

Outline of PhD manuscript

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1 Introduction

- 1.1 Importance of the numerical model in predictions
- 1.2 Need for good calibrated models
- 1.3 Oceanic modelling
- 1.4 Uncertainties in the modelling and classification
- 1.5 Defining robustness

2 Inverse Problem Formulation

- 2.1 Bayesian Formulation
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- 2.3 Calibration of numerical models using adjoint method
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- 2.4 Localized optimisation pitfalls

3 Robust estimators in the presence of uncertainties

- 3.1 (Re)defining robustness
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4 Adaptative design enrichment for calibration using GP

- 4.1 Mathematical background on Gaussian Processes
 - 4.1.1 GP as prior on functions
 - 4.1.2 Selecting covariance kernels and hyperparameters
 - 4.1.3 Using gradient information
- 4.2 One-step lookahead: Stepwise Uncertainties Reduction
 - 4.2.1 Exploration based criteria

- Maximum of variance

- Reduce one-step IMSE

4.2.2 Goal driven criteria for global optimisation

- Probability of Improvement
- Expected Improvement
- Informational Approach to Global Optimisation

4.2.3 Criteria for Contour Estimation / level sets

- Margin definition
- Vorob'ev mean and deviation

4.2.4 Criterion to estimate jointly α_p and k_p

- Reduce modified IMSE

4.3 Taking advantage of parallelism

4.3.1 From one-step to q step lookahead variations of criteria

4.3.2 Sampling-based adaptive designs of experiments

5 Application to the numerical coastal regional model CROCO

5.1 Physical parametrization of the bottom friction

5.2 Modelling the uncertainties

5.3 Sensitivity on the uncertainties

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6 Conclusion

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6.2 Perspectives