

Data Analytics and Optimization

Theme leader:

Dr. Bhushan Gopaluni (bhushan.gopaluni@ubc.ca)

Data analytics can help us solve today's complex energy challenges. The influence of data science in the clean energy sector continues to expand with major algorithmic developments in machine learning, relentless growth in computing power and advancements in sensor technology and Internet of Things (IoT) capabilities.

Data comes in many different shapes, sizes and volumes. Manufacturing sites in particular, are in possession of mountains of industrial data that are often underutilized and ripe for value extraction. These incredible volumes of data, when combined with expert domain knowledge and advanced analytics capabilities, are poised to elucidate valuable insights never realized before in the clean energy sector.

Challenges in Clean Energy

The increasing penetration of renewables has a profound impact on the electric grid. Many renewable sources such as solar and wind energy are volatile. They vary with weather, making them challenging to design and control compared to traditional energy sources. This volatility increases the complexity of overall grid operations and stresses our ability to match energy supply and demand in real-time. Data analytics can help with this challenge.

Advanced analytics has the potential to transform how we design, build, operate and maintain modern energy systems. We can leverage data science to build sophisticated predictive models to tame the intermittent and variable nature of renewable energy, creating highly resilient electric grids with stable operations.



Extract Knowledge

We use advanced analytics for extracting and exploiting knowledge from large, complex, heterogeneous energy datasets including time series, images and text documents.



Gain Insights

We build sophisticated predictive models and answer complex energy questions using causal inference and machine learning.



Optimize Assets

We develop optimization tools to help organizations manage energy assets and improve decision-making through data-driven insights

Data-driven Insights

Energy organizations can derive data-driven insights to enhance decision-making and optimize production assets. Data analytics offer incredible opportunities for the clean energy sector, including:

- Optimizing energy consumption and reducing greenhouse gas emissions in buildings
- Monitoring asset health in solar plants and wind farms
- Developing high-performance, low-maintenance controllers for smart manufacturing plants
- Forecasting energy consumption and peak energy usage in utilities
- In a competitive energy market and global economy, data analytics can help energy organizations squeeze every last drop of performance out of their renewables assets. By leveraging cutting-edge data analytics and optimization techniques, the clean energy sector can transform raw data into actionable insights for improving decision-making and generating productivity gains.

Challenges and Opportunities

Data-driven policy making: Using data science to inform better policy design, planning and implementation under uncertainty

Advanced analytics for energy management: Harnessing the power of machine learning and optimization to improve energy efficiency and sustainability

Asset optimization: Monitoring equipment health in solar plants and wind farms and optimizing assets for peak performance using data analytics

