Accelerate the Integration of Electric Vehicles in Power Distribution Systems with Data-Driven Planning
Team Name: Electrify USA. Team Lead: Prof. Nanpeng Yu, University of California, Riverside.

Project Summary

Utility Partners' Problem: The increased EV charging load will lead to many issues in the power distribution systems such as deteriorating voltage quality, higher network loss, and overloaded transformers.

Project Objective: Develop an integrated and data-driven planning platform that predicts the feeder level EV adoption, charging profile and impacts on the distribution network (see Figures Below).

Proposed Solution & Approach: The data-driven planning platform has 3 modules.

1) EV adoption prediction module using deep graph learning
2) EV charging demand forecasting module with temporal graph convolution network
3) Assess impacts of EV charging on power distribution feeders by integrating the outputs of deep learning models with distribution system simulation software.

Key Project Members

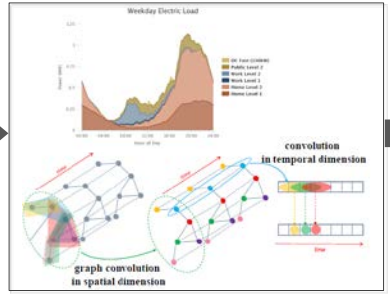
- University of California, Riverside (**UCR**): Prof. Nanpeng Yu (ML)
- Baltimore Gas and Electric (**BGE**): Kristy Fleischmann Groncki and Divesh Gupta (EV)
- Pepco Holdings (**PHI**): Dan O'Connor and Brianne Jordan (EV)
- **Exelon**: Po-Chen Chen and Ankush Agarwal (ML)
- **Weave Grid**: John Taggart (ML, Transportation)
- Morgan State University (**MSU**): Prof. Mansoureh Jeihani (Transportation)

Project Impacts and Benefits

- ✓ More accurate EV adoption and charging load prediction
- ✓ Reduction in GHG emission from increased EV adoption
- ✓ Lower investment and upgrade cost in power distribution system to accommodate EVs
- ✓ Early prediction of overloaded transformers, over-/under-voltage conditions

Task 1: Zip Code / Feeder Level EV Adoption Prediction

Task 2: EV Charging Profile Forecast



Task 3: Analyze Impacts of EV Charging on Power Distribution Grids