SSDL Sustainable Systems Design Laboratory

University of Victoria | Institute for Integrated Energy Systems

PhD Position: Stochastic Wind Energy System Optimization

Wind energy systems are one of the most cost effective renewable energy generation types available. They now include terrestrial, bottom- and floating-offshore variants of the 3-bladed 'Danish concept' machines, along with nascent airborne wind energy concepts. All wind energy systems fundamentally operate in the unsteady wind environment, which creates the loads and variable power outputs that are so challenging to design for. Optimization done for steady-state conditions is unable to fully account for or exploit these stochastic effects.

Graduate student positions are available under the direction of Dr. Crawford, the director of the Sustainable Systems Design Lab (SSDL) within the Institute for Integrated Energy Systems (IESVic) and Department of Mechanical Engineering at the University of Victoria. The students will work on a project to continue research in the SSDL aimed at exploiting stochastic methods (e.g. polynomial chaos expansion and Bayesian methods) within single machine and array layout optimizations of wind energy converters. Floating offshore and airborne wind energy concept optimization are both specific application focuses within the SSDL. The intention is to develop new stochastic computational analysis tools that enable more robust and reliable designs using the developed analysis tools (both custom and black-box simulators) and multi-fidelity optimization techniques, all accounting directly for the stochastic wind (and wave) inputs to the system.

Requirements

- Master's degree in engineering or science
- Experience in stochastic/probabilistic analysis methods (e.g. PCE, Bayesian, cumulants, Gaussian processes), metamodeling (e.g. Kriging), machine learning (e.g. K-means, PCA) and/or optimization
- Familiarity with and enthusiasm for wind energy
- Knowledge of Python, LaTex, Matlab tools for analysis and figure generation
- Strong writing, conversational and presentation abilities in English
- Ability to work effectively in a diverse team

Timeline

Subject to funding, spring to summer 2020.

How to apply

Interested candidates should email Dr. Crawford at curranc@uvic.ca with the subject Stochastic Wind Energy, and attach:

- ☑ A detailed curriculum vitae
- ☑ A one-page cover letter describing your relevant (research) experience and motivation for the position
- ☑ Names and contact details for two references

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