CAREER: Securing Cyberspace: Gaining Deep Insights into the Online Underground Ecosystem

Case Western Reserve University EST. 1826
think beyond the possible

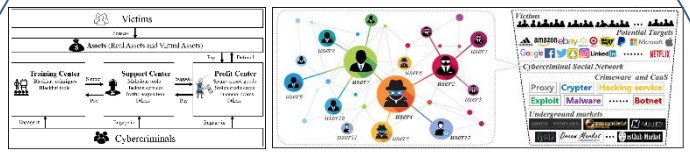
Challenge:

- Cybercrime is increasingly enabled by an online underground ecosystem, within which are anonymous forums and dark web platforms for cybercriminals to exchange knowledge and trade in illicit products and services.
- To better protect the trust of legitimate institutions and users within cyberspace, and to disrupt or mitigate the harm of illegal markets, there is an urgent need to gain deep insights into the online underground ecosystem and understand its intricate relationships.

Solution:

- Design methods and develop scalable techniques to automate the analysis of online underground markets;
- Develop novel frameworks for cross-market user identification and profiling;
- Design innovative models and propose algorithms for structural analysis of cybercriminal social networks to gain deep insights into the organization and operation of cybercriminals in the ecosystem.

Driven by the prospect of substantial economic gains, cybercriminals are organized within the **complicated online underground ecosystem**, which has a clear division of labor and value chain.



The goal of this project is to design and develop an integrated computational framework for in-depth investigation of the online underground ecosystem and thus to help secure cyberspace by producing data-driven interventions of cybercrimes.

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Scientific Impact:

- The scientific impacts of the proposed work could reach other fields such as social or economic sciences (e.g., the business model of CaaS, which includes actors, value chains and operation modes, can facilitate the research in economic science).
- The developed techniques can be used in other security domains, such as spammer detection and anti-fraud.
- The proposed methods can be applicable in different learning tasks in data mining and machine learning, such as multi-class classification and network embedding.

Broader Impact:

- The project integrates research with education through curriculum development, the participation of underrepresented groups, and student mentoring activities.
- The establishment of a cybersecurity lab through this project will enhance education and workforce training in cybersecurity.
- This project will benefit to scientific communities and society as a whole by developing interventions into online crime to secure cyberspace for its users.

Award Number: CNS-1940859(1845138), **PI: Yanfang (Fanny) Ye** (Case Western Reserve University), Contact: yanfang.ye@case.edu