

# USING HYBRID MACHINE LEARNING MODELS

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# HOSTS



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Associate Professor and Chair in Exploration Geophysics at University of Calgary.



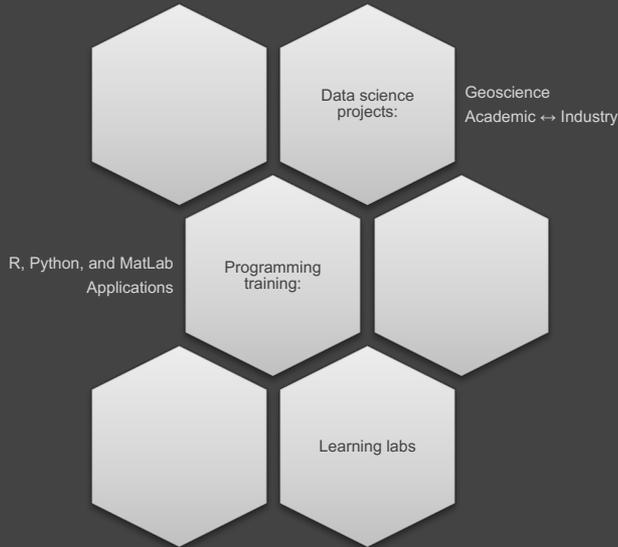
## **David Emery**

Geophysical specialist and active member of the CREWES Data Science Initiative





# CREWES Data Science Initiative

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## Data Science

Full Waveform Inversion

Converted Waves

Joint Inversion

Graduate Theses

Explorer Programs

Free Seismology  
Textbook & Software

Online Papers

Publications

Errata

## Data Science

Data Science is a growing field with different tasks and applications. Everyday more people are entering the field, making it a great career course and moving to this relatively new and exciting area. Here at the CREWES we are engaged on research and dissemination of what is new in the data science world.

With the CREWES Data Science Learning Labs, we focus on the learning steps to help you learn how you can bring business value to your organization. The labs will focus on how a data scientist can read, through data cleaning and pre-processing, visualization, data transformation, and finally finishing with app development/deployment. Join us for bi-weekly webinars (beginning in late 2020, dates announced) to get access to codes and "cookbooks."

### Lab 0: July 2, 2020, Noon (MST): Introduction to R and Shiny

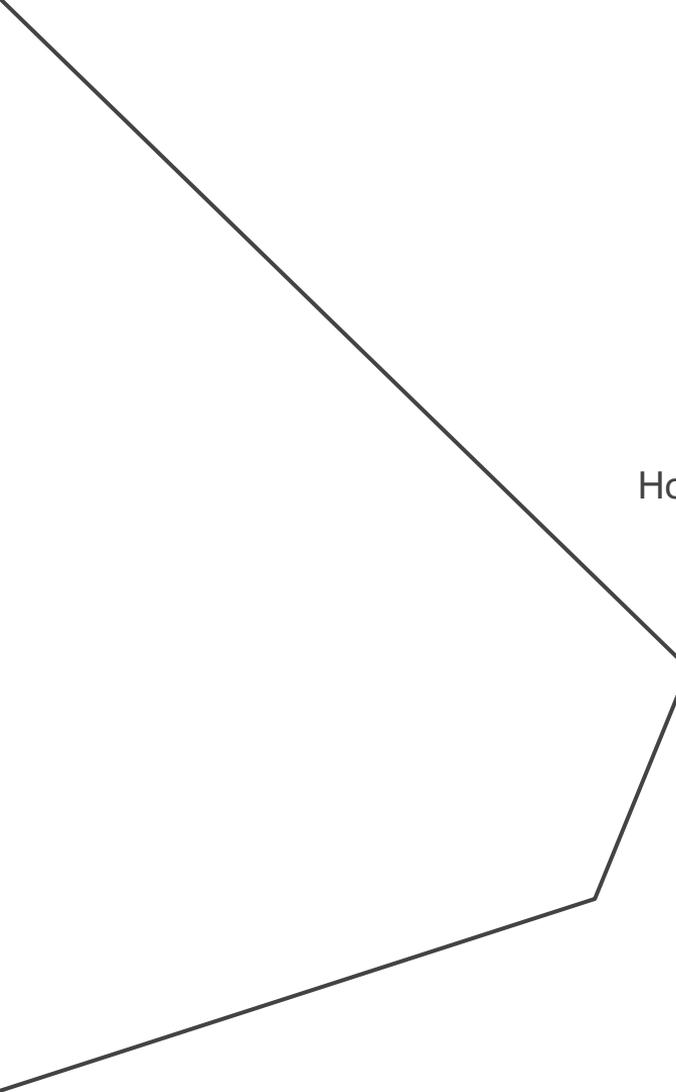
In our first lab we will set out our goals, define a learning path, and introduce both the concepts and the building of apps with the Shiny library.

[Data Science Lab 0 \(video\)](#)

### Lab 1: July 16, 2020, Noon (MST): WTI crude oil price forecasting algorithm

In this lab, we will present a workflow in R to predict the WTI crude oil price that is derived from the Quandl database, as well as the univariate forecast algorithm Facebook Prophet. We will also demonstrate an app built in Shiny.

[Register for the live Zoom presentation](#)



## PAPER OVERVIEW

Presenting the proposed solution

01

## HYBRID MODELS

How to create a hybrid model using the package  
**mlxtend**

02

## REGRESSION

Coding: how to stack regression models

03

## CLASSIFICATION

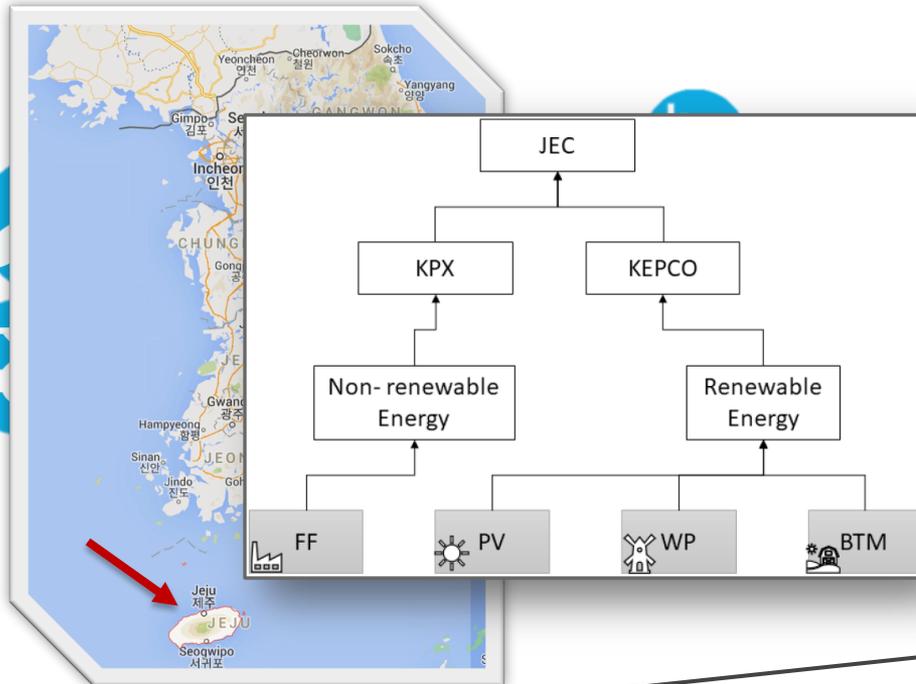
Coding: ensemble voting system for trained  
classifiers

04



# MACHINE LEARNING-BASED APPROACH TO PREDICT ENERGY CONSUMPTION OF RENEWABLE AND NONRENEWABLE POWER SOURCES

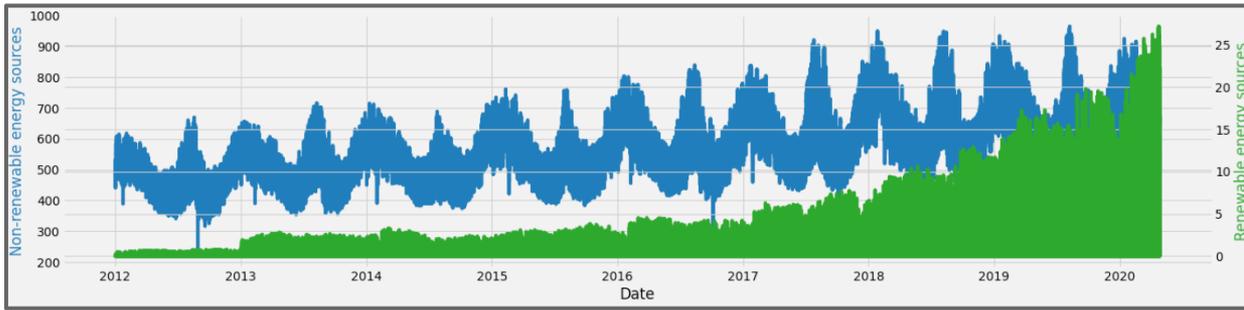
by Khan, P.W.; Byun, Y.-C.; Lee, S.-J.; Kang, D.-H.; Kang, J.-Y.; Park, H.-S, 2020



**JEJU ISLAND** is used as a test lab

**REPLACE** non-renewable energy by renewable energy by 2030

**FORECAST** energy consumption (MW) from all sources



# ENERGY MW

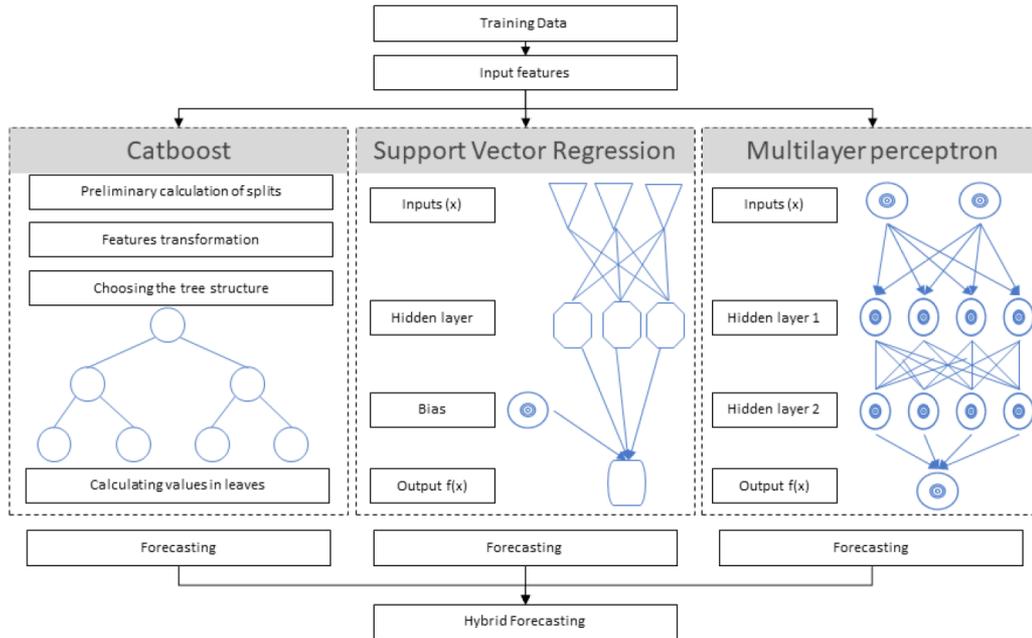
Total consumption  
(renewable + non-renewable)

# MODEL

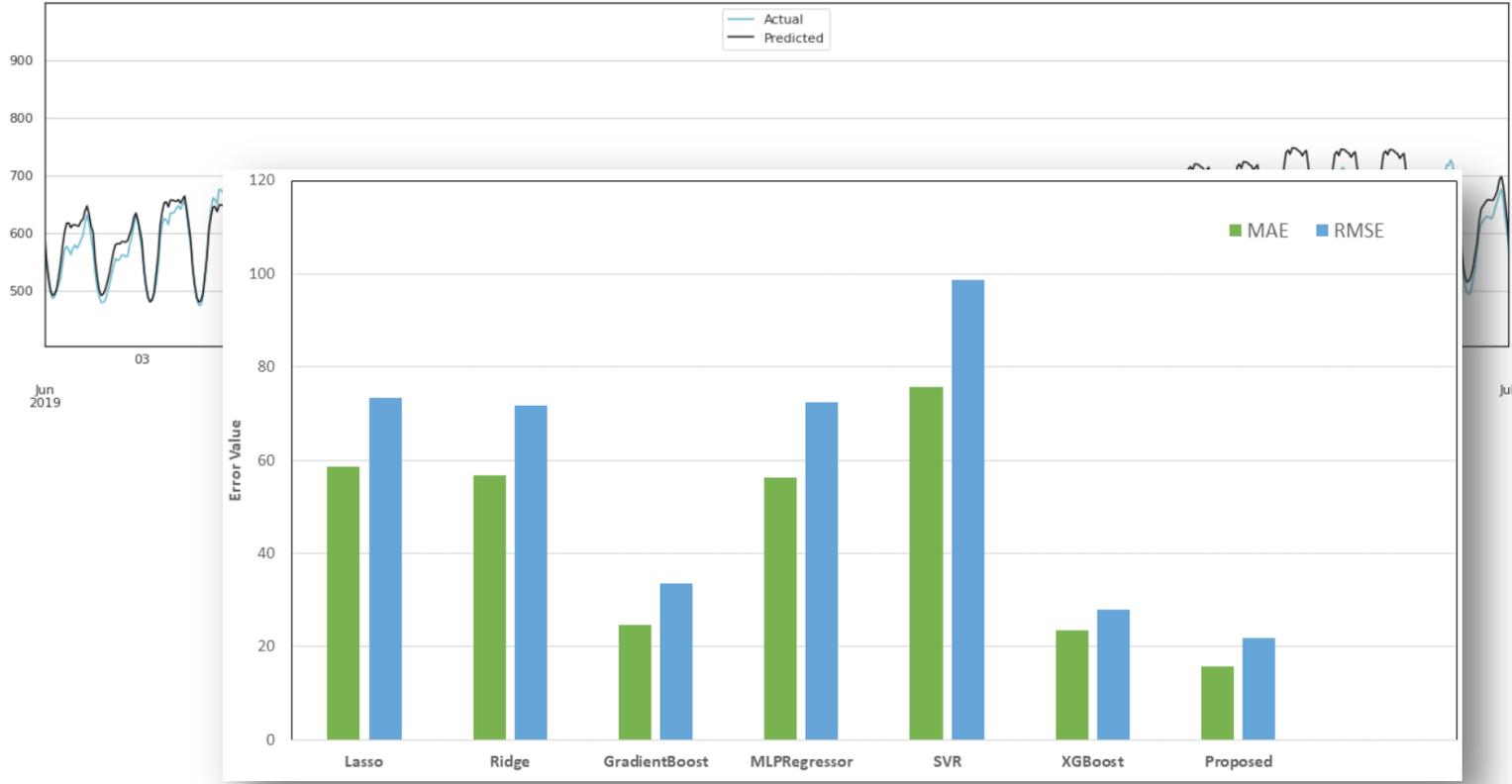
Hybrid model

# COMPARE

Against other models



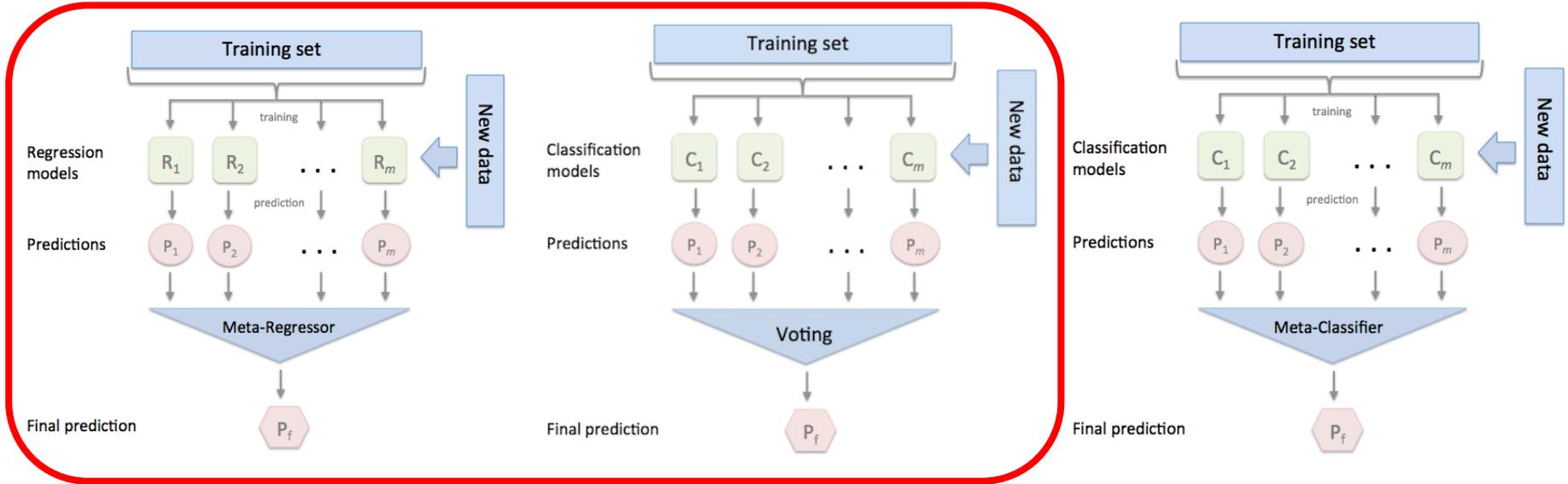
# FORECASTING



# RESOURCE

- Khan, P.W.; Byun, Y.-C.; Lee, S.-J.; Kang, D.-H.; Kang, J.-Y.; Park, H.-S. Machine Learning-based Approach To Predict Energy Consumption Of Renewable And Nonrenewable Power Sources. *Energies*, **2020**, *13*, 4870. <https://doi.org/10.3390/en13184870>

# HYBRID MODELS



Let's Code!!!



Thank you!