Réseau Energie et Bâtiments

UNIVERSITÉ DE SHERBROOKE

Conference of Energy and Buildings

Model Predictive Control of Energy Systems in High-Rise Buildings Based on Machine Learning

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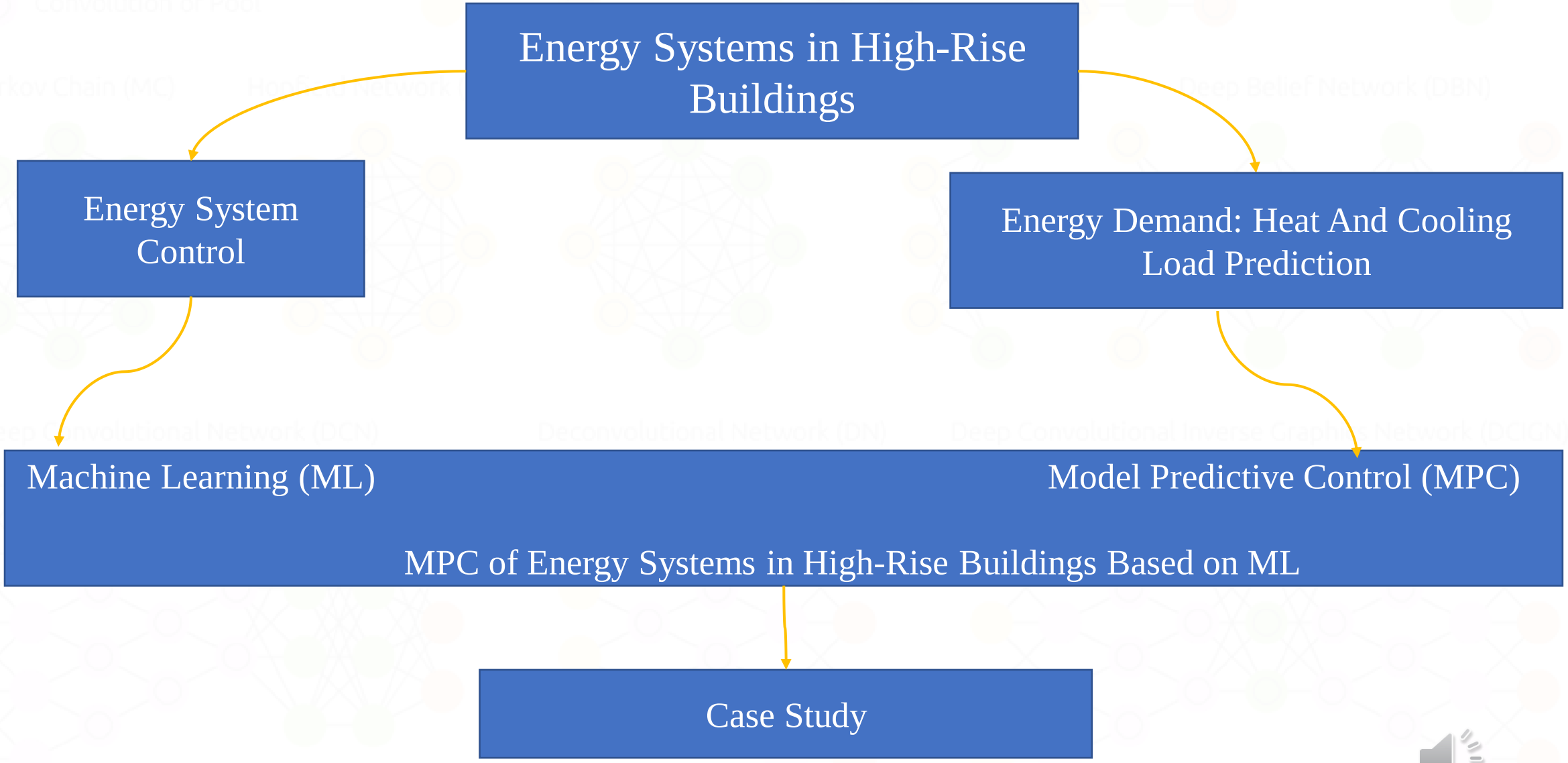
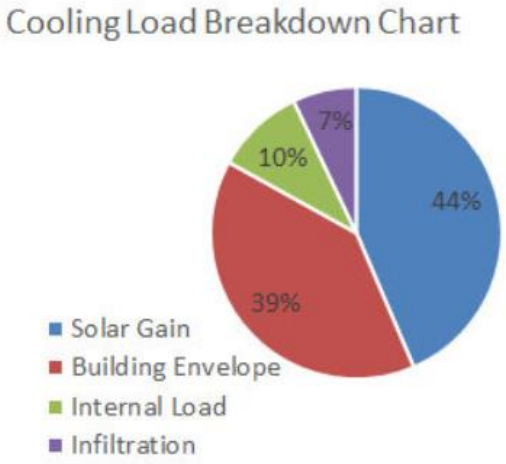
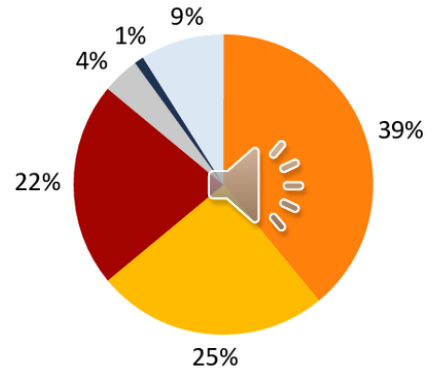

Energy Systems in High-Rise Buildings
Energy System Control
Energy Demand: Heat And Cooling Load Prediction
Machine Learning (ML)
Model Predictive Control (MPC)
MPC of Energy Systems in High-Rise Buildings Based on ML
Case Study

Energy Systems in High-Rise Buildings and Heat And Cooling Load Prediction

- High-rise buildings are complex energy systems that require careful management to ensure optimal performance.
- Energy systems in high-rise buildings include heating, ventilation, and air conditioning (HVAC), Domestic hot water, lighting, and Lifts, and others.
- Its important to control the systems that consumed the maximum portion of energy especially HVAC systems.
- Here are some key factors that influence heat and cooling load prediction:
  - Building envelope.
  - Occupancy and use.
  - Climate.
  - HVAC system efficiency.



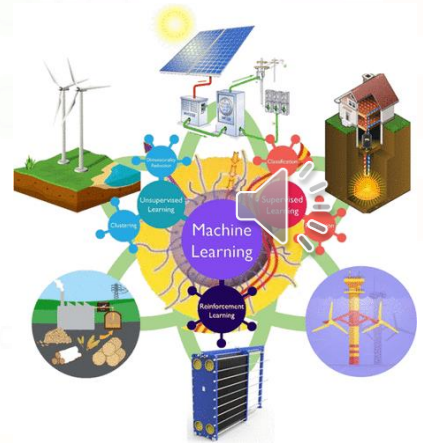


Energy Systems Control and Machine Learning (ML)

- Energy system control in buildings refers to the process of managing the energy consumption of a building's (HVAC) system, lighting, and other building systems to optimize energy efficiency and reduce energy costs.
- **Some common energy system control strategies for buildings include:**

- Building automation systems (BAS).
- Occupancy sensors.
- Daylight harvesting.
- Demand-controlled ventilation.

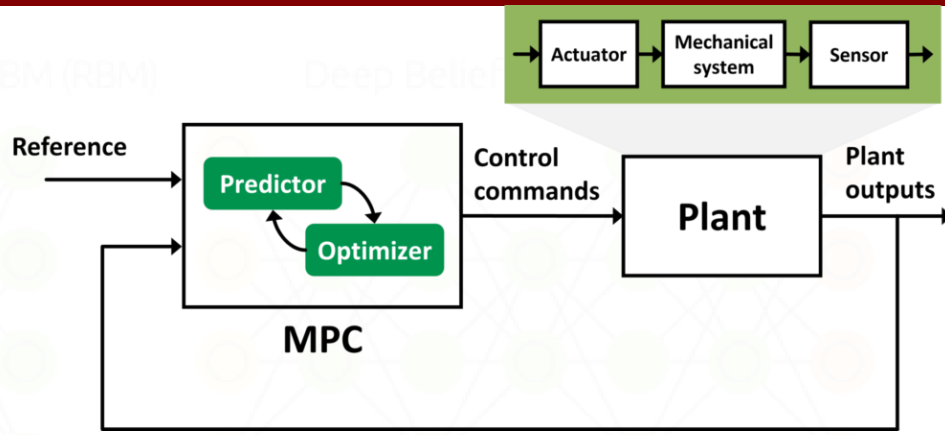
- Machine learning (ML) is a subset of artificial intelligence (AI) that involves powerful tool for energy systems control because it can learn from data and adapt to changing conditions.

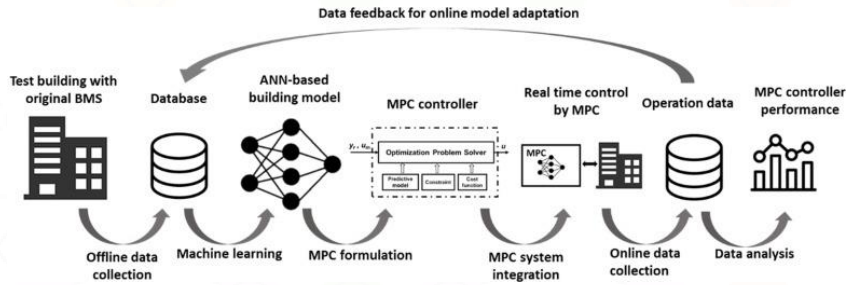


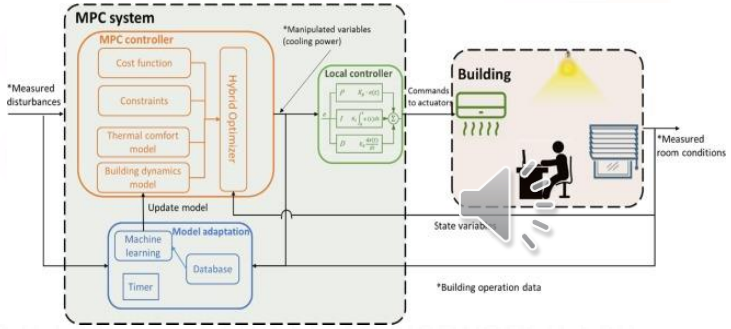
- ML can be used for building energy modeling, anomaly detection, and prediction of energy demand.

MPC of Energy Systems in High-Rise Buildings Based on ML

- Model Predictive Control (MPC) is a control strategy that optimizes a system's performance over a given time horizon.
- It uses a dynamic model of the system to predict its behavior and generate a control sequence that minimizes a cost function.
- MPC is commonly used in industrial control applications, but it has also been applied to building energy management.
- The MPC algorithm generates a control sequence that minimizes energy consumption while maintaining occupant comfort.



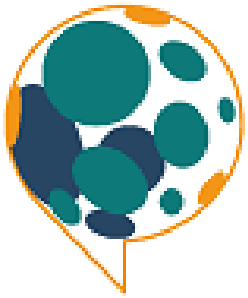




Campus de Longueuil

- Campus de Longueuil de Université de Sherbrooke is a high-rise building located at QC, and it has 19 floors in total.

Thank You for Your Attention



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