UNCERTAINTY QUANTIFICATION FOR PARTIAL FORWARD MODEL EMULATION IN EARTH REMOTE SENSING

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ABSTRACT

Current and future generations of remote sensing instruments are producing increasingly enormous volumes of highly informative data. Since remote measurements are indirect, one or more inverse problems need to be solved for each acquired measurement. The associated forward models often include computationally expensive high-fidelity models that cannot be used as-is for the high rate of remote sensing acquisitions. This computational challenge can be substantially reduced by using machine learning emulators to replace the full-physics models, either partially or fully. While this will introduce additional uncertainty in the forward model, it will also allow for more principled inverse UQ as the number of forward model calls can be increased.

In this talk we demonstrate how cross-validation-based high-dimensional Gaussian process emulators can be used to improve inference outcomes and uncertainty quantification for a number of NASA missions, ranging from imaging spectroscopy to atmospheric carbon and upcoming space-based weather radar applications.

REFERENCES

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