

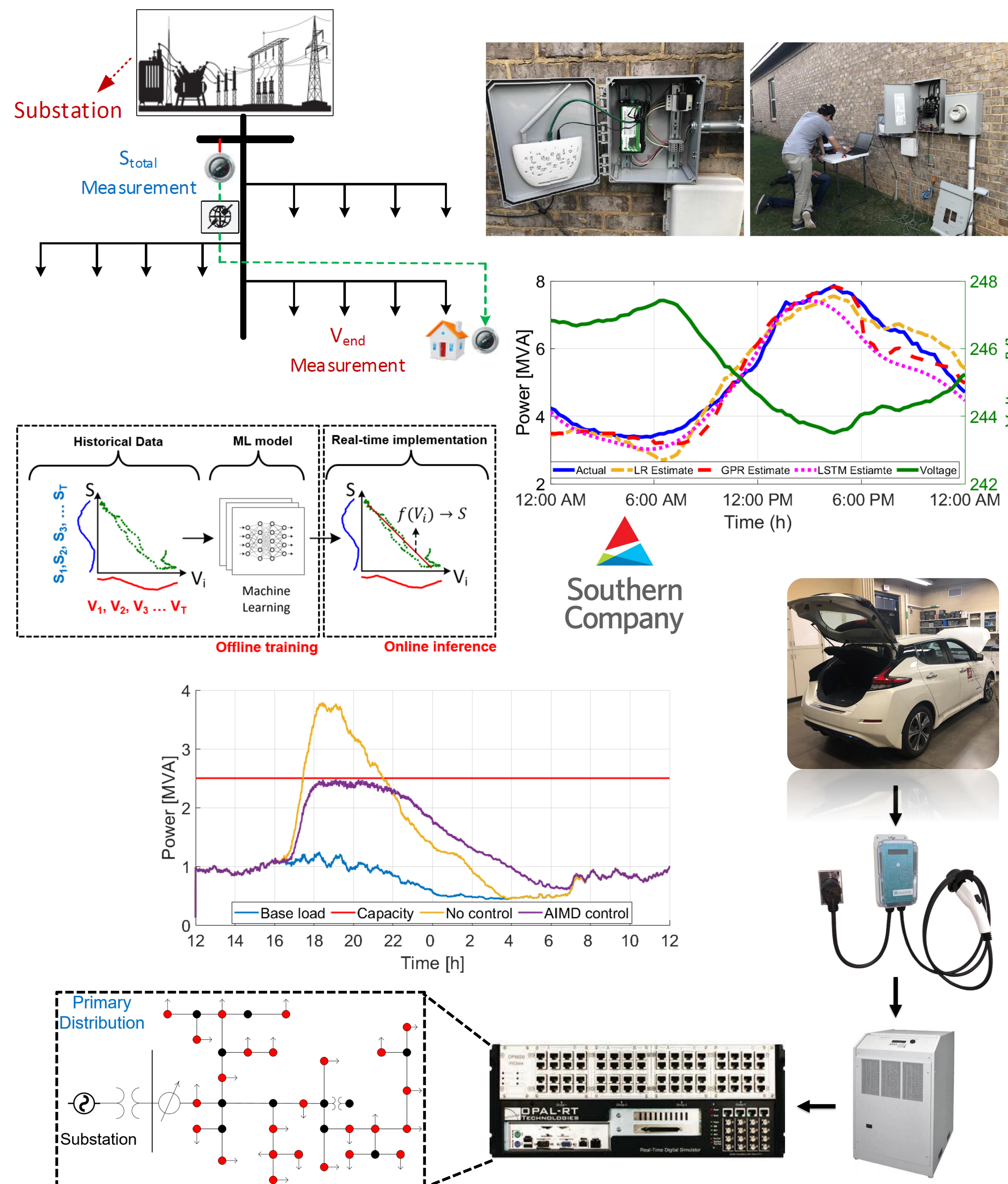
CRII: CPS: Internet-Inspired Autonomous EV Charging

Mithat Kisacikoglu; The University of Alabama; Award# 1755996; Start Date: March 6, 2018

mck.people.ua.edu/nsf_crii.html

Challenge:

- Uncontrolled mass EV penetration can cause voltage drops, increased peak-loading, thermal overheating and equipment failure.
- Decentralized and autonomous EV charging control with minimum communication overhead is a key enabler for wide-scale and scalable integration of EVs in the power distribution grid.



Scientific Impact:

- The developed algorithms can also be used for distributed energy resources integration to the power grid.
- The solutions developed can be transferred to CPS areas such as traffic management for autonomous EVs and unmanned aerial systems (UAS).

Proposed Solution:

- We investigate methods that can help estimate total feeder power demand using local measurements.
- Estimation is performed via machine learning (ML) models trained over historical localized end-node and feeder-level measurements.
- EV charging power is controlled based on estimated feeder demand (without real-time communication) using additive increase and multiplicative decrease (AIMD) algorithm.

Broader Impact:

- The produced algorithms can help utilities to relieve the burden of over-investing to the power distribution network and to manage increased EV integration effectively.
- EV manufacturers can be guaranteed a fair share of the network capacity.
- 2 IEEE journals and 7 conf. papers have been published so far.—one prize paper award from PES General Meeting in 2019.