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Computational Mathematics
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Graduate student orientation
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My Philosophy of Applied and Computational Mathematics

- If it is not programmed and actually works, it is just a fantasy.
- Implementation reveals errors in the theory.
- Theory provides insights, guidance, and guarantees.
- Never assume something works, look for breaking points.

Parallel iterative solvers for large linear systems (Sandia National Laboratories)

- Functional analysis, finite elements, numerical linear algebra
- Domain decomposition, multigrid
- Lots of programing: prototypes in Matlab
- Proofs: rigorous bounds
- Heuristics: estimates of the bounds to guide computations

Dynamic Data Driven Wildfire Modeling (NSF)

- Goal: coupled weather-fire model running continuously, updated by incoming data
- Big project: $2M, 5 institutions, 8 faculty
- Regular meetings announced on events, often tutorial presentations to educate ourselves, students welcome at all
- Numerical methods, statistics, modeling, parallel computing

Dynamic Data Driven Wildfire Modeling (NSF)

- Numerical solution of stochastic partial differential equations
- Numerical linear algebra
- Statistical filtering and estimation, uncertainty
- High-performance parallel computing
- Lots of programming:
  - Prototypes in Matlab
  - Production code in Fortran, parallel
- Some opportunity for proofs, mostly we build something that needs to work
- Project involves airplanes, satelites, sensors, supercomputers, some people will go to actual forest fires