Why is Predictive Science Fascinating?

- **The big picture stands out (System Engineering Point of View)**

- **The black boxes must be opened (Scientific Understanding)**

  Choices need to be made for:

    - Priors

    - Inadequacy Models

    - Domains of Applicability

    - Unknown Unknowns?

    - When to Ask for more Data, and What to Ask

      …

- **The curse of dimensionality is not an enemy (Recall to Efficiency)**

    - Sensitivity Analysis

    - Code Optimization

    - Model Reduction

      …

Probabilistic Programming

Codes:

- **SMUQ (UIUC), Fortran 2008**

  https://www.politesi.polimi.it/bitstream/10589/118101/3/SimoneVenturi_MastersThesis.pdf

- **Dakota (Sandia National Lab.s), C++**

  https://dakota.sandia.gov/release-notes-headings/uncertainty-quantification-uq

Python Libraries:

- **PyMC3**

  https://docs.pymc.io/

- **TensorFlow Probability**

  https://www.tensorflow.org/probability

  Fusion Plasma Example: https://youtu.be/Bb1_zlrjo1c