# Thesis Plan

Jack Kennedy

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## 1 Thesis Structure

1 Introduction

- Thesis aims and outline
- Athena model
- Bayesian methods - I am concerned with decision making and elicitation

2 Emulators/GPs - Statistical analysis of complex computer models

- Introduction to Emulators: prior over functions (vs prior over individual parameters)
- Stochastic vs deterministic, the nugget effect
- Literature review on various emulation approaches
- HetGPs - important special case
  - Gramacy/Goldberg's HetGP
  - "implied" HetGPs e.g. DAH paper with 2 emulators, quantile kriging etc
  - Might be agood place to put some initial Athena emulators in e.g. the one used in my early talks?
- Review on applications of emulators: focus on sensitivity, uncertainty propagation and decision making
- Diagnostics

3 Stochastic ML Emulators

- This will be very similar to paper
- I can go into more detail though. I have used an EB approach to fit emulators but I could include the MAP estimate work for the full picture

4 Sensitivity analysis for complex models

- Review of key approaches. Oakley and O'Hagan paper + Marrel paper v important

- Also mentions other types of SA e.g. local SA?
- Put my sensitivity analysis via hetgp and sml in here

5 Bayesian Optimisation & Decision support

- Outline bayesian optimisation
- Outline history matching optimisation
- Discuss decision making Vs decision support

6 Wind farm optim problem

- Set scene with wind farm problem
- Give and discuss results of my approach to the problem
- Similar to a "data analysis" chapter

7 Conclusions/discussion

- Summary of each thesis chapter (about 1 paragraph each)
- Loop back to start: "In chapter X we did Y"
- Future work
  * Designs for SML Emulators
  * We could investigate senstivity to the optimal decision using Oakley's method. NB this would be tricky because we have a discrete simplex valued component i.e. correlated inputs.

# 2 Work timeline

The plan is to spend $\sim$ 3 weeks constructing a first draft of each chapter. Roughly as follows

- January - emulators
- Janury/Febuary - SML emulators and HetGPs
- Revise emulators
- Febuary/March - Sensitivity analysis
- Revise SML/HGP
- March - Bayesian Optimisation, Decision support
- Revise SA
- April - Wind farm optimisation problem
- Revise BayesOpt/DS

- April/June - Intro
- Revise wind farm optim
- June/July - Conclusions
- Revise intro
- Revise conclusions