ALEX FRANCIS

CALWAVE RESEARCH FALL 2015

ABOUT ME

3rd Year, Computer Science & Statistics

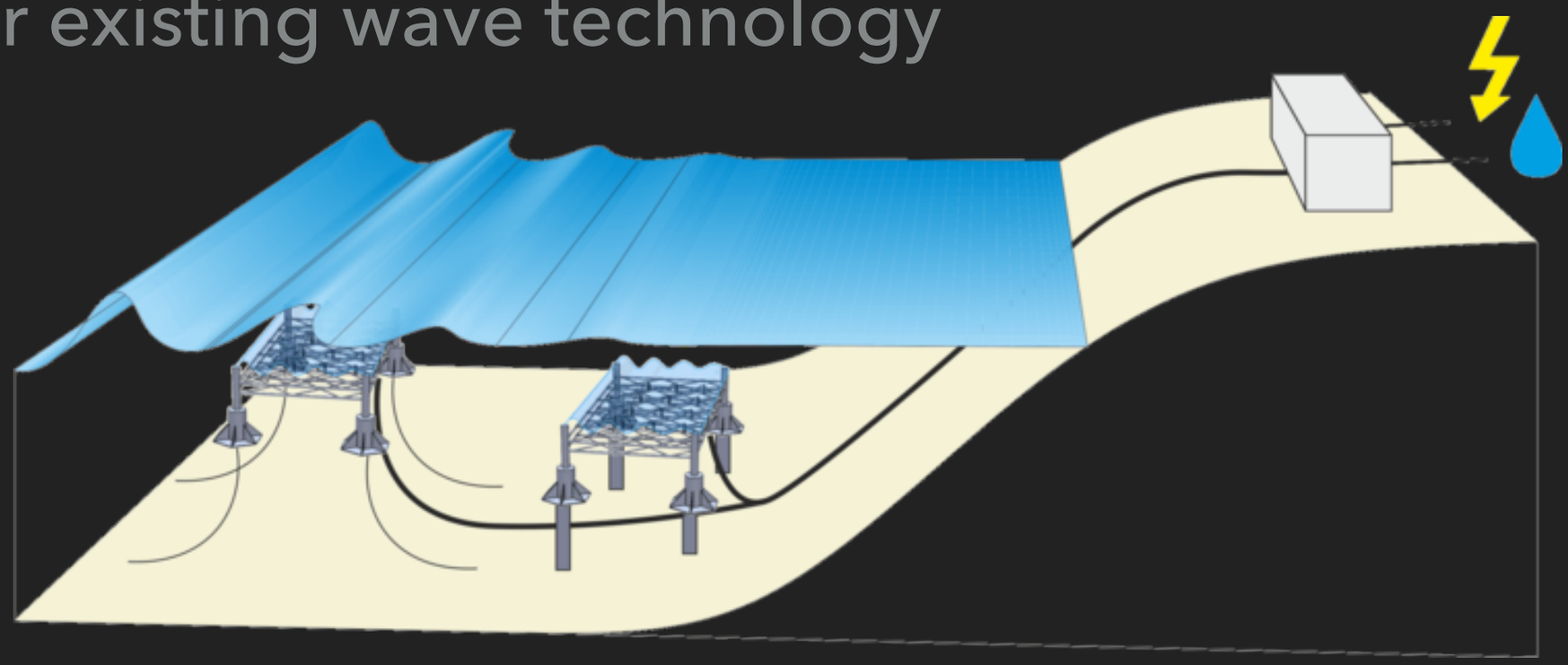
KPCB Fellows Program & Introduction to CalWave

Interest in Machine Learning, Statistical Modeling

Involvement in EECS Honors Degree Program

CALWAVE INTRODUCTION

- "Wave Carpet" produces electricity and freshwater
- Model: ability of sea floor to dampen waves
- Research performed at MIT and UC Berkeley, with potential for commercialization (CalWave)
- Superiority over existing wave technology



VIDEO (1:45)

- http://calwave.org/technology/

BEFORE FALL 2015...

- Wave Energy Prize, sponsored by the U.S. Department of Energy (DOE)'s Water Power Program
- Technical Gate 1
  - Series of questions to determine viability of model and concept
  - Concluded ~ August 14th
  - 9th Place
- Performing research in association with Reza Alam, Assistant Professor of Mechanical Engineering

GOALS FOR FALL 2015

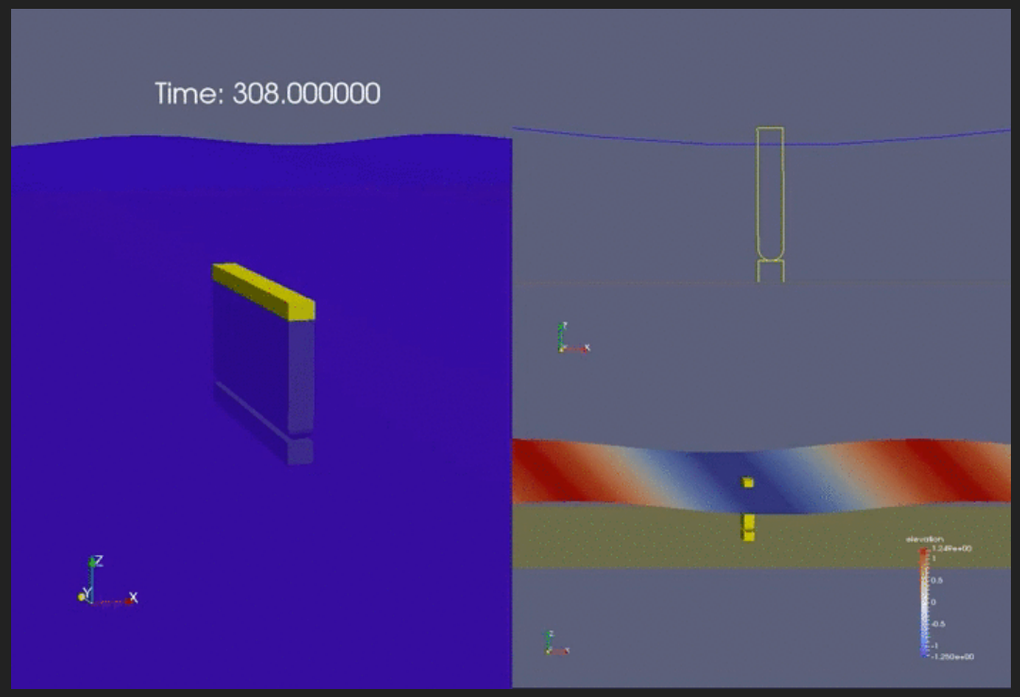
- Technical Gate 2
  - 1/50th Scale Model Testing, Data Analysis - Experimental.
- Numerical Modeling and Calculation of Characteristic Capital Expenditure

CONTRIBUTIONS

- Numerical Modeling and Simulation
  - WEC-Sim (https://github.com/WEC-Sim/WEC-Sim)
    - NEMOH as a preprocessor for hydrodynamic coefficients
  - Geometries
  - Interpolation

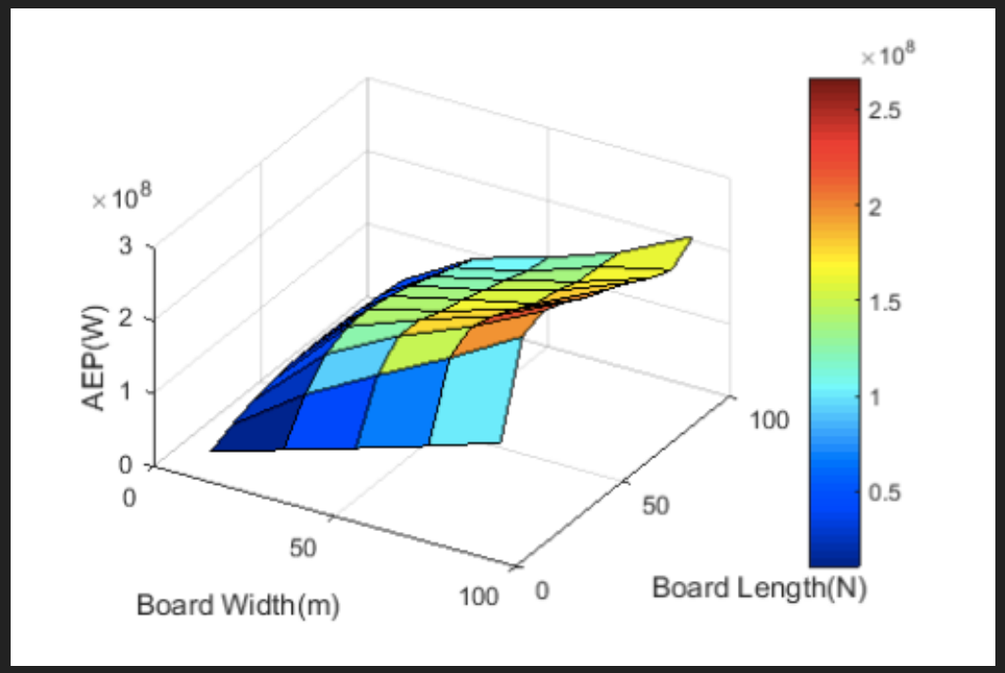
CONTRIBUTIONS – WECSIM & NEMOH

- Problem Statement: write a MATLAB script that will calculate hydrodynamic coefficients and determine annual energy output across matrix of wave climates (given geometries)
- Different models:
  - Monochromatic Waves & Bretschneider



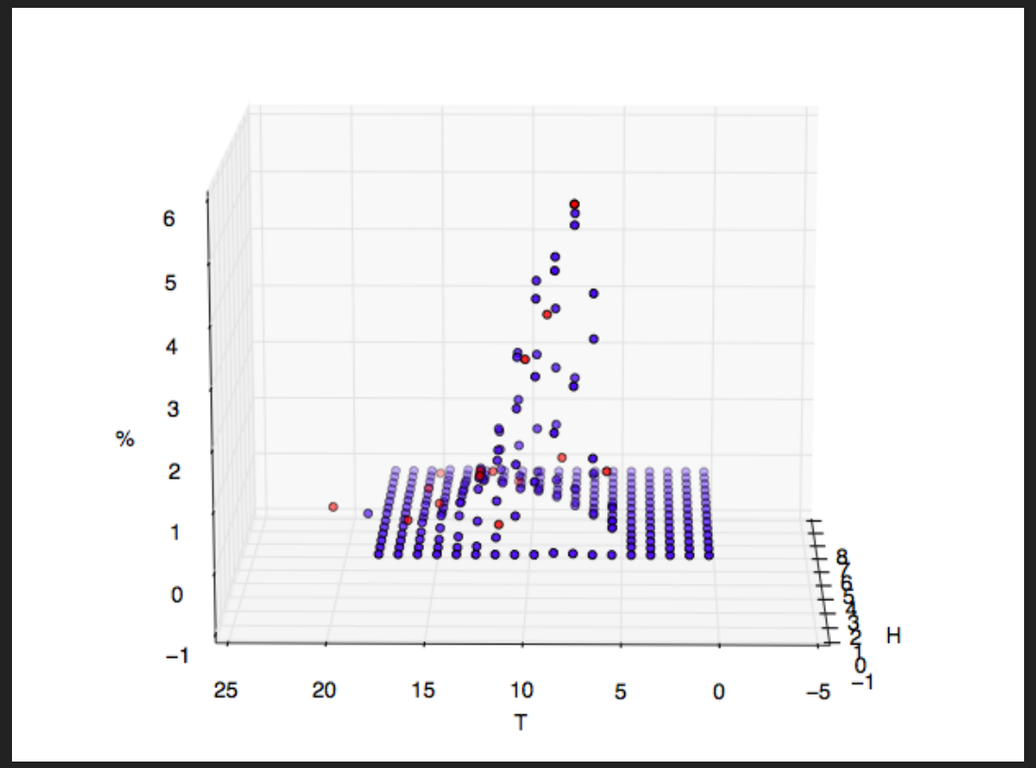
CONTRIBUTIONS – GEOMETRIES

- Problem Statement: different geometries produce different AEP results - construct a variety of them and determine the optimal AEP
- SALOME
- Minimal time spent here given unfamiliarity with CAD software, but important part of project



CONTRIBUTIONS – INTERPOLATION

- Problem Statement: Given a matrix with joint densities
  P[X = x, Y = y], how can we find densities with data points a, b not in the matrix?
- Linear approximation
- Allowed team to bridge gap between experimental and theoretical results
- Generalizable to n-dimensions (n - 1 independent variables, with probability dependent)? Open source project



NEXT STEPS

- Win Wave Energy Prize!
- Commercialize
- Departure - ICSI

Q & A