

A Hierarchical Approach to Dynamic Big Data Analysis in Power Infrastructure Security

(NSF/AFOSR DDS EAGER Project 1462530)

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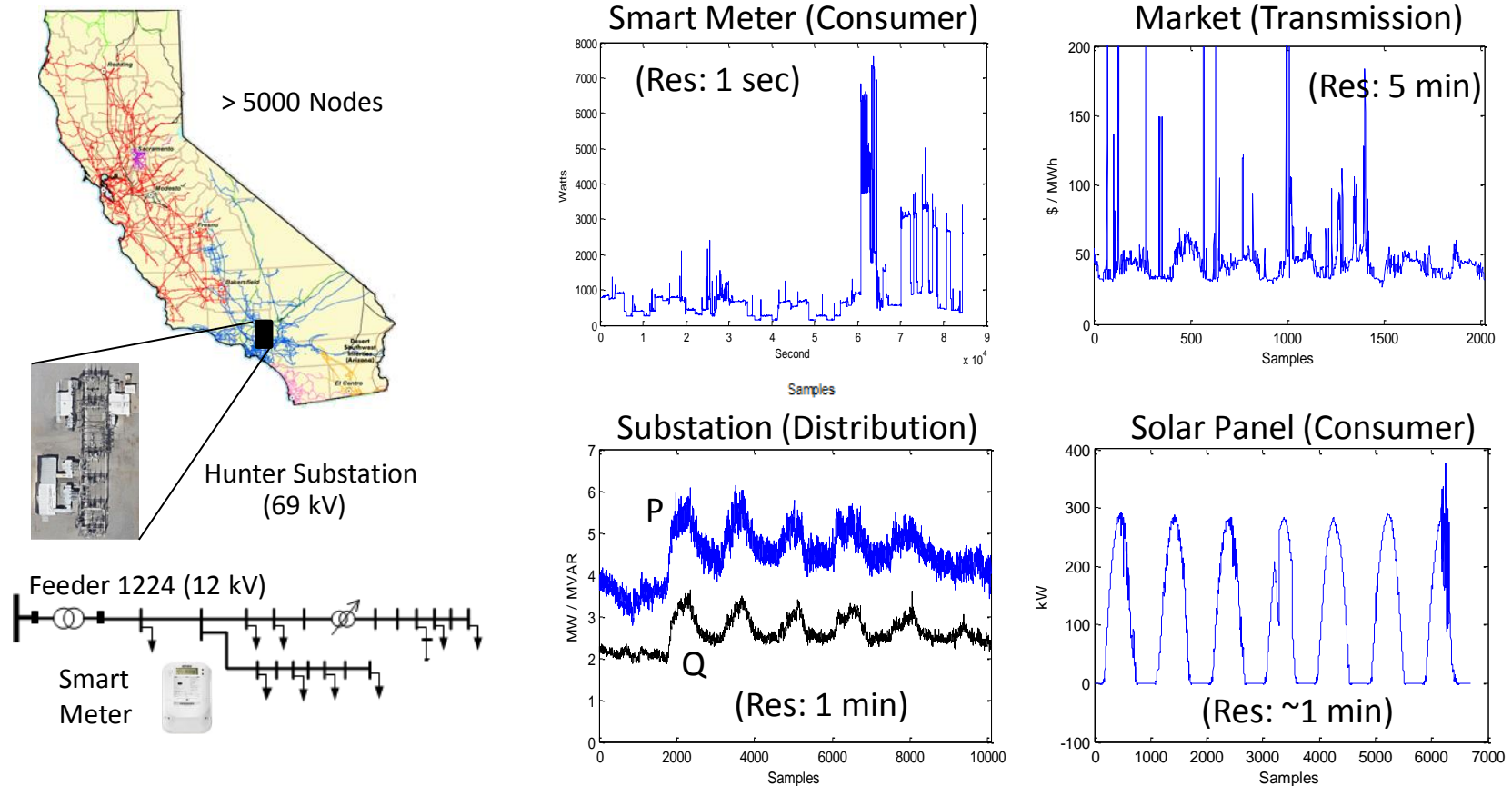
University of California at Riverside



PI Meeting – Arlington, VA, January 2016

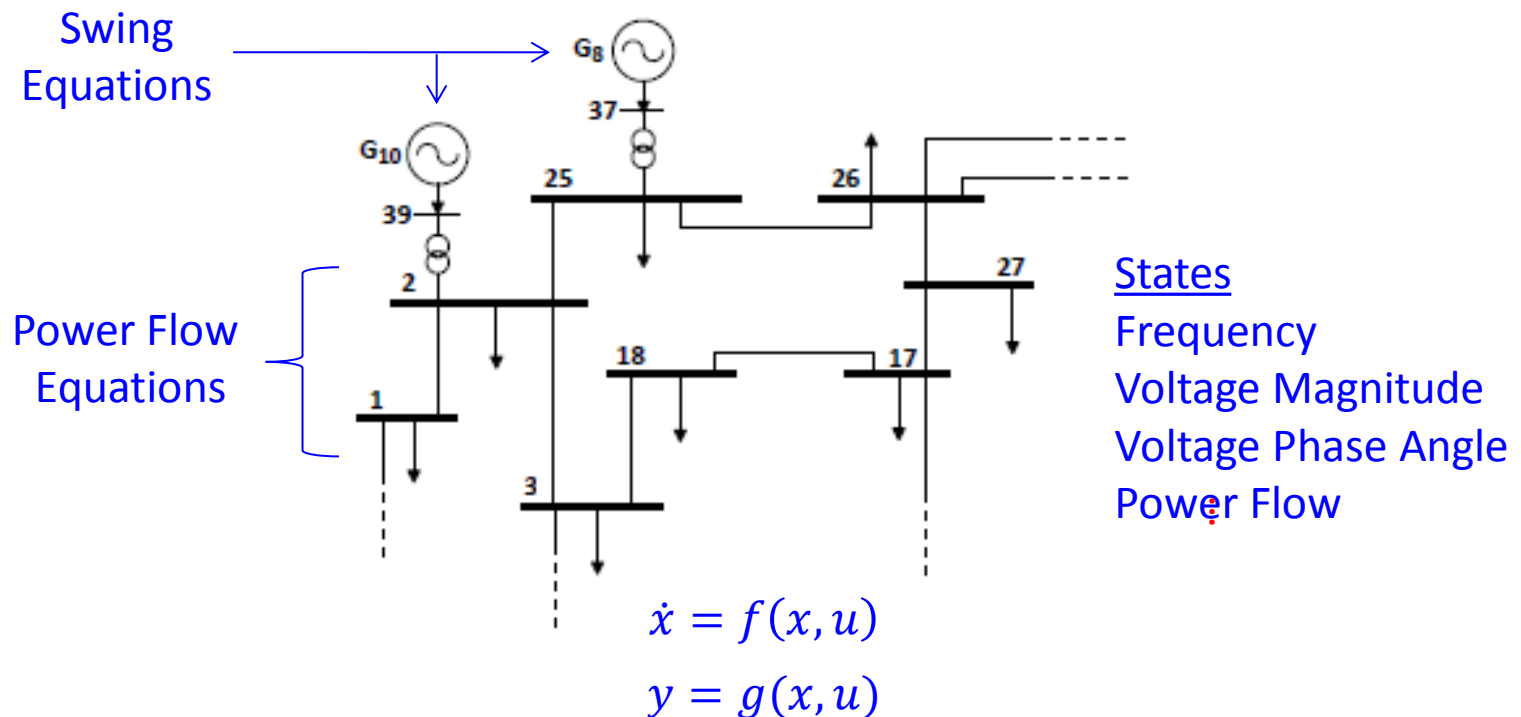
Problem Statement

- **Goal:** Detect and identify faults and attacks from diverse multi-resolution dynamic data in a power infrastructure.



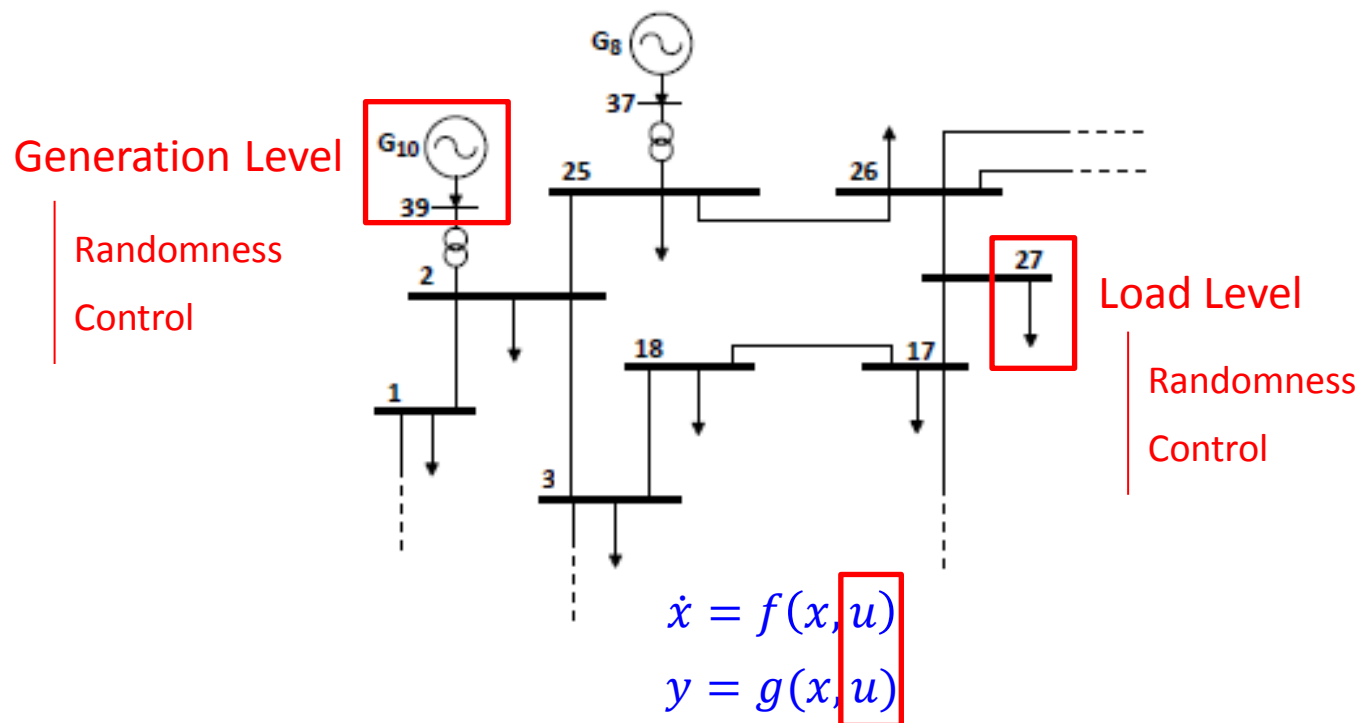
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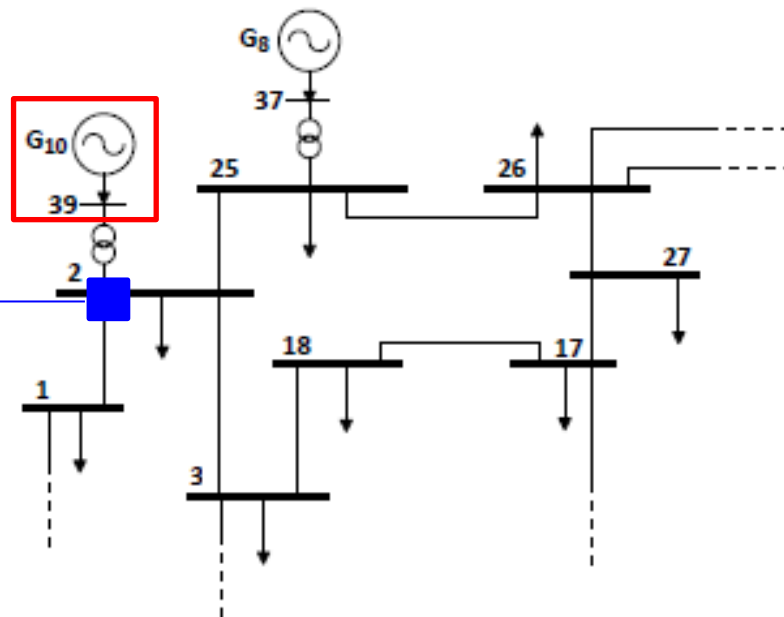


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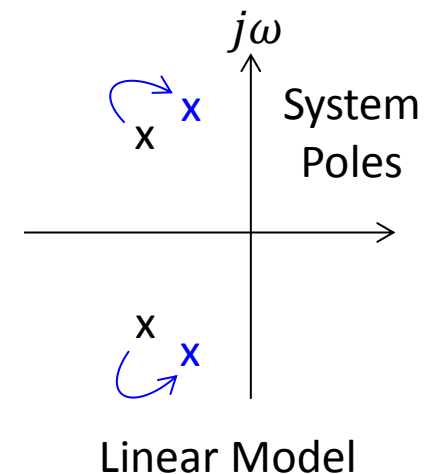
Positive Feedback

Generation Level



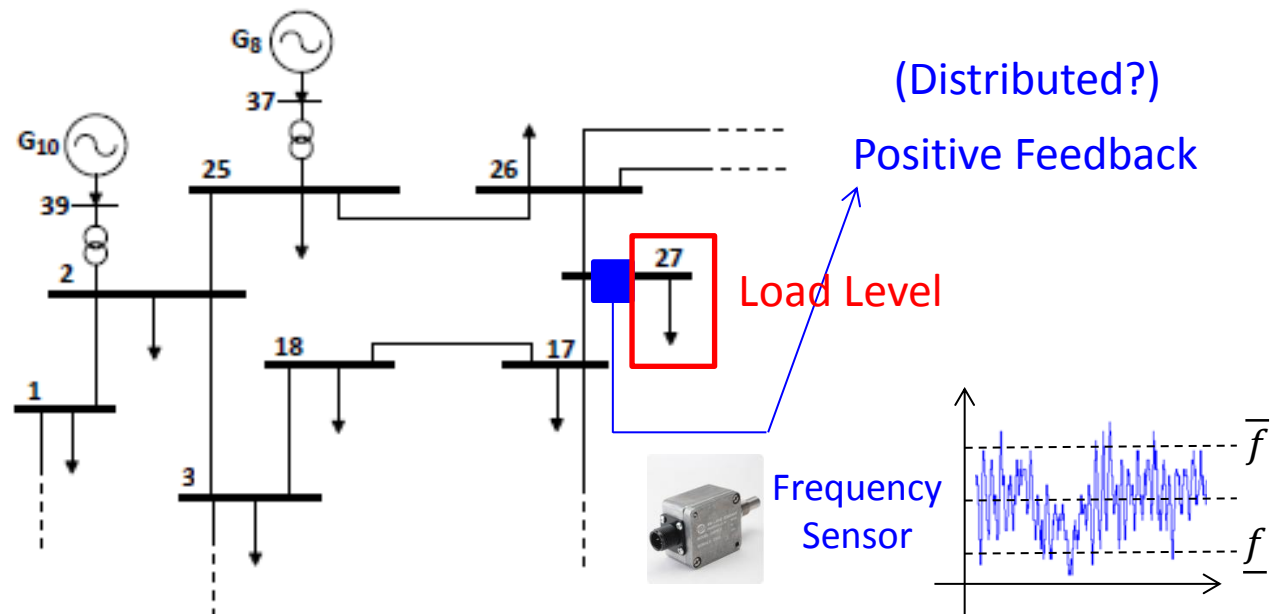
Fault

Attack [DeMarco 1996, Pasqualetti 2012, etc.]



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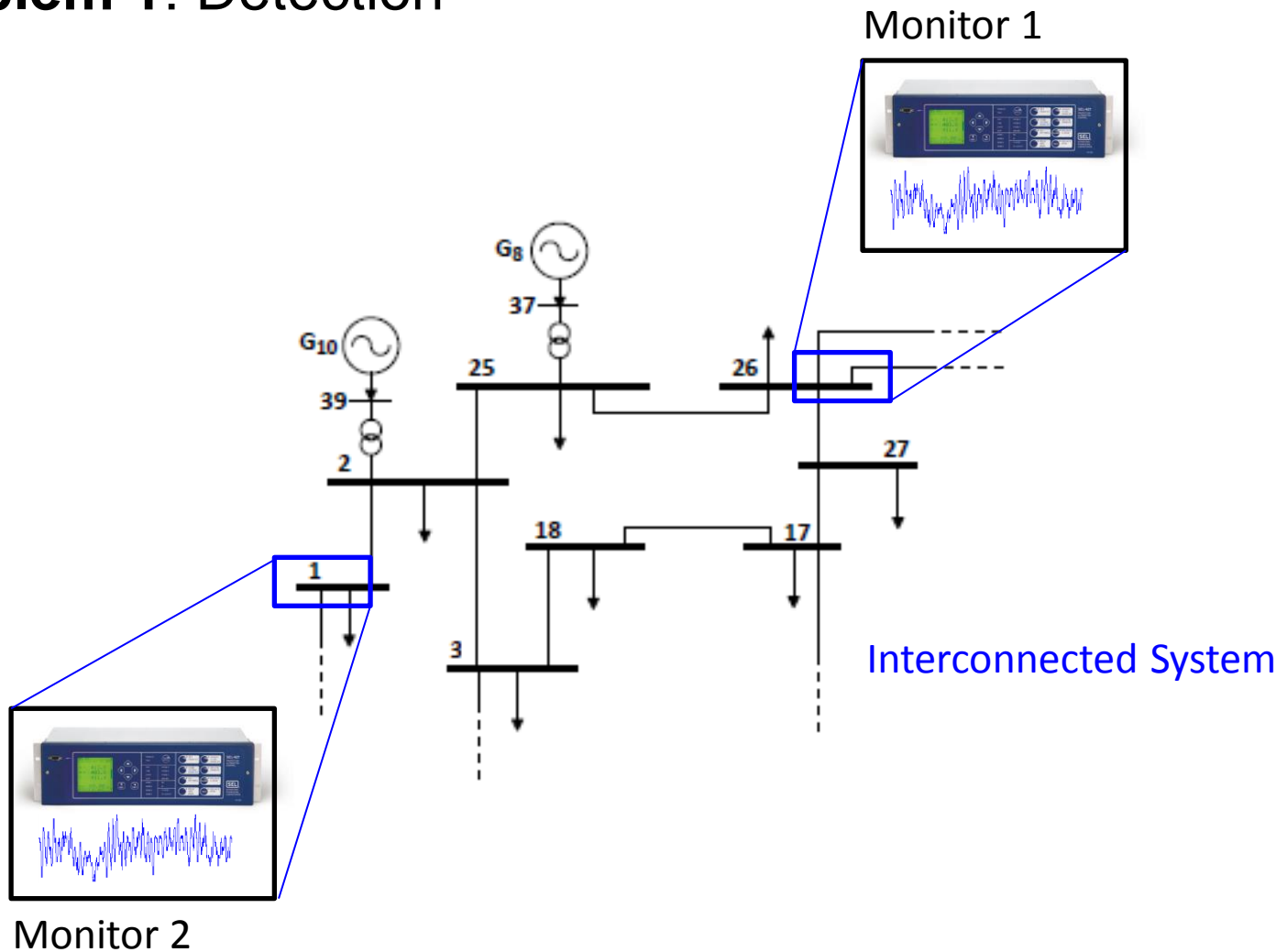


Fault

Attack [Mohsenian-Rad 2010, Marnerides 2014, Amini 2015, etc.]

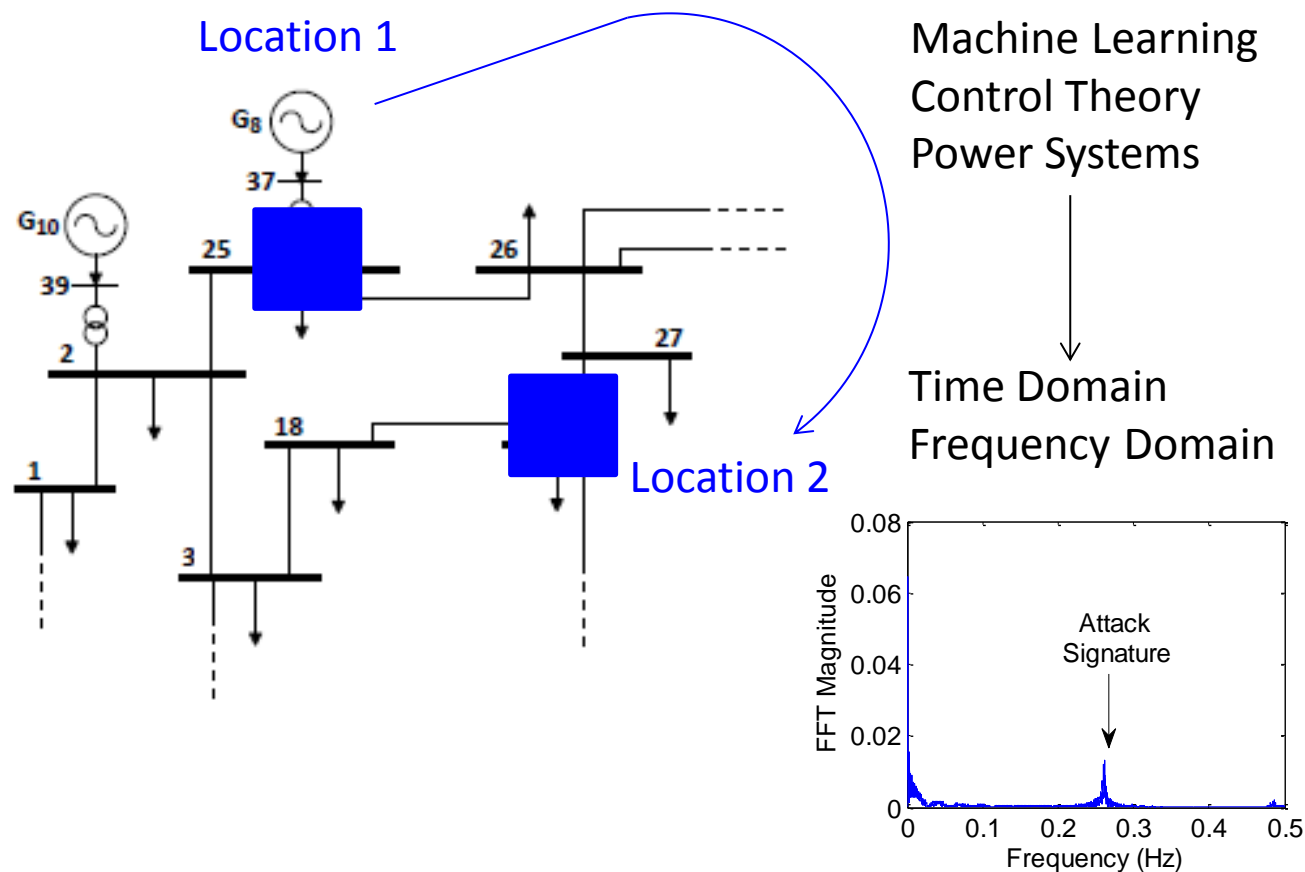
Research Challenges

- **Problem 1: Detection**



Research Challenges

- **Problem 2: Identification** (Recall > 5000 nodes, etc.)



- Parallel Research Efforts:
 - **Task 1:** Problem Formulation
 - **Task 2:** Designing Detection / Monitoring Tools
 - **Task 3:** Designing Identification Tools
 - **Additional Task:**
 - Developing Proper [Hierarchical] Simulation and Testing Tools

Thank You!

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- [4] A. K. Marnerides, P. Smith, P. A. Schaeffer-Filho, and A. Mauthe, "Power Consumption Profiling Using Energy Time-Frequency Distributions in Smart Grids", *IEEE Communications Letters*, vol. 19, no. 1, pp. 46-49, January 2015.
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- [6] S. Amini and H. Mohsenian-Rad and F. Pasqualetti, "Dynamic Load Altering Attacks in Smart Grid", in *Proc. of the IEEE PES Conference on Innovative Smart Grid Technologies*, Washington, DC, 2015.