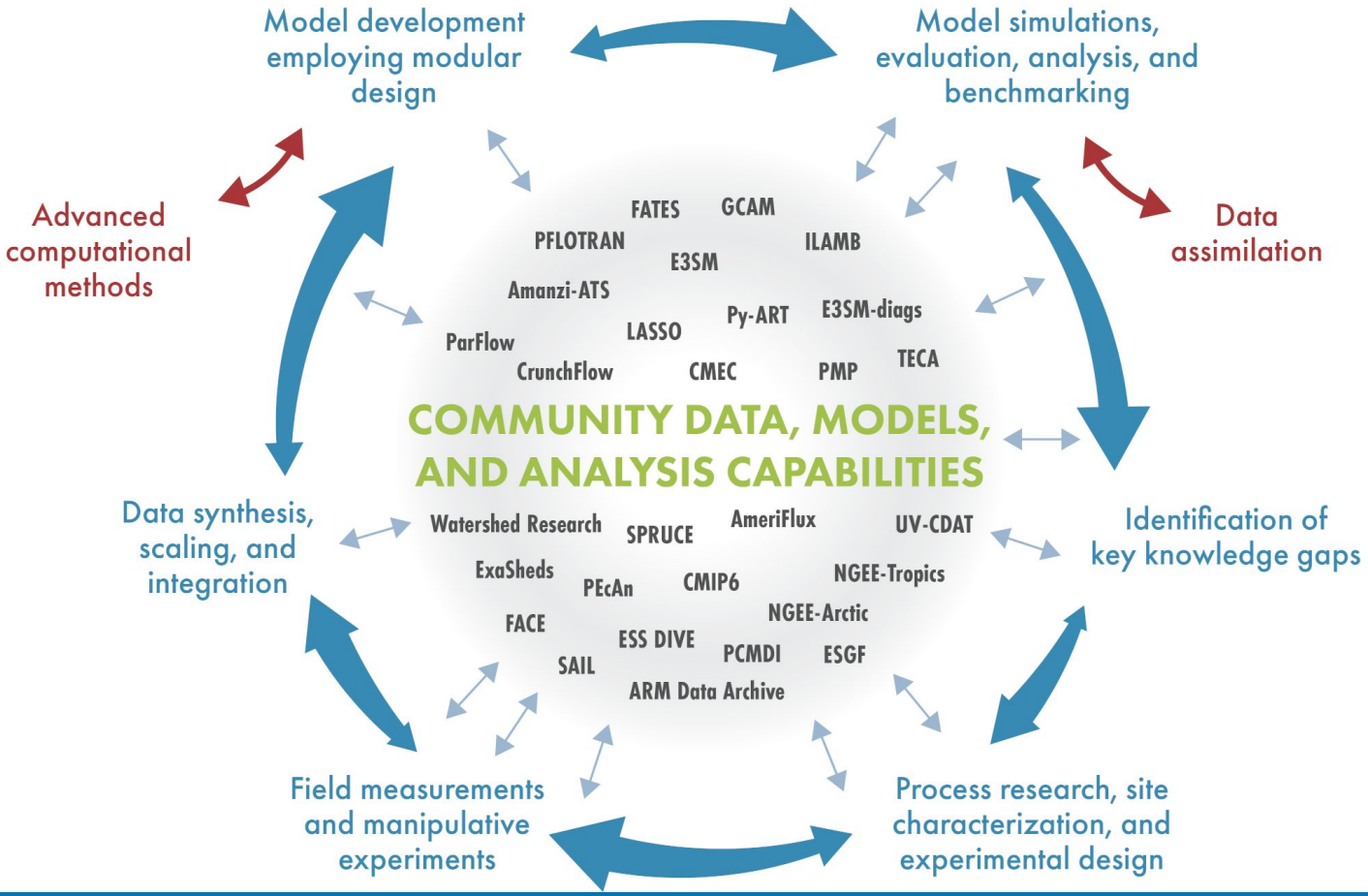
Get Involved:
- RGMA AI/ML Collection
- Sign Up

Overarching Goal

- A framework to combine DOE's experiment/observation and simulation capabilities to quantify and reduce the uncertainty in high-resolution Earth systems models
- Bridge the gap between the state of the art in AI/ML research and the needs of EESSD programs
- Harness Earth Systems data including inter-agency resources (DOE, NOAA, NASA) and seamlessly link data holdings
- Harness upcoming DOE computing including Exascale, mixed architecture and edge

DOE's Model-Data-Experiment Enterprise



Novel AI/ML Framework for Land–Atmosphere Interactions

- Domain-specific machine learning applications from field and lab activities to models and analysis
- AI/ML at every aspect in the wheel (examples; not exhaustive)
  - Simulation-guided experiment/sampling design
  - Dynamic/responsive AI-controlled measurement systems
  - Edge computing and 5G sensor networks
  - Pattern recognition and process discovery through large data
  - Hybrid process-/machine learning-based coupled Earth system modeling
  - Data-driven multiscale modeling and data–model integration and analytics

Summary

- Developing vision for new paradigm for Earth System predictability focused on enabling artificial intelligence and machine learning across field, lab, modeling, and analysis activities.
- Workshops coming soon (9–18 months)
  - Whitepapers & surveys
- How to engage:
  - Participate in breakout survey at this meeting
  - Sign up for more information and tell us about what you're working on: http://bit.ly/MLAI4earth