



Politecnico  
di Torino



MARINE  
OFFSHORE  
RENEWABLE  
ENERGY LAB

## Data-based optimisation of arrays of wave energy conversion systems

Master thesis proposal at the Marine Offshore Renewable Energy Lab  
Department of Mechanical and Aerospace Engineering  
Politecnico di Torino (Italy)

In collaboration with the Department of the Built Environment  
Aalborg University (Denmark)

### Recommended profile:

Mechanical engineering, Mechatronic engineering, Applied mathematics

### Topics involved:

Modelling, data-based, system dynamics, wave energy conversion

## Proposal description

Wave energy conversion devices, commonly referred to as **wave energy converters** (WECs), need to be deployed in array configurations to maximise the overall energy extraction from the ocean wave resource, hence directly lowering the associated levelised cost of energy. Optimising array layouts hence becomes a fundamental stepping stone towards widespread commercialisation of WEC technology.

This project aims at using non-parametric data, in the frequency-domain, to optimise layout configurations based on spectral analysis. Hydrodynamic solvers will be used in order to compute sufficient data to characterise a set of diverse array configurations, used for optimisation leveraging algorithms able to balance Euclidean and  $\mathcal{H}_\infty$  norms with the scope of maximising controllability. Tools from data analysis will be used, including (but not limited to) signal processing, system identification, among others.

**Note: This thesis is performed in collaboration with Aalborg University, and the student is expected to spend a period of approximately 4 months in the institution.**

Relevant references:

<https://www.sciencedirect.com/science/article/pii/S0960148123006924?via%3Dihub>

<https://www.mdpi.com/2071-1050/9/1/115>

### Contact references:

Dr. Nicolás Faedo (nicolas.faedo@polito.it)

Dr. Francesco Ferri (ffer@build.aau.dk)