Computer-aided Discovery of Surface Deformation

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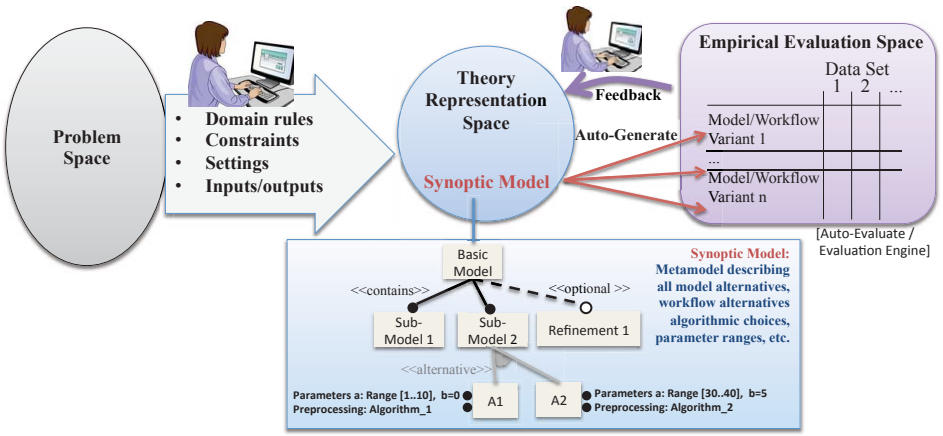
Objective

- Improve the ability of scientists to discover new surface deformation phenomena
  - Develop enhanced environments to enable computer-aided discovery and analysis for diverse scientific datasets
  - Allow cross-comparison of multiple datasets
- Demonstrate the value of this approach in 3 scenarios:
  - Volcanology Case Study
  - Groundwater Case Study
  - Study on interaction of standing atmospheric waves with Sierra Nevada topography distorting GPS locations (Lee Waves)



Concept of Operations for Discovery and Analysis

Accomplishments

- Developed a cloud-based platform for analysis that facilitates new scientific discoveries with the aid of high-performance parallel computing and NASA data; approach led to several discoveries in volcanology (previously undiscovered inflation events)
- Tested and refined platform tools in Jupyter/Python around volcanic, groundwater, atmospheric data sets; created Jupyter extension for transparent cloud offloading of data processing pipelines (e.g., Amazon Cloud)
- Explored related applications of technology for additional disciplines - lunar and planetary science (e.g., Moon/Mars landing site selection)
- Developed components for Principal Component Analysis (PCA), neural networks/deep learning of patterns in MODIS, data fusion of GPS + MODIS.
- Authored publications on all objective case studies, and developed workflow warehouse for processing code reuse (Open-source code available through MIT and github)

Co-Is/Partners: Thomas Herring, MIT

$TRL_{in} = 2$ $TRL_{out} = 4$