



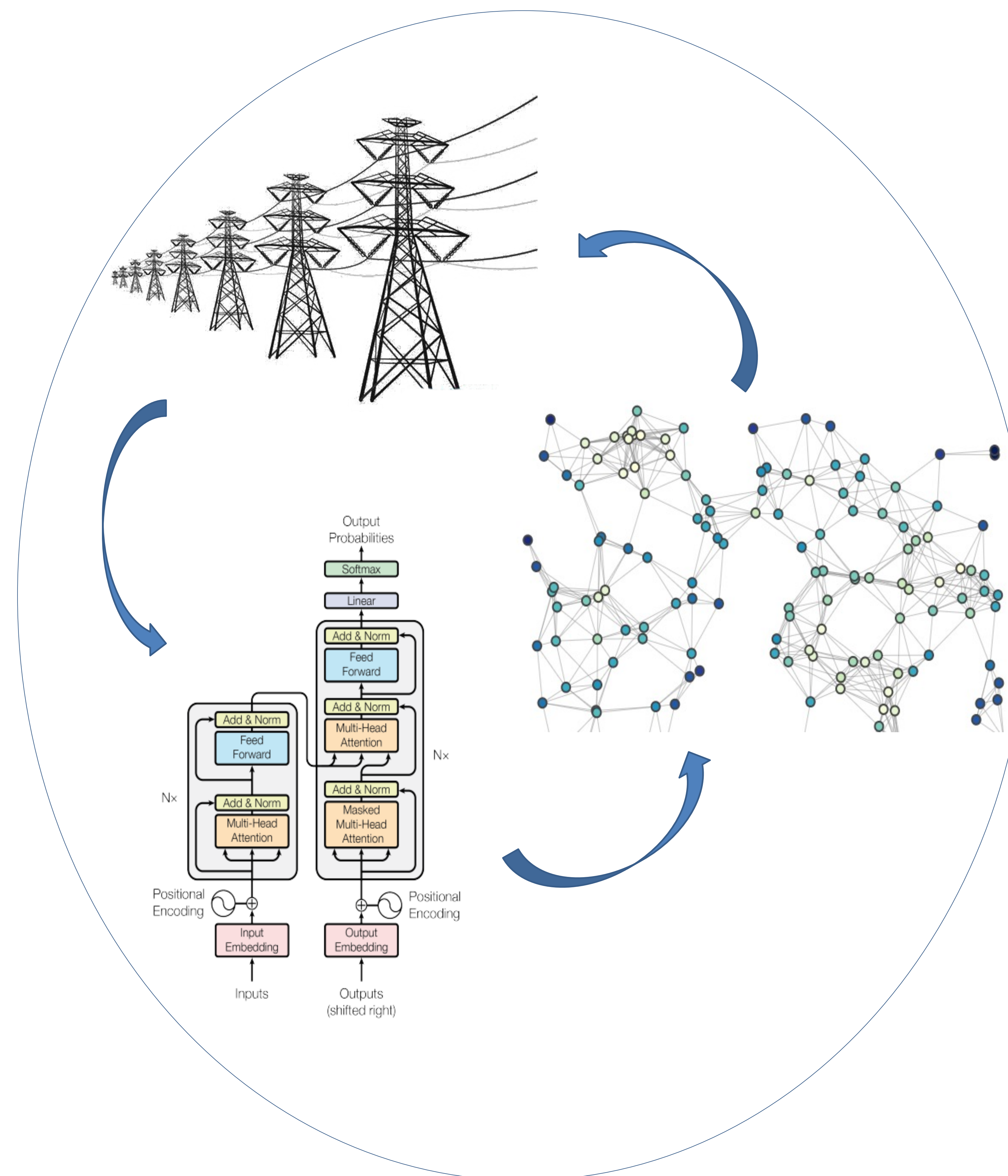
**CRII: CPS: Data-Driven Cascading Failure Abstraction and Vulnerability Analysis in Cyber-Physical Systems**  
NSF-CNS 1948550, Awarded 03/26/2020, PI: Xiang Li (xli8@scu.edu), Santa Clara University

### Challenge:

- Describing complicated CPS cascading failures with simpler models
- Quantitatively measure vulnerability in large-scale CPS systems efficiently

### Solution:

- Trained *the first Transformer based models* to predict CPS cascading failure with high accuracy
- *Built simpler cascading failure models using the attention matrix*
- Developed *new dynamic and adaptive sampling algorithms* for cascade models
- Conducted vulnerability analysis with critical lines generated using the learned attention matrices



### Scientific Impact:

- The developed sampling methods in large-scale networks can be extended to any networks with the diffusion phenomenon
- Using Transformer to predict cascading failures can be helpful to simplify any complicated cascading process in CPS
- The trained models are effective in finding the critical components and can guide protection decisions for CPS systems

### Broader Impact:

- Better understanding of cascading failures will help enhancing CPS security
- Research opportunities for high school students and students from underrepresented groups
- Senior design project opportunities
- Disseminated research results to high school and undergraduate students in workshops and seminars

