Forecast Accuracy

RMSE and MAE error between prediction and ground truth values



Adjust

- Training data length
- Included data features
- Online training (data window)

Prediction Models

ML forecasting models tested



Simple

Linear NN, CNN, ResMLP

Complex

Transformer (TFT), DeepAR, NHiTS

Operational

condition forecast

Battery Control

Model Predictive Control (MPC)

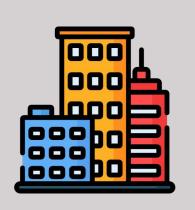


Linear MPC

schedules battery
Objective balances
electricity cost,
carbon emissions,
grid ramping

Simulation

District energy system simulation



Battery

schedule

CityLearn used to simulate district of 15 buildings
Only electricity usage considered

Data

Case study from Cambridge Uni



10 years of historic building energy usage data + solar generation, electricity price & carbon intensity

Conclusions

- 1. Impact of data on forecast accuracy and MPC operational performance quantified
- 2. Simple linear MLP model provides equivalent forecast accuracy to state-of-the-art models
- 3. More than 2 years of training data did not significantly improve forecast accuracy
- 4. Screening training data using change-points improves accuracy and data efficiency

Control Performance

Electricity cost, embodied carbon emissions, and grid ramping; normalised by values without battery