Welcome to the 2020 JISEA Annual (Virtual) Meeting!

JISEA
Joint Institute for Strategic Energy Analysis

Machine Learning and Artificial Intelligence for Energy Solutions

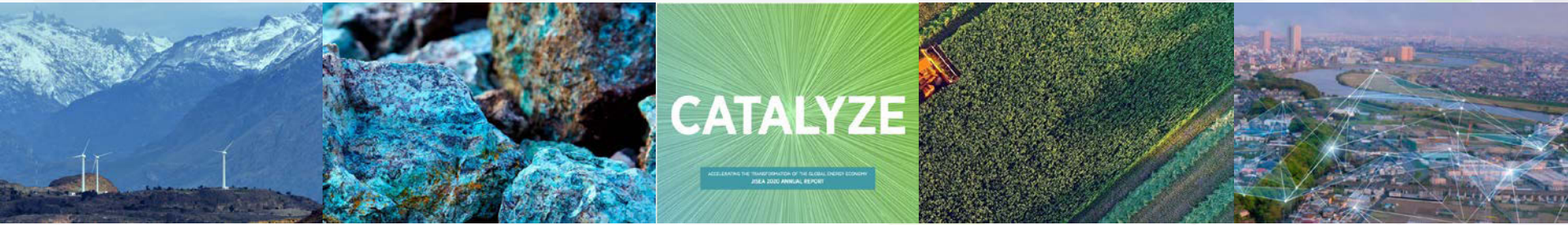
3 August, 2020

Introduction: Jill Engel-Cox, JISEA Director

Moderator: Kristi Potter, JISEA

@JISEA1

www.jisea.org

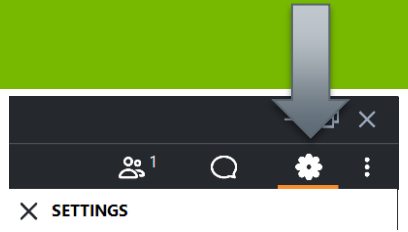


NREL NATIONAL RENEWABLE ENERGY LABORATORY · COLORADOSCHOOLOFMINES · Colorado State University · Massachusetts Institute of Technology · STANFORD UNIVERSITY · University of Colorado Boulder

Some Housekeeping Items

TWO OPTIONS FOR AUDIO

SELECT SETTINGS WHEEL



1

Listen through your computer.

Please select the “Computer” option and review your Microphone and Speakers selection.

2

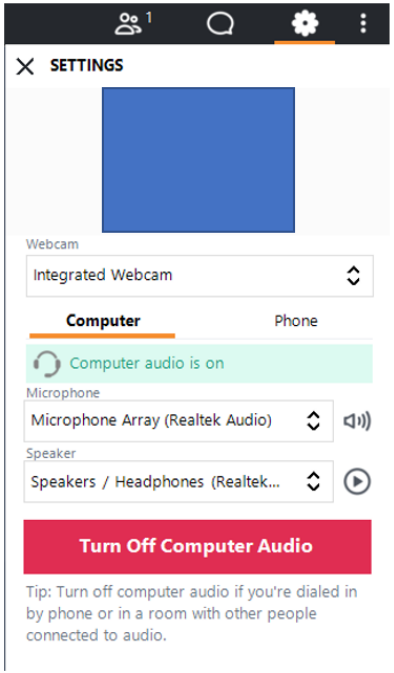
Listen through by telephone.

Please select the “Phone” option and a phone number and access code will display.

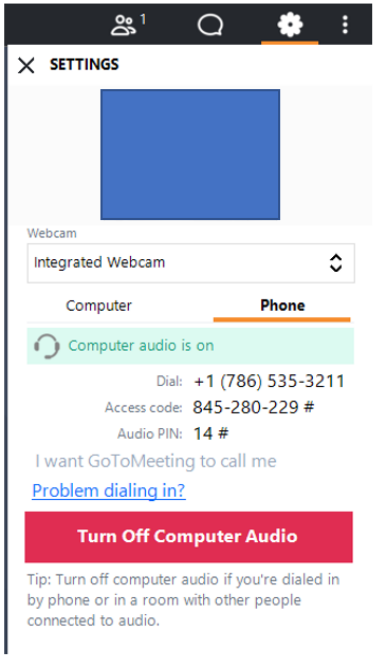
Unless presenting, please mute your audio device.

GoToMeeting: Attendee Participation

Computer Audio



Phone Audio



Your Participation

- Open and close your control panel.
- Join audio:
  - Choose **Computer** to use VoIP
  - Choose **Telephone** and dial using the information provided
- Submit questions and comments via the Chat panel (note if you don't want to ask verbally)
- We will call on and unmute you to ask question verbally with video on
- Be sure to answer the polling question!

Overall Agenda: All Sessions 8:30-9:45 am MT

July 27-30: Sustainability in a Changing World

- Technical "Poster" Session and JISEA Intern Experience
- Energy for Future Food Systems
- Keynote Discussion: Rural Economies & Social Systems
- Circular Economy of Materials and Global Supply Chains

Aug 3-6: Big Data and Business Systems

- Machine Learning and Artificial Intelligence for Energy Solutions
- Financial Risks and Opportunities of Decarbonization
- Keynote Discussion: Corporate Decision Making for Systems Innovation & Disruption
- Topic "Tables": Open Discussion Breakouts with Experts

All sessions about 45 minutes presentation and 30 minutes open questions & discussion

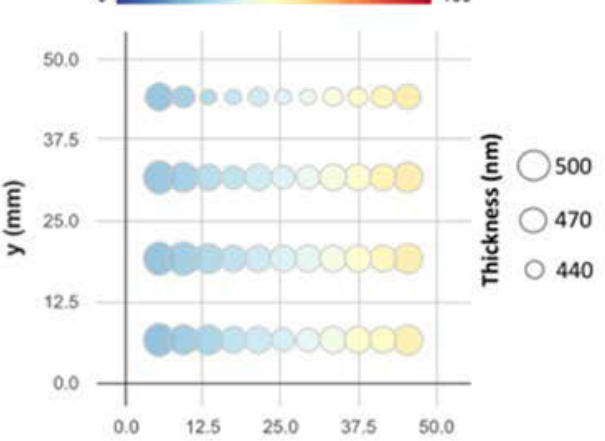
Machine Learning and Artificial Intelligence for Energy Solutions

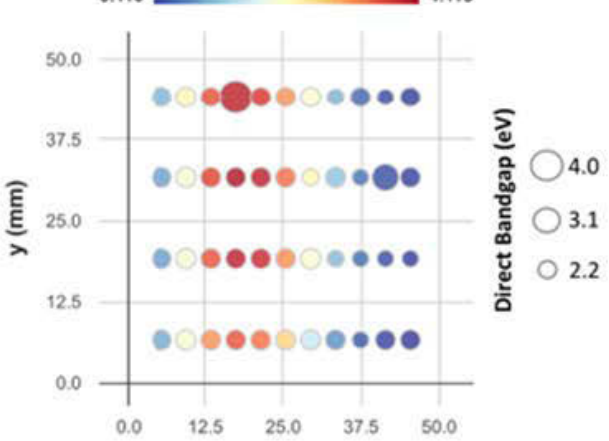
Barbara Humpton (Siemens, USA)

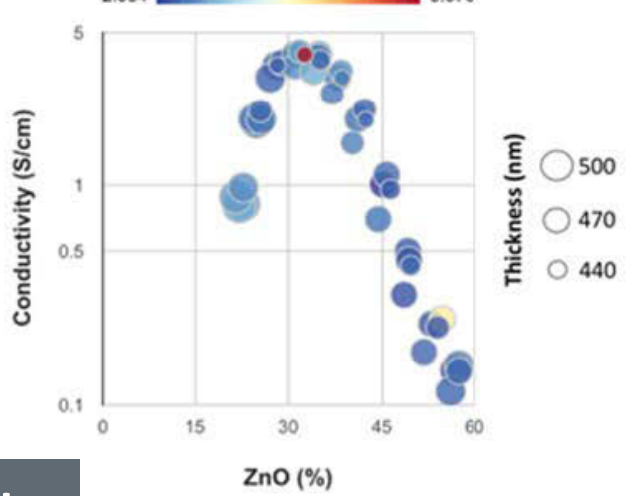
Solomon White (Blinker Inc.)

Vipin Kumar (University of Minnesota)

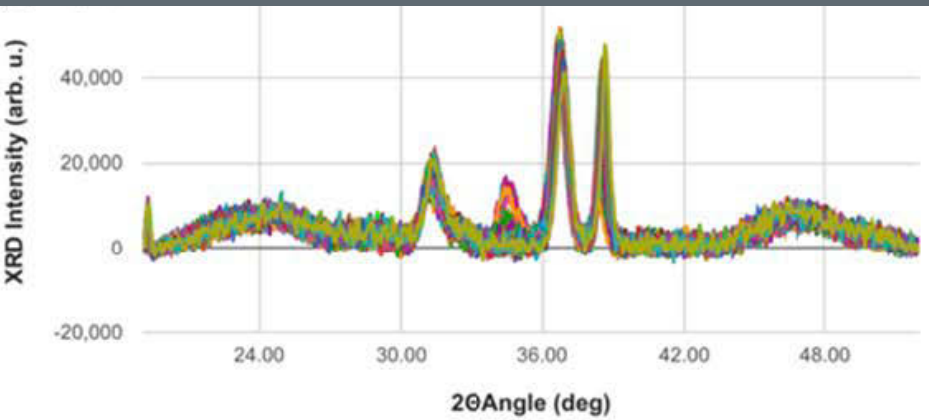
Moderator: ***Kristi Potter*** *(JISEA/NREL)*

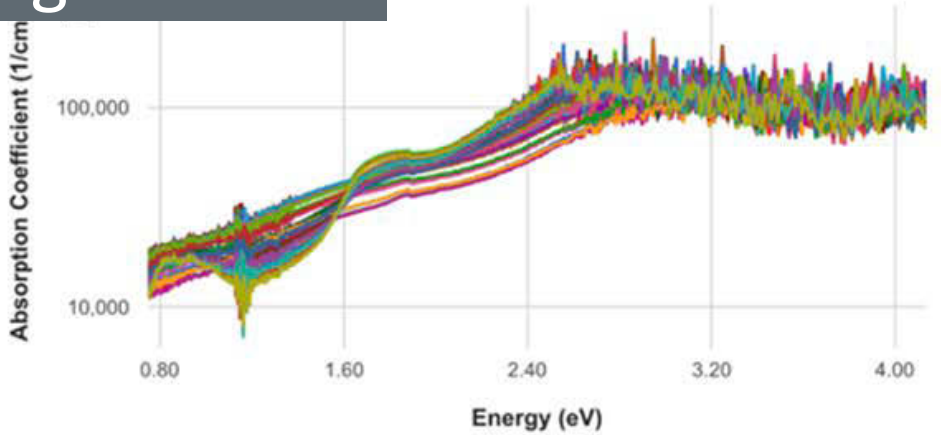






Overview of Machine Learning at NREL

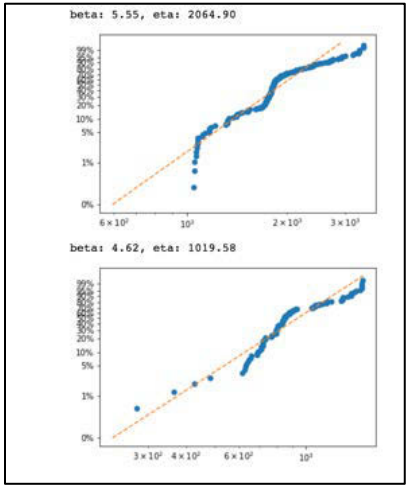




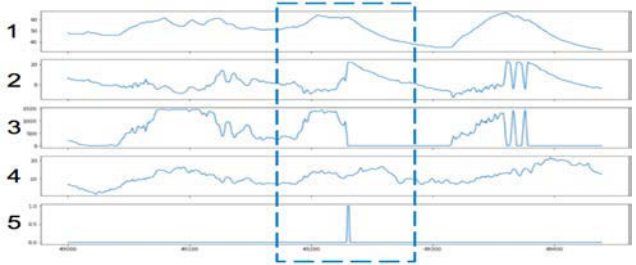
Wind Power

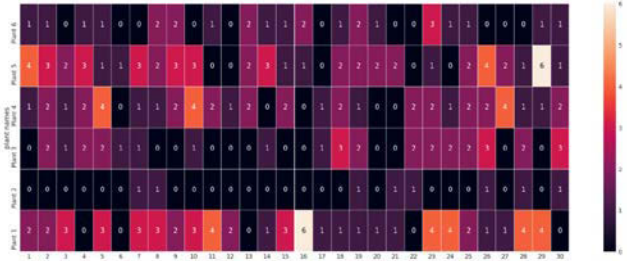
Gearbox Reliability – Analysis, Diagnostics & Prognostics

with Shawn Sheng (NWTC), Yi Guo (NWTC), Rafael Oroszco (CSC SULI), Nick Wunder (CSC)



Gearbox Reliability Database: http://grd.nrel.gov

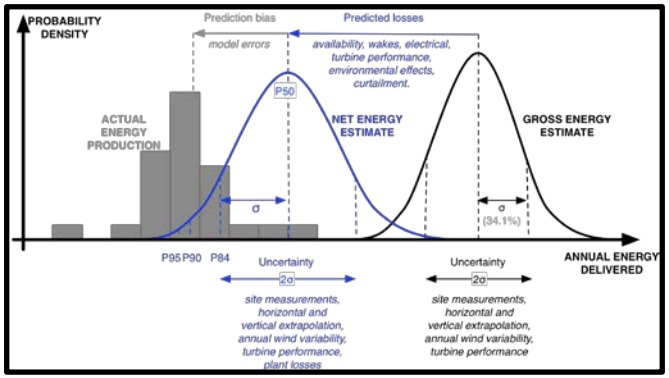


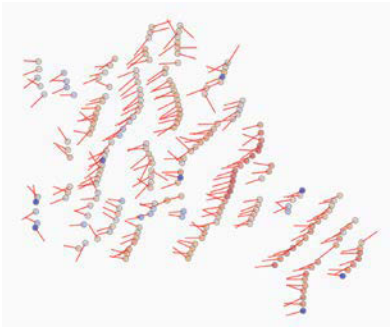


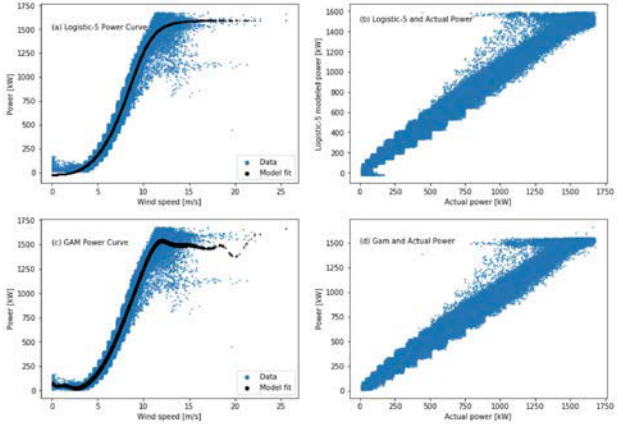
Diagnostic Models for Wind Turbine Gearbox Components using SCADA Time Series Data (in submission to IEEE PHM)

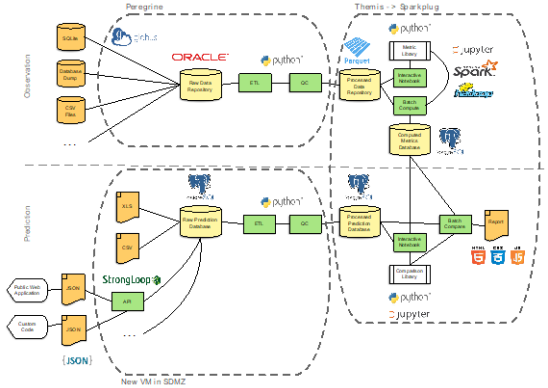
Operational Assessment – SCADA Data Analysis

with Jason Fields (NWTC), Mike Optis (NWTC), Anna Craig (NWTC), Shawn Sheng (NWTC), Jordan Perr-Sauer (CSC), Travis Kemper (CSC), John Meissner (NWTC), External Partners







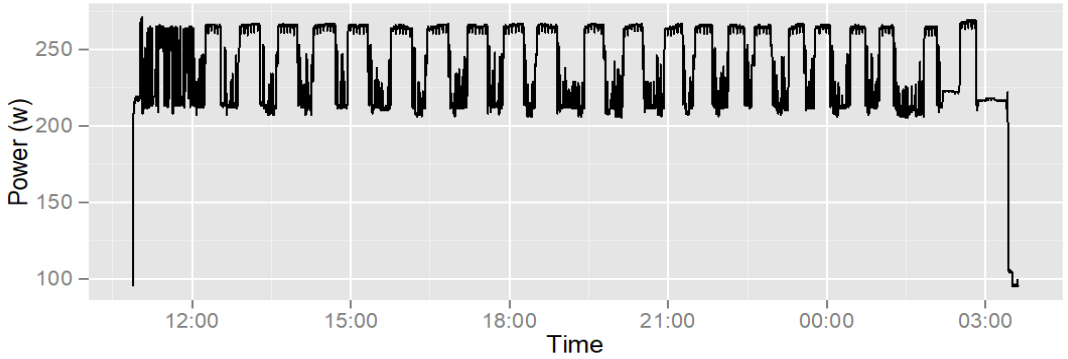


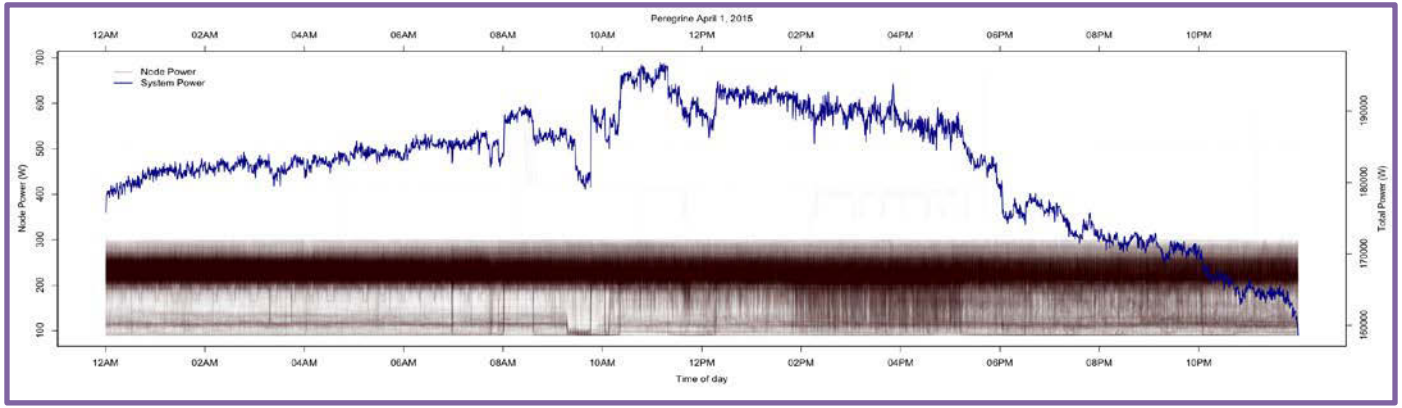
Common, scalable framework for operational data analysis tasks at NWTC with strong, growing adoption.

High-Performance Computing

Power Aware Scheduling for Energy Efficient HPC

with Hilary Egan (CSC CSGF), Bruce Bugbee (CSC), Ryan Elmore (CSC DU), Kenny Gruchalla (CSC), Avi Purkayasha (CSC)

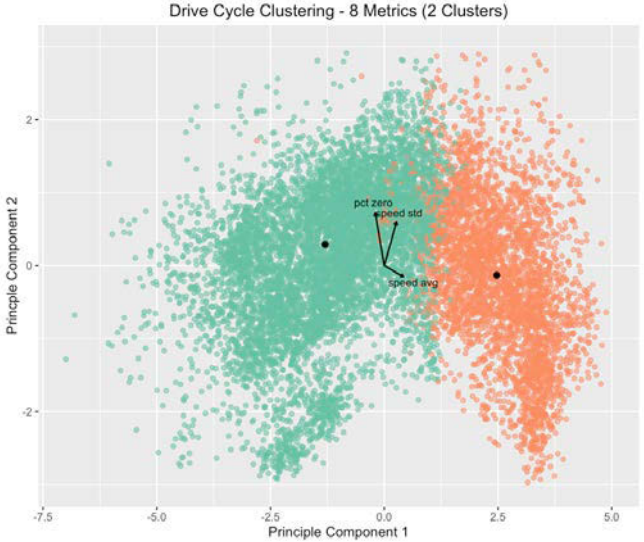




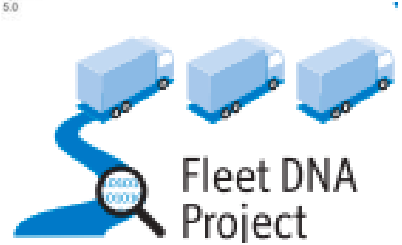
Transportation

Fleet Analytics – Big Data Analysis and Segmentation

with Adam Duran (THSC), Ken Kelly (THSC), Len Strnad (THSC), Jeff Gondor (THSC), Jordan Perr-Sauer (CSC), Eric Miller (THSC), Bruce Bugbee (CSC), Alex Van Roijen (CSC SULI)

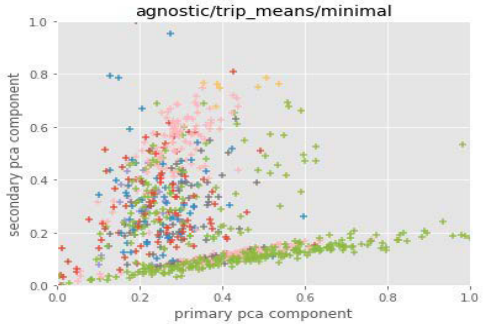


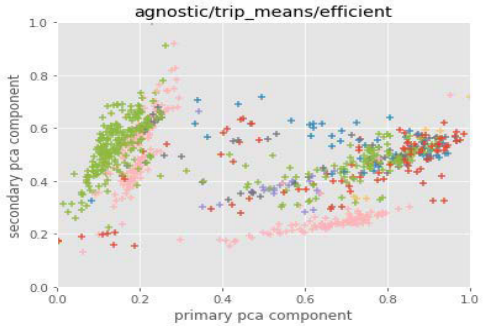
Developing scalable big data analysis framework. Ongoing relationships with industry partners and EPA. Upcoming meeting at DOE HQ/VTO to discuss work. Upcoming publication in SAE.



The Development of Vocational Vehicle Drive Cycles and Segmentation

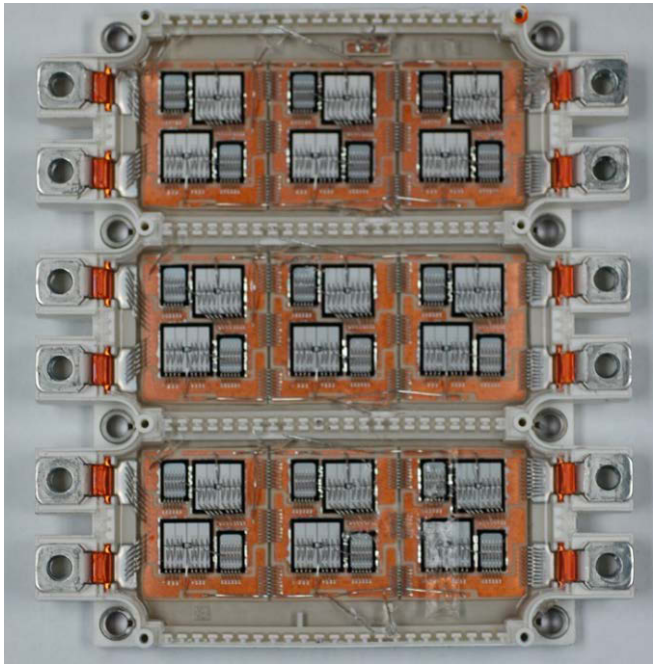
Adam Duran, Caleb Phillips, Arnaud Konan, and Kenneth Kelly

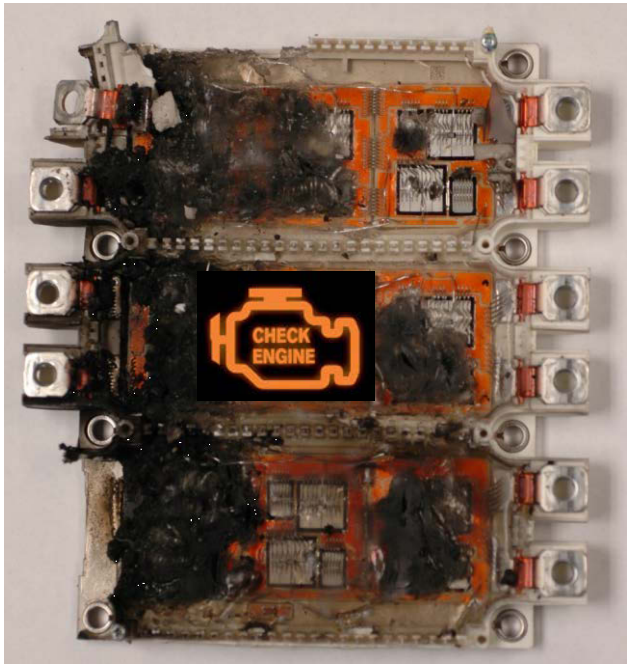




Power Component Prognostics

with Doug Devoto (THSC), Paul Paret (THSC)



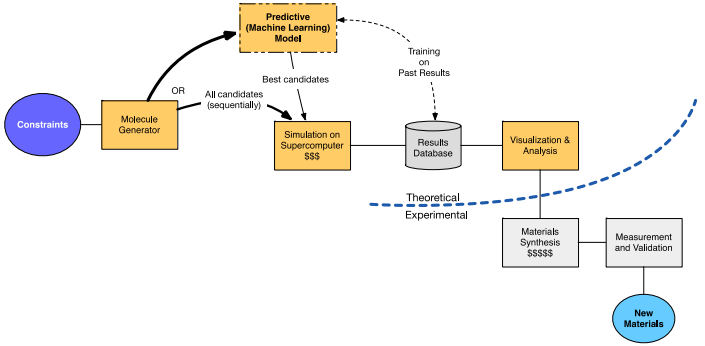


Collaborative work with academic partners to identify precursors to power component failure and predict those failures before they occur.

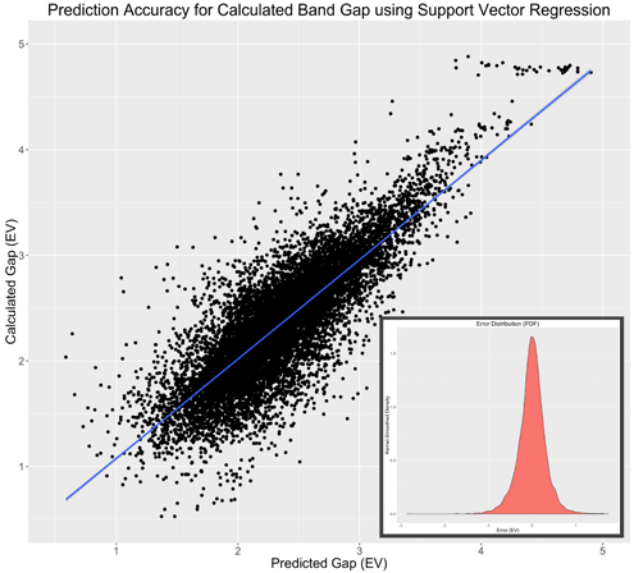
Materials Science

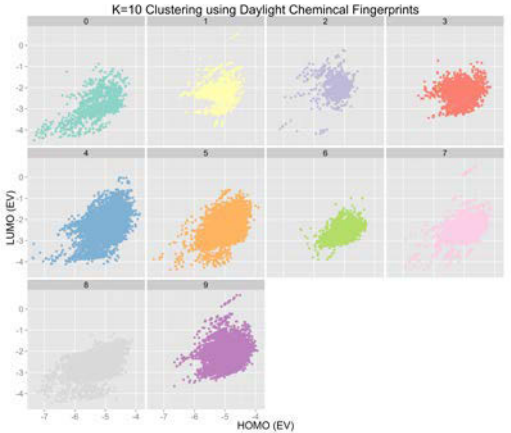
Semi-Automated Materials Discovery for Polymers

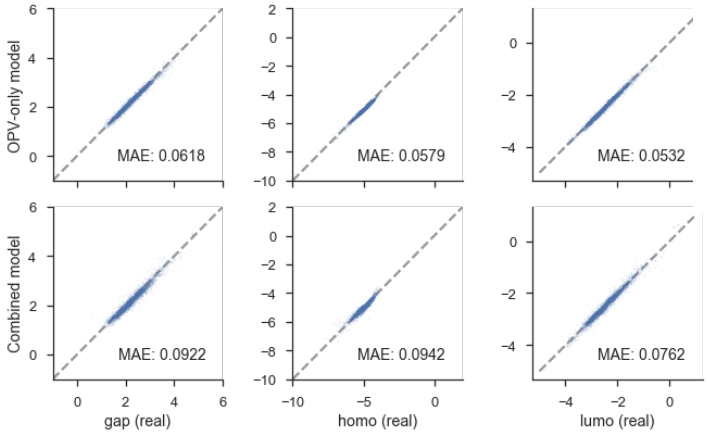
with Ross Larson (CSC), Joe Berry (MCST), Travis Kemper (CSC), Peter St. John (BST)



Preliminary work presented at DOE CoDA, ongoing work in BST and Perovskites applications



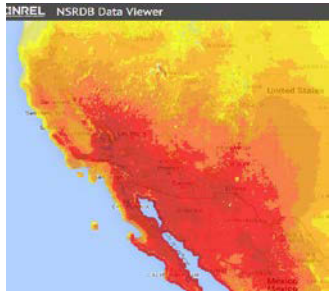


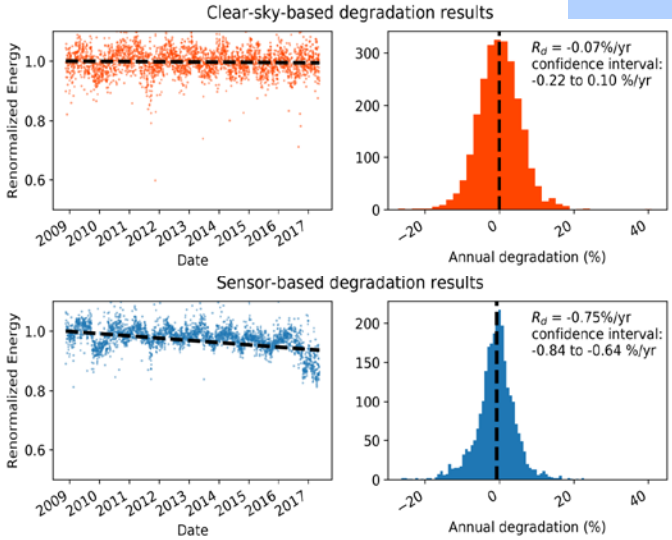


PV Reliability

Predictive of Photovoltaic Soiling & Degredation

with Travis Kemper (CSC), Michael Deceglie (OTF), Lin Simpson (OTF), Leo Micheli (OTF), Ambarish Nag (CSC)



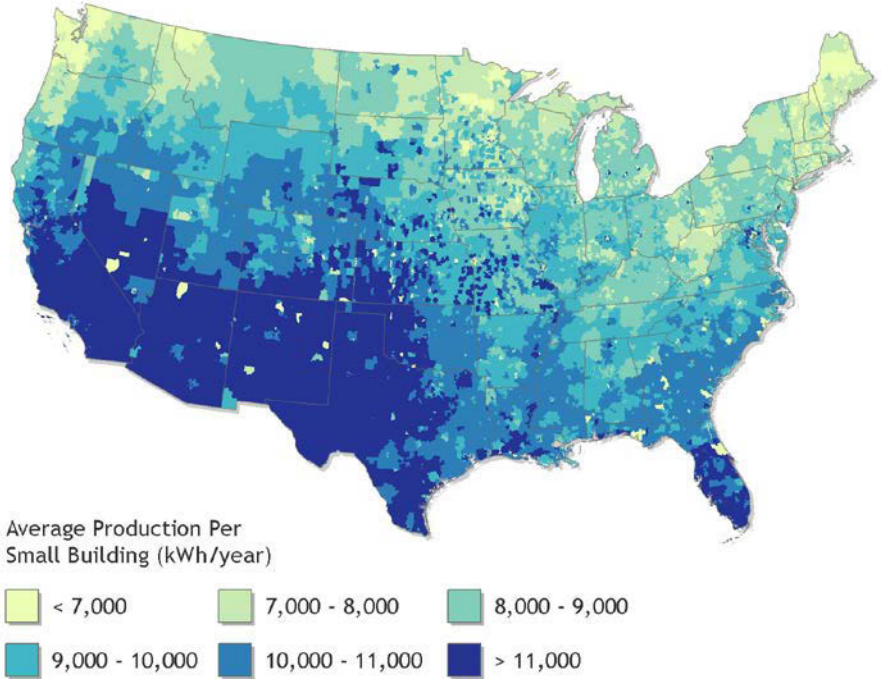


Photovoltaic soiling and PV degradation can be predicted to determine expected losses and cleaning schedules.

Energy Analysis

Estimation of US Photovoltaic Technical Potential

with Jenny Meilus (SEAC), Pieter Gagnon (SEAC), Robert Margolis (SEAC), Ryan Elmore



Multiple publications and well featured in international press.

Rooftop solar panels could provide nearly half US power

Rooftop panels could supply 40% of country's power with open spaces such as parking lots offering further potential, study shows. Conservation magazine reports

▲ Rooftop array of solar panels in Woodland, California. Photograph: Robert Nickelsberg/Getty Images

A Data Mining Approach to Estimating Rooftop Photovoltaic Potential in the U.S.

Caleb Phillips[a], Ryan Elmore[b], Jenny Melius[c], Pieter Gagnon[c], and Robert Margolis[c]

[a]Computational Science Center, National Renewable Energy Laboratory, 15013 Denver West Parkway, Golden, CO, USA; [b]Department of Business Information and Analytics, Daniels College of Business, University of Denver, 2199 S. University Blvd., Denver, CO, USA; [c]Strategic Energy Analysis Center, National Renewable Energy Laboratory, 15013 Denver West Parkway, Golden, CO, USA

Environmental Research Letters

LETTER

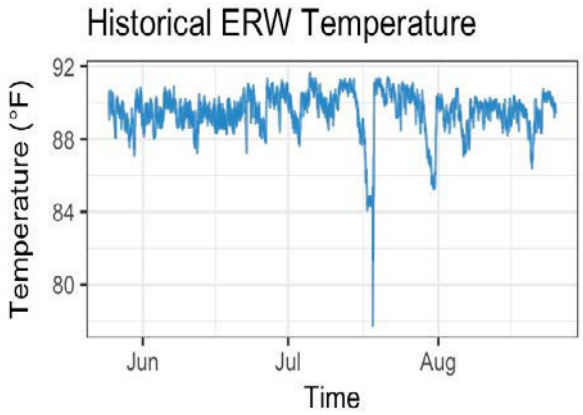
OPEN ACCESS

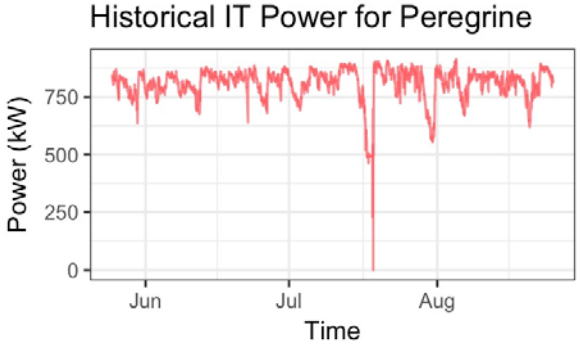
Estimating rooftop solar technical potential across the US using a combination of GIS-based methods, lidar data, and statistical modeling

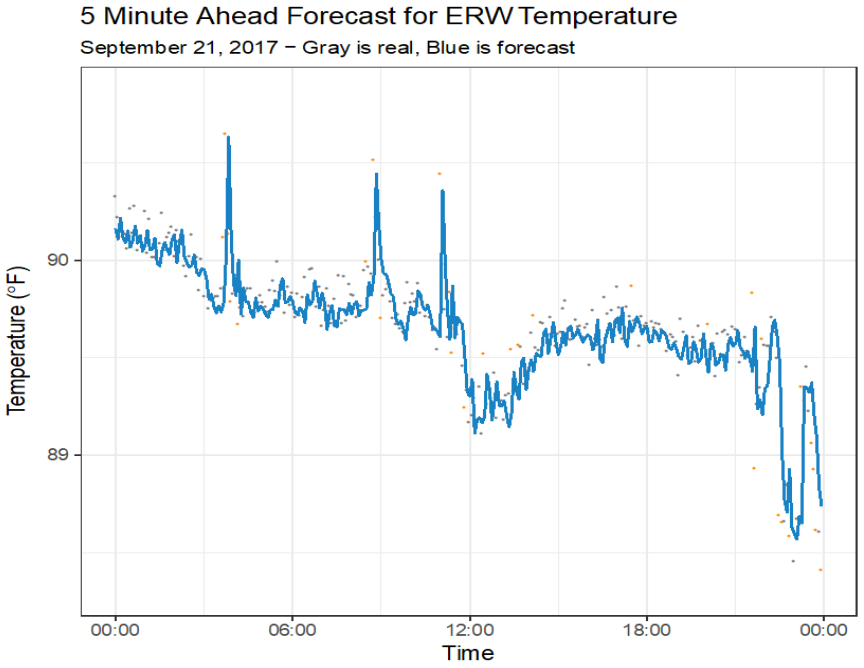
Pieter Gagnon[1,3], Robert Margolis[1], Jennifer Melius[1], Caleb Phillips[2] and Ryan Elmore[2]

Adaptive Timeseries Forecasting with Anomolies

with Bruce Bugbee (CSC)







Adaptive Forecast: Able to learn how to predict ERW temperature solely on historical data

Anomaly Detection: Can detect when things deviate from normal based on prediction bounds (orange points)

Thank you

NREL/PR-6A50-77525

www.jisea.org

@JISEA1

This work was authored by the National Renewable Energy Laboratory, operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC36-08GO28308. Funding provided by the Joint Institute for Strategic Energy Analysis (JISEA). The views expressed in the article do not necessarily represent the views of the DOE or the U.S. Government. The U.S. Government retains and the publisher, by accepting the article for publication, acknowledges that the U.S. Government retains a nonexclusive, paid-up, irrevocable, worldwide license to publish or reproduce the published form of this work, or allow others to do so, for U.S. Government purposes.

JISEA Joint Institute for Strategic Energy Analysis

NREL NATIONAL RENEWABLE ENERGY LABORATORY

COLORADOSCHOOLOFMINES EARTH • ENERGY • ENVIRONMENT

COLORADO STATE UNIVERSITY

Massachusetts Institute of Technology

STANFORD UNIVERSITY

University of Colorado Boulder