Summer School on Forecasting and Mathematical Modeling for Renewable Energy

Organized by PIMS Collaborative Research Group on Forecasting and Mathematical Modeling for Renewable Energy

Organizers: Deniz Sezer (U Calgary), Richard Karsten (Acadia University), Slim Ibrahim (U Victoria)

Dates: May 29, 2023-June 9, 2023

Location: University of Calgary Main Campus, Calgary, Alberta, Canada

Local organizer: Deniz Sezer, adsezer@ucalgary.ca

For updates check: https://ucalgary.ca/labs/math-for-wind-plus/news-and-events

Wind and solar power are the primary sources of renewable energy, and both driven by the weather, hence stochastic and variable. To solve the grand challenges related to their optimal deployment requires an interdisciplinary approach combining expertise in mathematics, statistics, atmospheric sciences, fluid dynamics and power system engineering. In this summer school, the students will receive training in key methodologies for forecasting and mathematical modeling of renewables. We offer the following mini courses:

1.   Spatio-temporal processes and forecasting ((5+4 hours, week 1)

Topics: Hierarchical Bayesian Models; Covariance models and Asymmetry

Instructors: Julie Bessac (Argonne National Laboratory), Deniz Sezer (U Calgary) Exercise sessions: Deniz Sezer

2.   Atmosphere and fluid dynamics, part 1: Meteorology of Wind Energy (5+4 hours, week 1)

Topics: Driving forces of horizontal winds in the atmosphere, Dynamics of the planetary boundary layer, Vertical profiles of wind speed.

Instructors: Adam Monahan (U Victoria), Exercise sessions: Richard Karsten (Acadia University)

3.   Atmosphere and fluid dynamics, part 2(5+4 hours, week 2)

Topics: Mathematical foundations of fluid models, Navier Stokes equations; Wind farm modeling

Instructors: Slim Ibrahim (U Victoria), Robert Martinuzzi (U Calgary), Exercise sessions: Richard Karsten (Acadia University), Slim Ibrahim

4. Optimization for renewables (5+4 hours, week 2)

Topics: Mixed Integer and Linear Programming algorithms, Applications to Transmission and generation planning

Instructors: Yuriy Zinchenko (U Calgary), Jalal Kazempour (Technical University of Denmark) Exercise sessions: Yuriy Zinchenko

Delivery method: In person/virtual. We will be hosting the students at U Calgary to enable in person peer to peer interaction to form a friendly and energetic atmosphere. There will be field trips to a wind or solar farm and social events such as hikes and picnics.

Courses are designed and delivered by a team of instructors. All courses will have lecture and exercise components. Some lectures will be delivered online; however, there will be an instructor on site for each course to assist students during the exercise sessions which will take place in person. Exercise components will include group projects and group presentations.

All lectures are open to public and will be made available online. Please register at (Registration for the Summer School). Participation in the exercise sessions require full time in person attendance to the summer school and is subject to admission. Anyone who is currently enrolled (or expect to be enrolled by September 2023) in a graduate program in an academic institution is eligible to apply. While no prior background in renewable energy is required, the applicants will be judged based on academic strength and research potential (or progress up to date) in renewable energy. Applicants are required to submit a current curriculum vitae and a support letter from a research supervisor. Please apply by April 10 5 pm at Admission to the Summer School

 Financial support: All admitted students will be provided financial support up to 1000 CAD to cover travel and accommodation expenses to attend the summer school.

Week 1 May 29- June 2, 2023

	Monday	Tuesday	Wednesday	Thursday	Friday	Sat	Sun
9:00-10:15	Julie Bessac *Title: Hierarchical Bayesian Models*	Julie Bessac *Title: Hierarchical Bayesian Models*	Deniz Sezer *Title: Covariance models and asymmetry*	Deniz Sezer *Title: Covariance models and asymmetry*	Student Presentation 1 / Student Presentation 2		
	Adam Monahan	Adam Monahan	Adam Monahan	Adam Monahan	Student Presentation 3		

10:45-12:00	Title: Meteorology of Wind Energy	Title: Meteorology of Wind Energy	Title: Meteorology of Wind Energy	Title: Meteorology of Wind Energy	Student Presentation 4		
1:30-3:30	Exercise session	Exercise session	Exercise session	Exercise session	Student Presentation 5 Student Presentation 6		

Week 2 June 5-June 9, 2023

	Monday	Tuesday	Wednesday	Thursday	Friday	Sat	Sun
9:00-10:15	Slim Ibrahim Title: Mathematical foundations of fluid models	Slim Ibrahim Title: Mathematical foundations of fluid models	Robert Martinuzzi Title: Wind farm modeling	Robert Martinuzzi Title: Wind farm modeling	Student Presentation 1 Student Presentation 2		
10:45-12:00	Jalal Kazempour Title: Mixed integer and linear programing for Generation and Transmission planning	Jalal Kazempour Title: Mixed integer and linear Programing for Generation and Transmission planning	Yuriy Zinchenko Title: Introduction to Mixed Integer and linear Programming Algorithms	Yuriy Zinchenko Title: Introduction to Mixed Integer and linear Programming Algorithms	Student Presentation 3 Student Presentation 4		
1:30-3:30	Exercise session	Exercise session	Exercise session	Exercise session	Student Presentation 5 Student Presentation 6		