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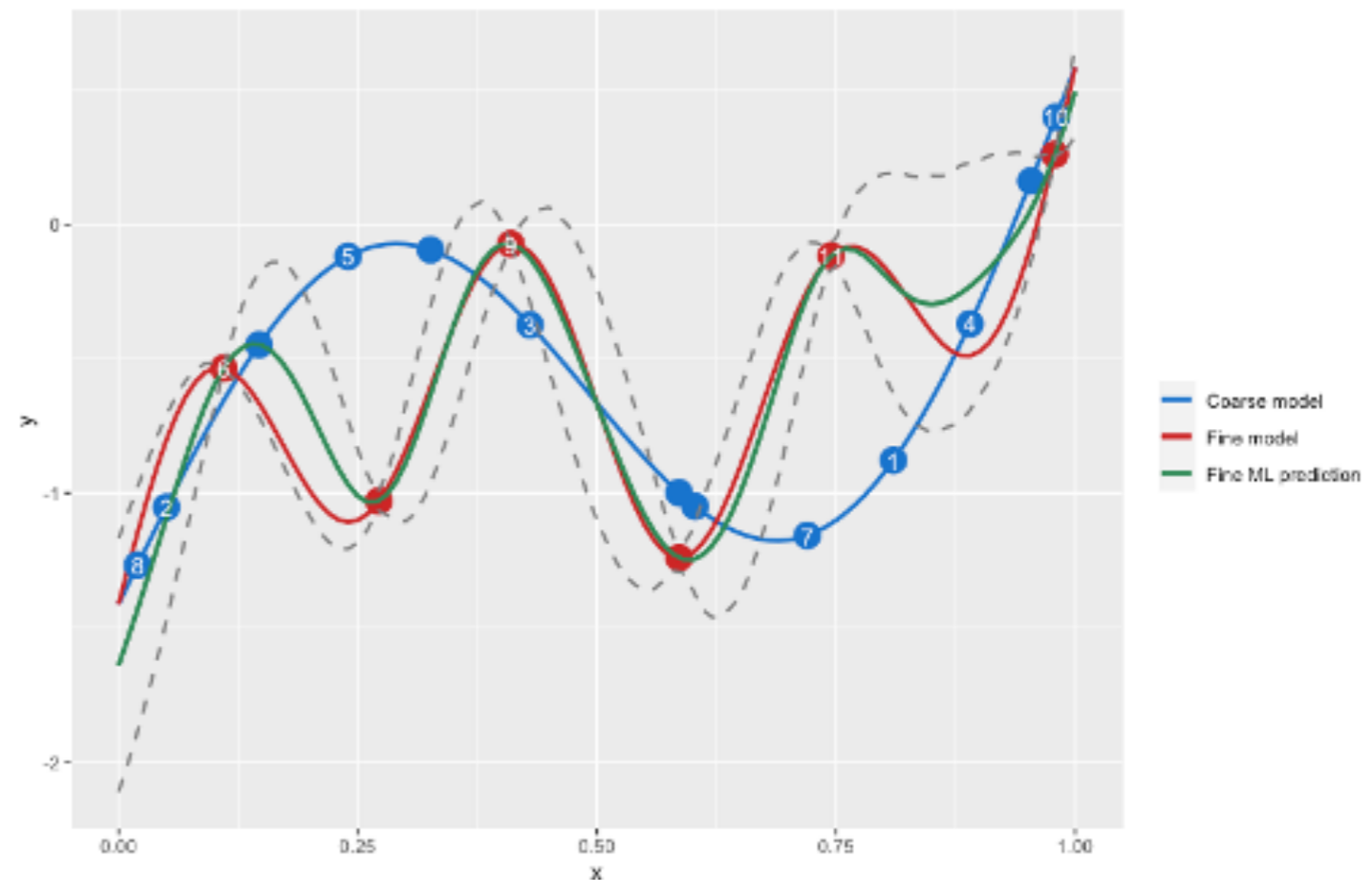
Uncertainty Quantification at the Exascale

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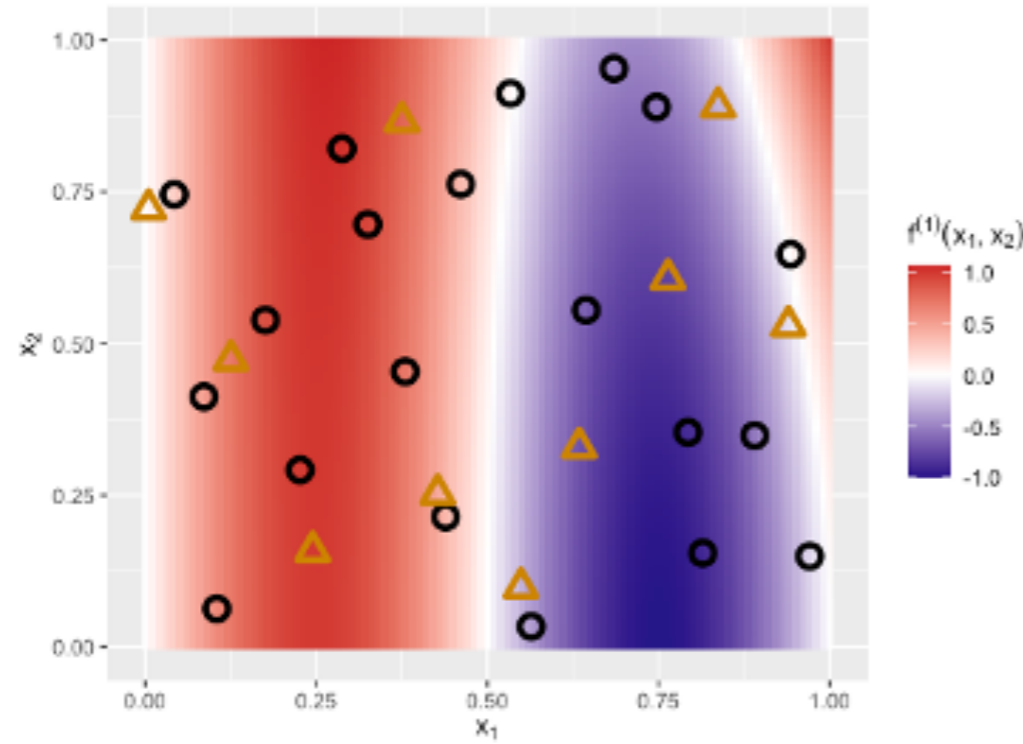
Peter Challenor, James Salter, Louise Kimpton, Xiaoyu Xiong,
Matt Johns, Tom Hawes

Uncertainty Quantification

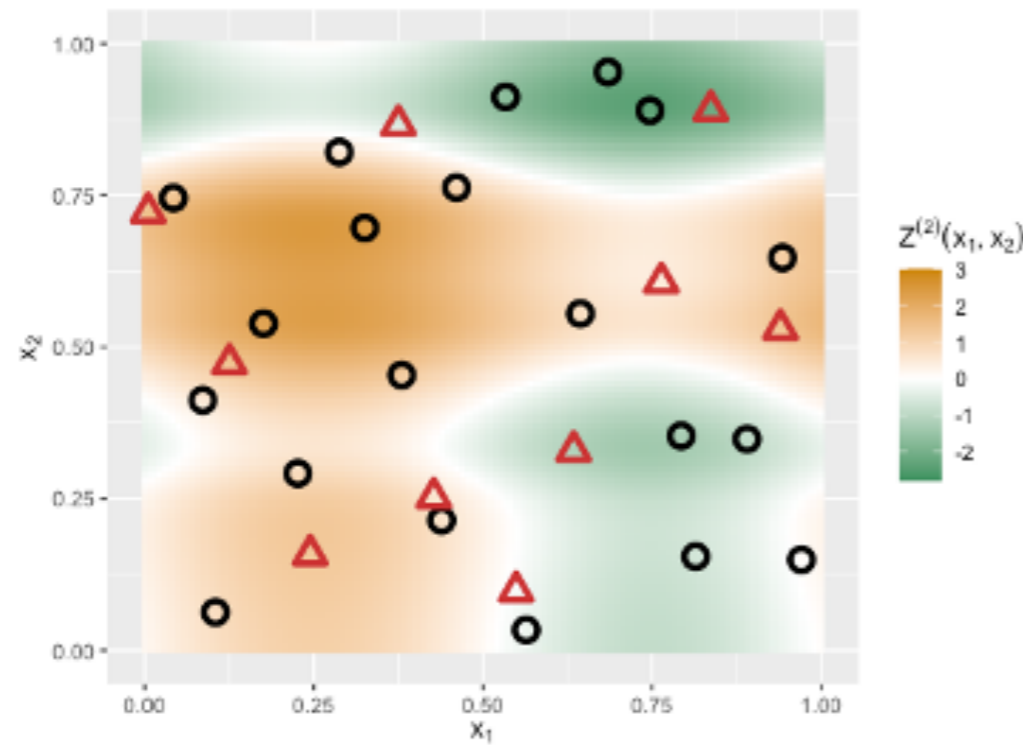
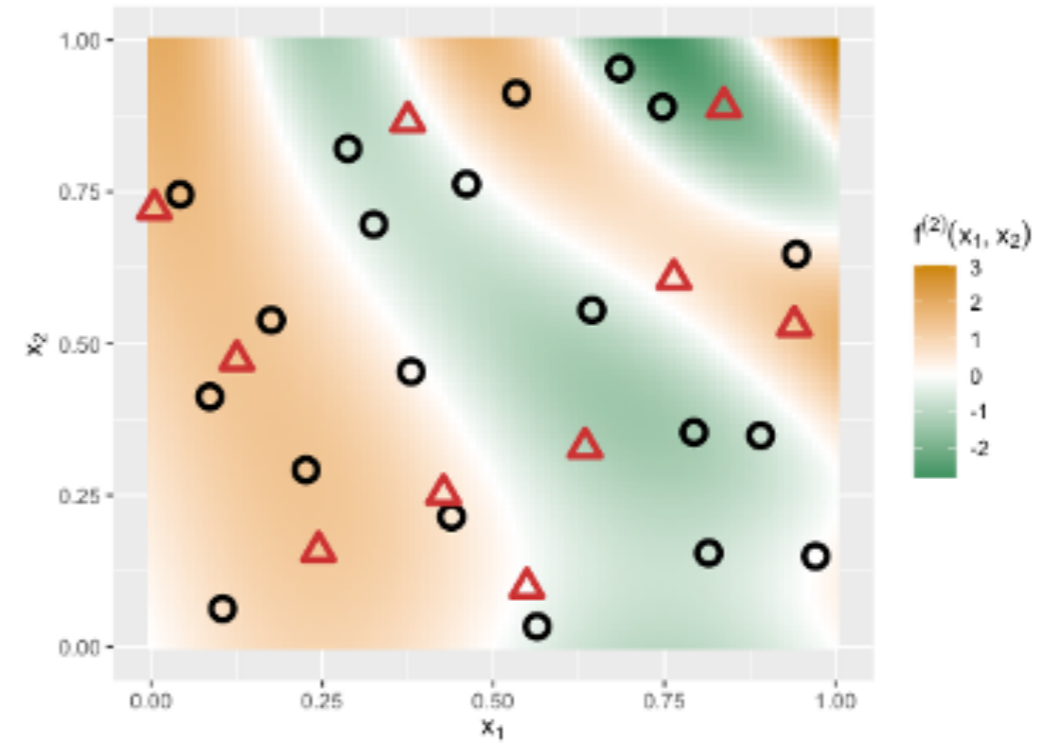
- Why UQ?
- UQ at the ExaScale
 - High fidelity = High computational cost
 - Hierarchies of fidelity and cost (co-kriging)
 - New Bayesian method removing linearity assumption



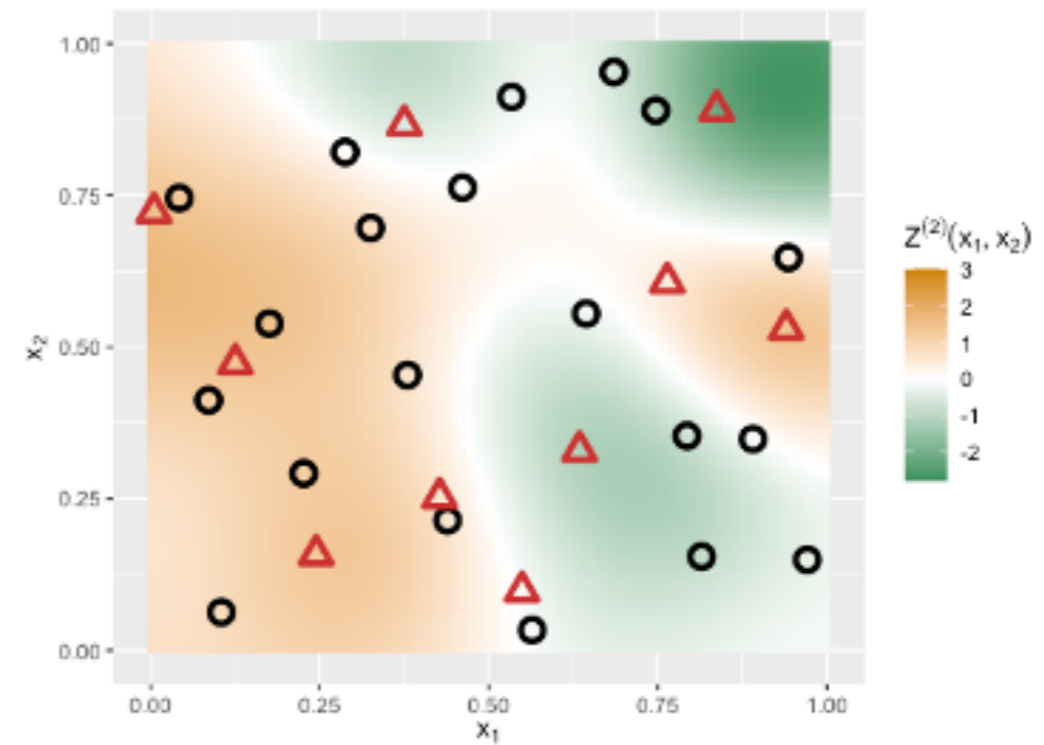
Level 1 truth



Level 2 truth



Oakley and O'Hagan prediction



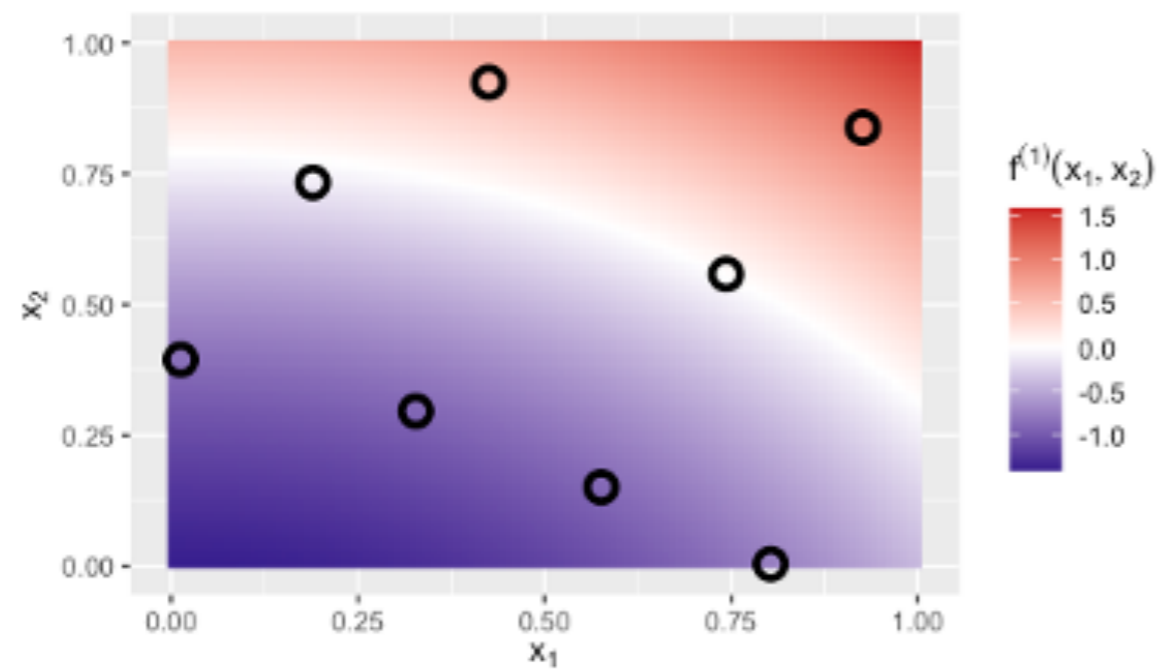
New method prediction

See poster for more details

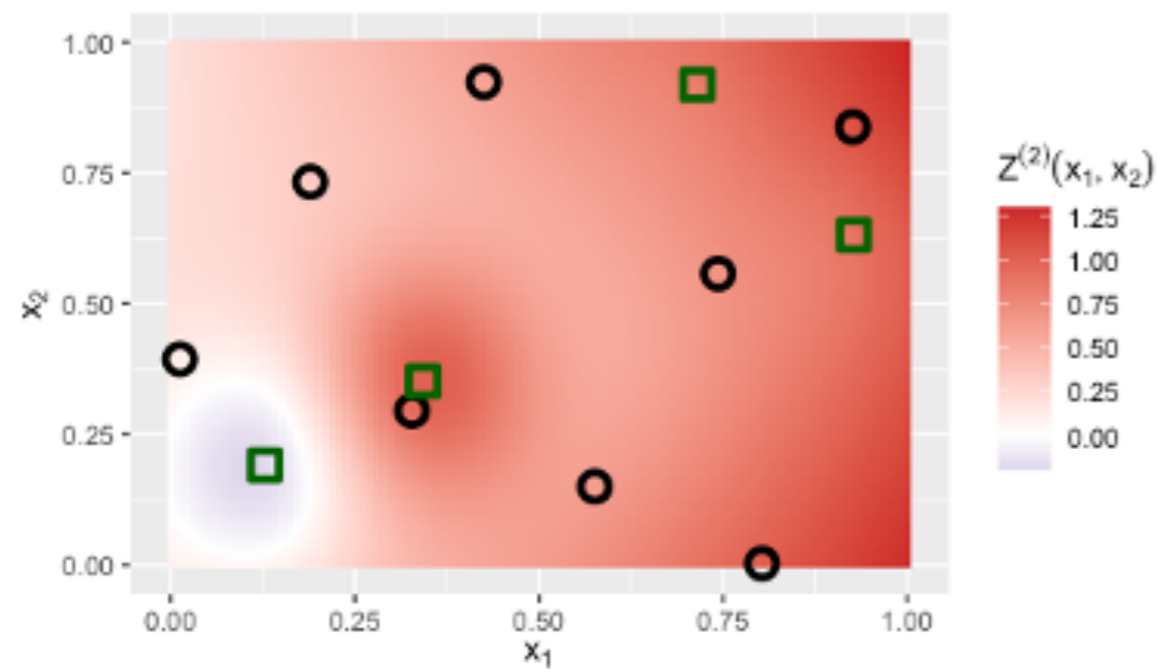
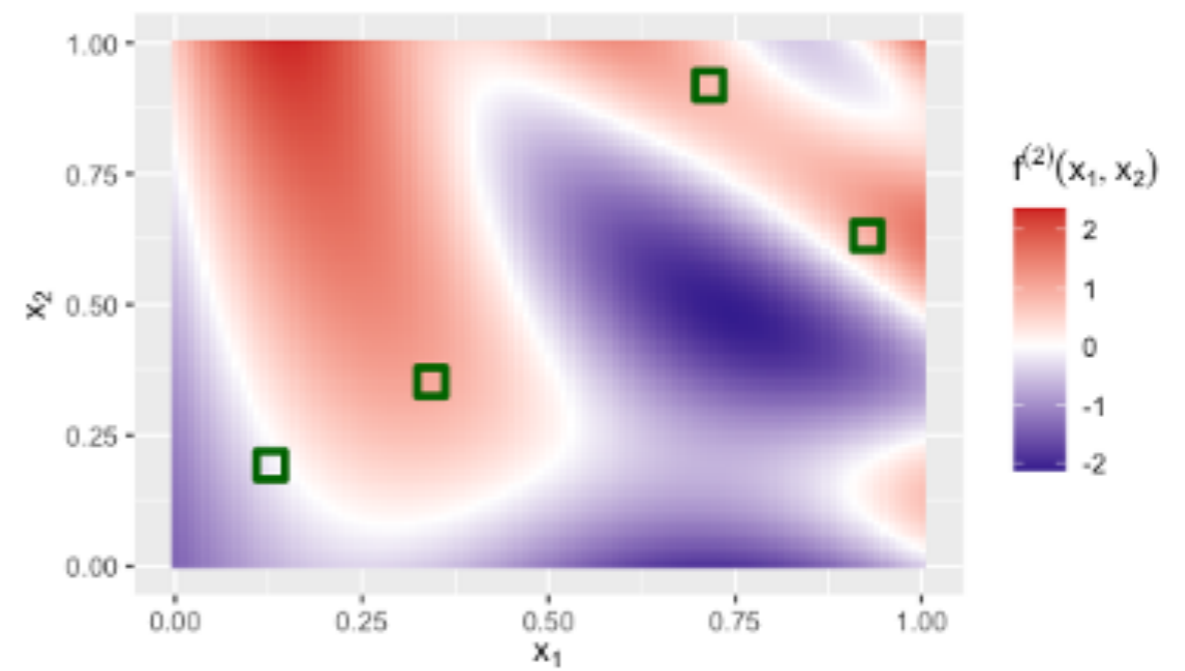
Design

- Expensive models => careful design
- Sequential design
 - Not only where do you put the next point; but at which level in the hierarchy
 - (And we want to do this in batch mode)

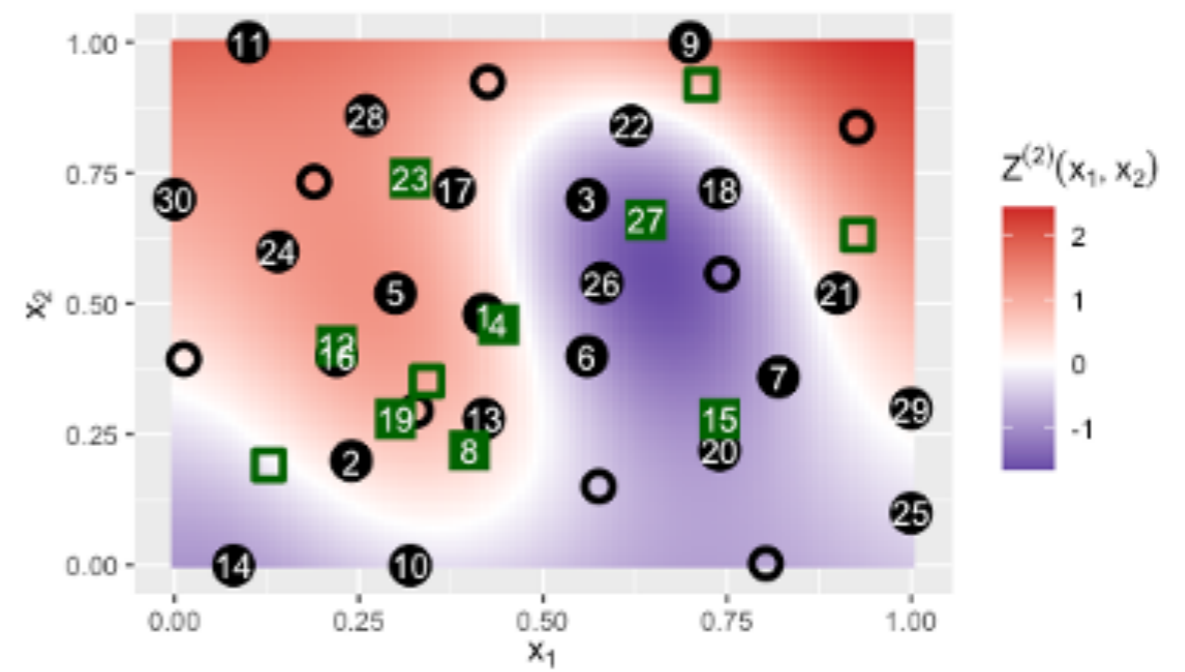
Level 1 truth



Level 2 truth



Initial prediction



Sequential design

Toolkits

- Handling ensembles of models and keeping track of the results
- Code for our new methods
- Links to MOGP (Turing)

Challenges

- Non-hierarchical models
 - What if there aren't simpler versions of the exa-models?
- Model calibration through hierarchies
 - Reified models
- Good, challenging models