Statistical Models and Methods for Dynamic Complex Networks

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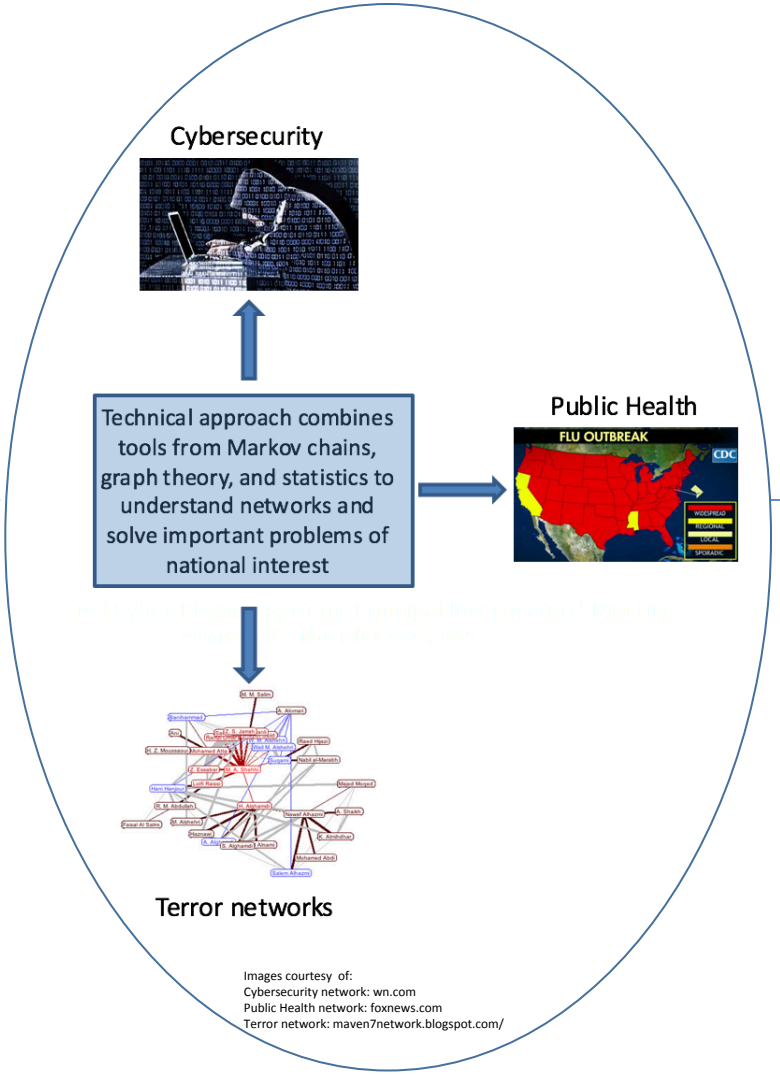
Challenge:

- Understand structure and function of complex systems arising, e.g, from internet traffic, social media, and information spread.

Solution:

- Approach: use insights from Markov chains and combinatorial stochastic processes to develop a general theory for dynamic networks.
- Highlights: (1) Rigorous theory for dynamic network models; (2) new framework (edge exchangeability) for understanding scale-free networks.



Scientific Impact:

- Three major but poorly understood questions in network science: (1) How to model heterogeneous structure in real world networks? (2) How sampling affects observed network structure? (3) How network dynamics affect these aspects?
- The main results of the project provide insight into each of these questions.

Broader Impact:

- Immediate impact: Call attention to shortcomings in current approach and suggest alternative solution.
- Long-term impact: Develop a more suitable framework for understanding complex networks arising in cybersecurity, counterterrorism, and national defense.
- Transition to practice includes dissemination at interdisciplinary conferences and integration into academic curriculum.

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