Summary of the Climate Change Breakout Discussion  
Participants: Doug Fisher, Auroop Gangolgy, Michael Steinbach

Scope of breakout: Computing problems, methods and challenges for characterization of, mitigation of and adaptation to climate change

Machine Learning and Optimization
• Deal with solution uncertainty and sensitivity: because of climate change, what is optimal today, may not be optimal ‘tomorrow
  ▶ How to characterize model/solution robustness in face of change?
  ▶ How to adapt (already implemented) ‘solutions’ in real world?
  ▶ Optimality at present \( \rightarrow \) acceptability in future ?
  ▶ Solving for change
• Deal with lack of iid in climate data

Modeling and Simulation
•Downscale models for regional characterizations and predictions
•Integrate information (physical, social, biological, etc) to get impacts population shifts, biodiversity, invasive species, energy and water supplies/demands
High Performance Computing
  • and human-computer interfaces with it, to include visualization

Sensors and Satellite Data
  • Challenges of sharing of data, to include data management
    ♦ e.g., for invasive species monitoring (highlighted in talks)

Social computing
  • Crowdsourcing of city and other built structure designs
    ♦ design was a topic highlighted in at least one talk

AI and Design
  • Retrofitting old (e.g., city) designs

Software Engineering
  • model validation – how to validate climate models?
  • automated software engineering applied to 2M lines of code, for
    ♦ simplification
    ♦ transparency
    ♦ identification of model interdependencies
  • interplay between models and data
    ♦ automated refinement of models in light of data
Other challenges

**Education**
- role of computing on climate change (and other sustainability) education
  - K-12
  - other sciences
  - policy makers, defense and others in government
- climate change (and other sustainability) education in CS
- role of games, such as ‘climate change war games’

**Why US and China in particular?**

- The US and China are the current and probably future leaders in GHG emissions, respectively, and it’s right that they either lead or follow in solutions and adaptations, preferably together

- Open question: If scientists collaborate across national lines, will there be any ripple to policy makers?