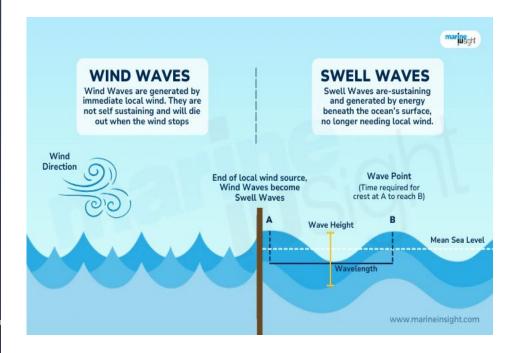
Wave Energy Prediction: A Machine Learning Approach



Subject Area Overview

Problem Statement/Opportunity

Employ machine learning to predict/forecast wave energy that is as accurate as existing models and provides a computationally efficient alternative to numeric and physics based models.



- Wave power is the energy derived from ocean waves.
- Swell, generated from wind and weather patterns.
- The prediction of wave power and other wave characteristics traditionally relies on established methods, such as numerical and physics based mathematical models.

Vision for Tackling the Problem



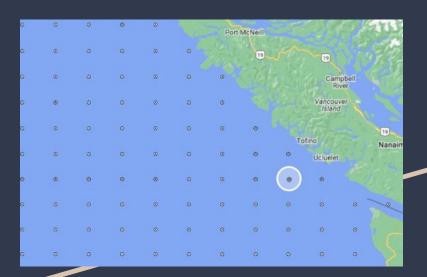
- Use Data Science and machine learning, to better understand complex interactions between environmental variables and wave power generation.
- Use machine learning to build a robust model to predict wave power available. Possibly Random Forest and Time Series analysis.
- Build a live forecasting model to provide real time insight.

Potential Impact

- Being able to accurately predict wave energy has implications in renewable energy, recreational activities as well as maritime safety operations.
- Running simulations of models such as the SWAN forecasting or Hindcast model may require supercomputing facilities or specialized high-performance computing clusters.



Introduction to Dataset



Data collected from 4 Different Sources:

- Historical buoy Data:
 - Laperouse buoy
 - MEDS Tofino
- HINDCAST MSC50 numerical model
- Tidal Data, station 8615 Tofino

Data Types

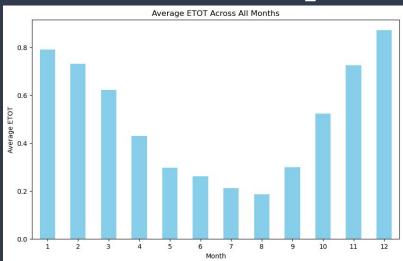
- Continuous numerical
- Directional
- Date time

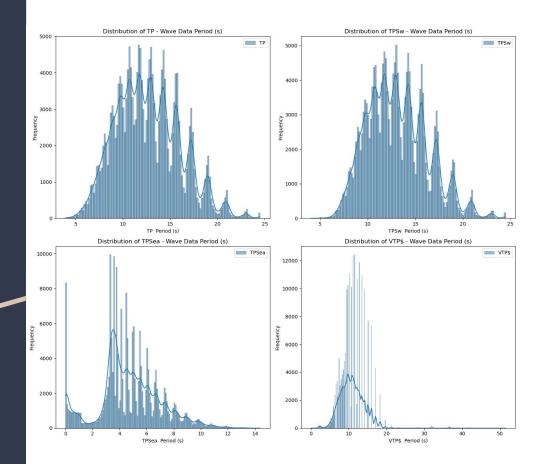
DataFrame shape: (199026, 38)

- Combined historical buoy data and Hindcast gridpoint.
- Possible inclusion of other data, or working with other data frames, taking distance into account.

Data Quality: Possible concerns, Q-flag values

Preliminary EDA and Next Steps





	Correlation Matrix Heatmap DEPTH - 1.00 -0.01 -0.01 0.00 0.02 0.03 0.03 -0.00 -0.01 -0.01 -0.01 -0.01 -0.00 0.01 0.02 -0.00 0.01 -0.01 -0.01 -0.01 0.00 0.00														- 1.00							
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VCMX0.01	0.96 1.00 0	.21 -0.00 0.	44 0.49	-0.37 -0.	.24 -0.11	-0.14 0.5	52 0.56	-0.13 0	.01 0.4	44 0.50	-0.05	0.43 -	0.09 0.0	0.6	0.04	0.08	0.08		- 0.75		Lasso	so Regression
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WDIR - 0.02 -	-0.01 -0.00 -0	0.11 1.00 0.0	02 0.02	0.08 0.	18 0.06	0.25 -0.	08 -0.09	0.04 -0	.06 -0.	04 -0.04	-0.16	-0.11	0.04 0.0	00 -0.1	11 -0.08	0.12	0.02					
WSPD - 0.03	0.45 0.44 -0	0.08 0.02 1.0	00 0.99	-0.31 -0.	.08 -0.07	-0.08 0.2	21 0.21	-0.06 0	.04 0.	15 0.19	0.01	0.19 -	0.03 -0.0	02 0.2	24 0.06	0.01	0.03					
GSPD - 0.03	0.50 0.49 -0	0.06 0.02 0.9	99 1.00	-0.33 -0.	.11 -0.08	-0.09 0.3	24 0.25	-0.06 0	.04 0.:	17 0.22	0.00	0.21 -	0.03 -0.0	01 0.2	0.06	0.01	0.04		- 0.50	•	Next	Steps:
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VMDSea - 0.02 -	-0.05 -0.05 0	.06 -0.16 0.	01 0.00	-0.08 -0.	.04 -0.00	-0.44 -0.	02 -0.09	0.01 0	.22 -0.	04 -0.17	1.00	-0.10	0.04 -0.3	10 -0.0	09 0.28	-0.39	0.15					
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DEP	× ×	> \$ \$	89	A S	בי א		Б	7	VMD	i i	VMDSea	ETTSW	TPSw		DMDIR	ANGSPR	Z					