PhD position at IFP Energies nouvelles (IFPEN)

Mathematics

Control strategies for a wind farm based on a simplified dynamical wake modeling

In the field of wind energy, operators are now focusing on using wind turbines located in wind farms in the best possible way, to either produce the maximum energy possible, or produce the right amount of energy at the right time, to meet power grid requirements while limiting the wind turbine mechanical stress, in order to eventually minimize the cost of energy.

It is possible to limit the interactions between a turbine wake and the downwind turbines by controlling its yaw angle and power produced, and thus alleviating the production losses and mechanical fatigue. In this context, our central question will be “How to robustly minimize a wind farm cost of energy via a control algorithm using a dynamic wind farm flow model, and how to implement it in real world”.

The PhD results will contribute to three major advances:

1. Develop wind farm control strategies based on a time-varying wake modeling and evaluate their added value.
2. Define a cost criterion allowing to efficiently minimize the cost of energy over long time horizons.
3. Contribute to the implementation and deployment of the developed control algorithms and prove and illustrate their robustness and efficiency.

Keywords: Wind turbines, Wind farms, Control, Estimation, Optimal Control, Optimization, Predictive control

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Doctoral School
Ingénierie des Systèmes, Matériaux, Mécanique, Énergétique

IFPEN supervisor
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PhD location
IFP Energies Nouvelles, Lyon, France

Duration and start date
3 years, starting in fourth quarter 2024

Employer
IFP Energies Nouvelles, Lyon, France

Academic requirements
University Master degree mathematics or mechanical engineering

Language requirements
Fluency in French or English, willingness to learn French

Other requirements
Control systems, optimization, signal processing

To apply, please send your cover letter and CV to the IFPEN supervisor indicated here above.

About IFP Energies nouvelles

IFP Energies nouvelles is a French public-sector research, innovation and training center. Its mission is to develop efficient, economical, clean and sustainable technologies in the fields of energy, transport and the environment. For more information, see our WEB site.

IFPEN offers a stimulating research environment, with access to first in class laboratory infrastructures and computing facilities. IFPEN offers competitive salary and benefits packages. All PhD students have access to dedicated seminars and training sessions. For more information, please see our dedicated WEB pages.