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Discussion: Research Advances at the Interface of Uncertainty Quantification and Machine Learning for High Consequence Problems

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Joint Statistical Meetings 2022

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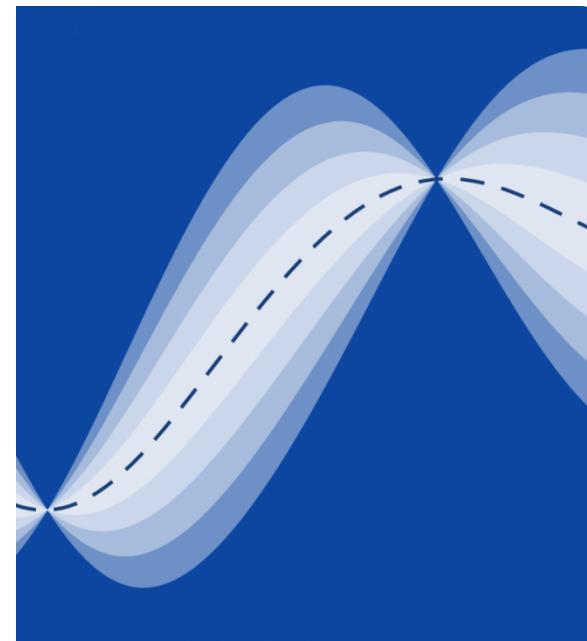




Uncertainty Quantification

Machine Learning

High Consequence
Problems

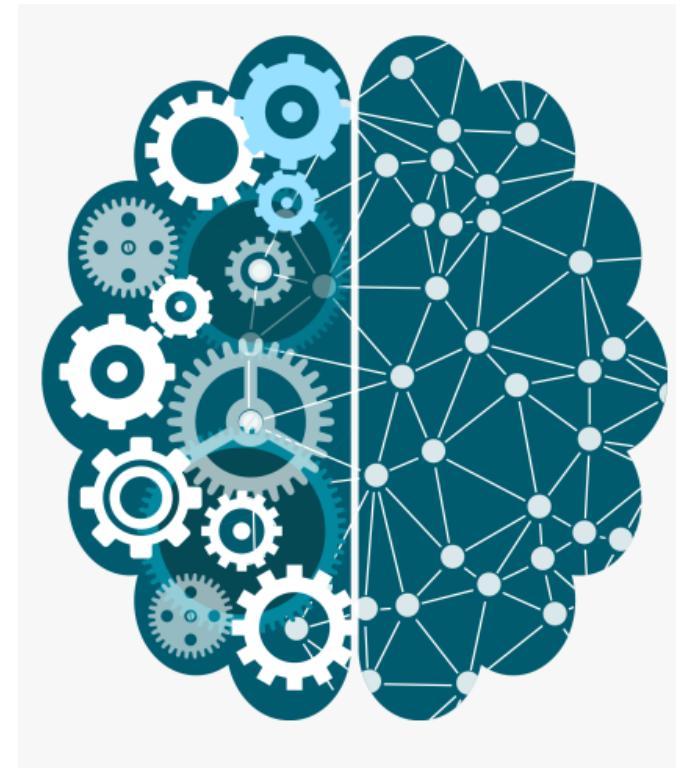




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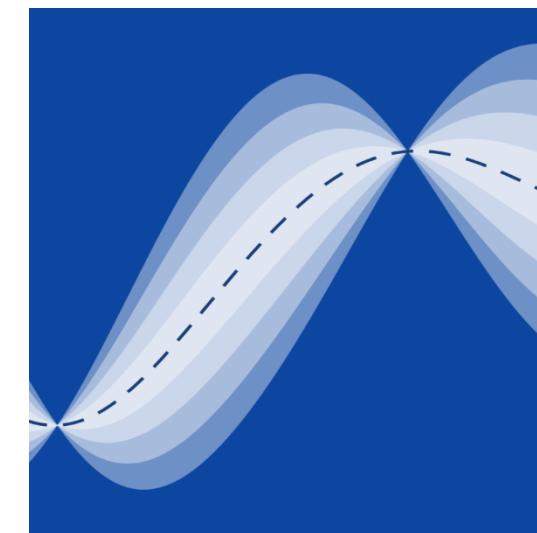
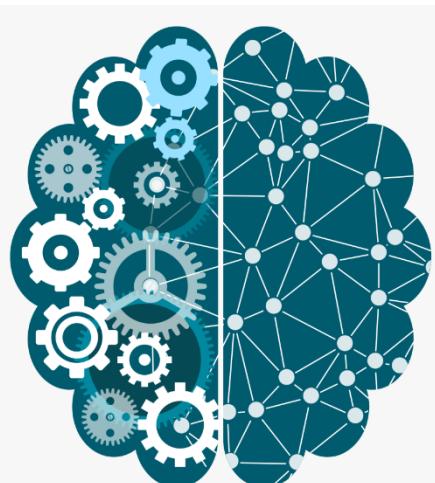
High Consequence
Problems





Machine Learning for
Uncertainty Quantification

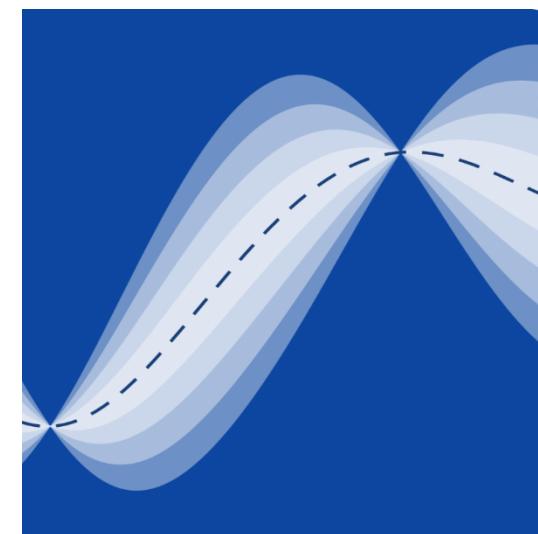
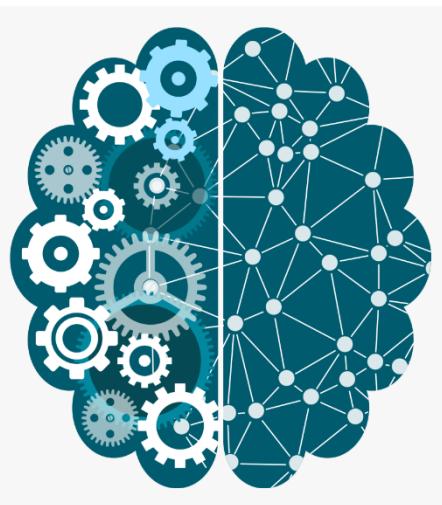
Uncertainty Quantification for
Machine Learning





Machine Learning for
Uncertainty Quantification

Uncertainty Quantification for
Machine Learning



Provocative Questions to Think About

- What value does UQ bring to high consequence problems?
 - How do you quantify this to decision makers?

- You successfully quantified uncertainty, now what?
 - How should this UQ be used operationally?

- How do we avoid the “Statistics vs Machine Learning” mindset?

Opportunities



Growth Opportunities

- A new quality of UQ metric, particularly for classification problems, analogous to MSE for predictive accuracy
 - Alternatively, an AIC-like measure
- A call for participating in the deep learning field
 - Need more involvement from statisticians in UQ
 - Low hanging fruit
- Algorithm development
 - VI is much faster, but not as accurate as MCMC
 - Need to more user-friendly interfaces, current implementations are touchy and difficult to use even for experts
- Decision making involvement
 - It's not just about the statistics
 - High consequence problems mean decision-making

Thank you for
Listening!