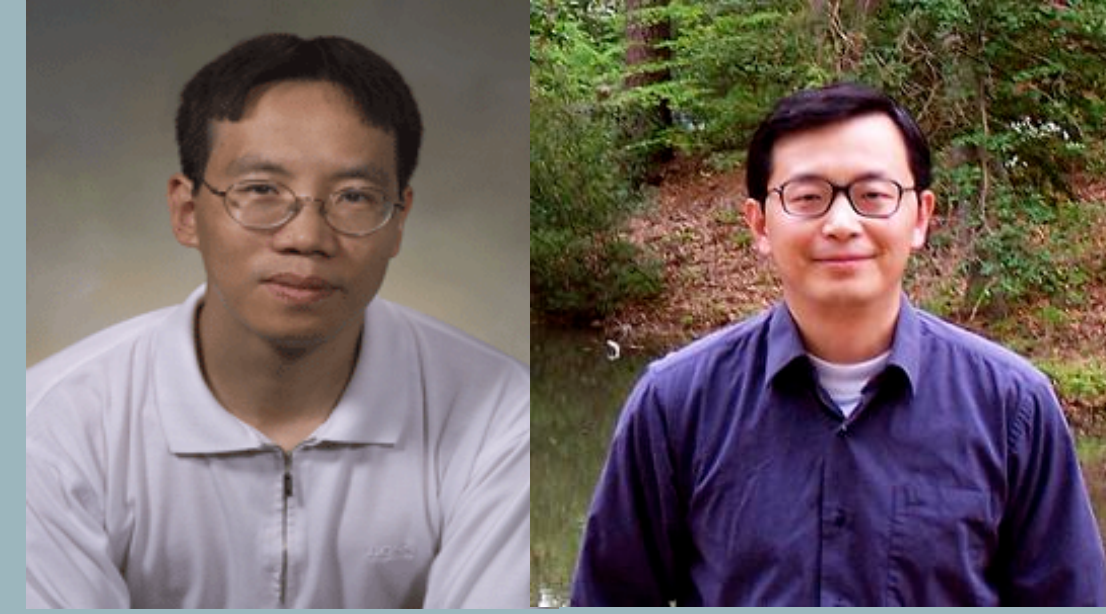


# Reputation-Escalation-as-a-Service: Analyses and Defenses

PIs: Sencun Zhu (PSU) and Haining Wang (UDel)

URL: [www.cse.psu.edu/~szhu/projects/REaaS.html](http://www.cse.psu.edu/~szhu/projects/REaaS.html)

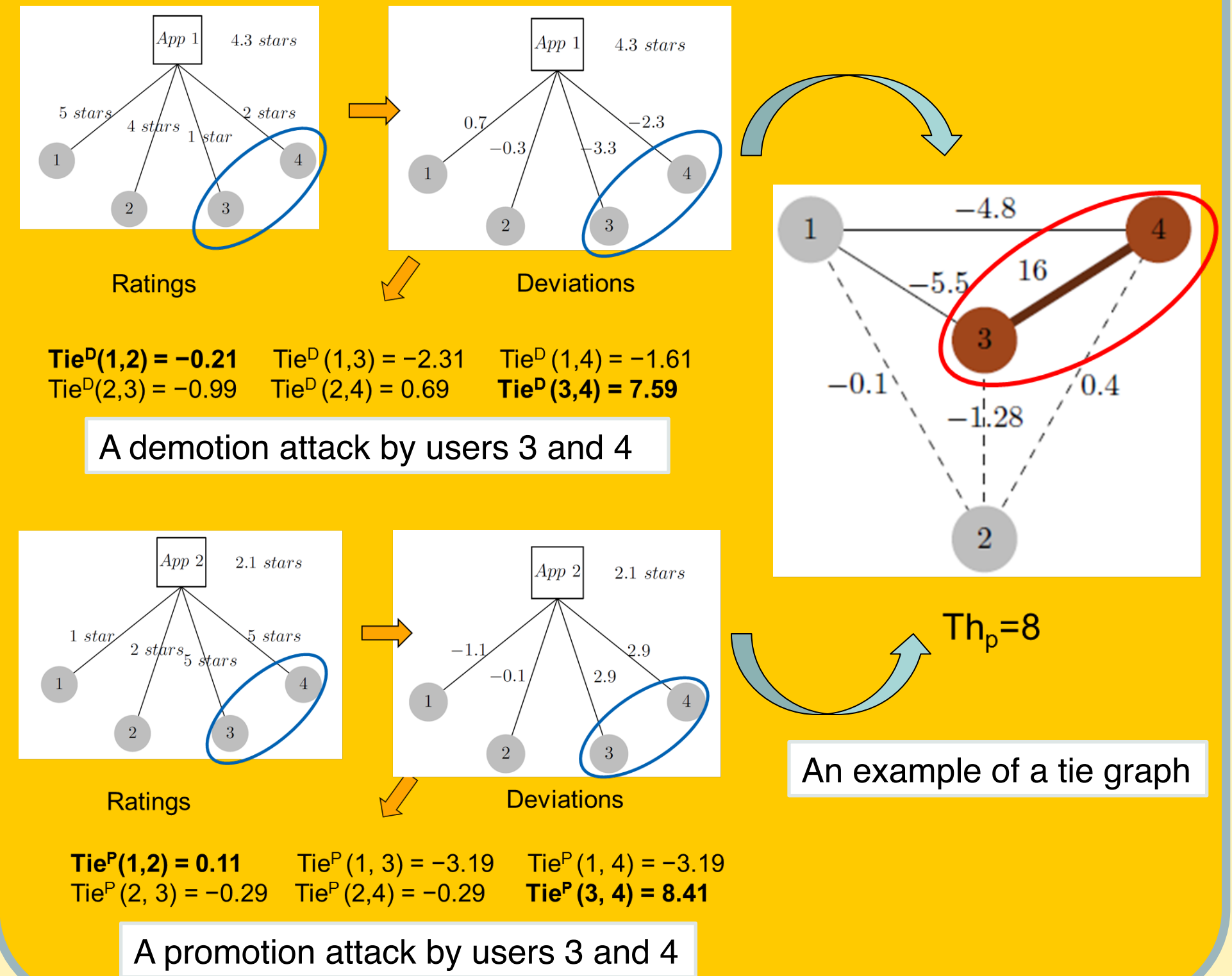


## Research Statement:

**Background:** Living in an age when services are often rated, people are increasingly depending on reputation of sellers or products/apps when making purchases online. This puts pressure on people to gain and maintain a high reputation by offering reliable and high-quality services and/or products, which benefits the society at large. Unfortunately, due to extremely high competition in e-commerce or app stores, recently reputation manipulation related services have quickly developed into a sizable business, which is termed **Reputation-Escalation-as-a-Service (REaaS)**. As REaaS attacks grow in scale, effective countermeasures must be designed to detect and defend against them.

**Objectives:** This research addresses REaaS from two aspects. **First**, it aims to understand the economics of REaaS by an empirical study of underground markets. The outcome will enable one to (a) understand how the underground markets operate, their market scales, etc.; (b) learn and model the behavioral characteristics of REaaS; and (c) obtain the ground truth for future evaluation. **Second**, it aims to develop defensive measures, which involve both technical approaches and market intervention.

## Tie Graph: a measure of co-rating behavior

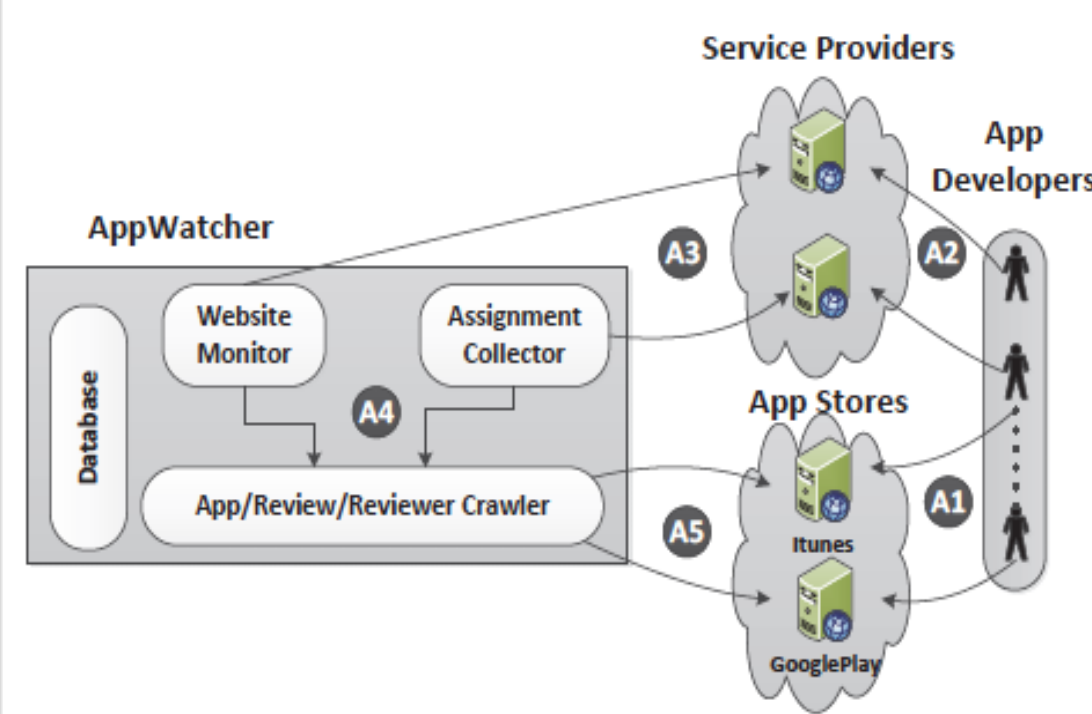


## Approaches

- A longitudinal and latitudinal study of mobile app underground markets for rating manipulation behaviors
- A longitudinal study of seller-reputation escalation (SRE) attack behaviors in ecommerce store Taobao(China)
- Defensive measures based on graph theory, social ties, and machine learning
  - Use the concept of tie graph to measure the co-rating behavior of users
  - Correlation between rating scores and rating numbers indicates manipulation
  - Underground market study provides strong features for classification of abused apps and attackers

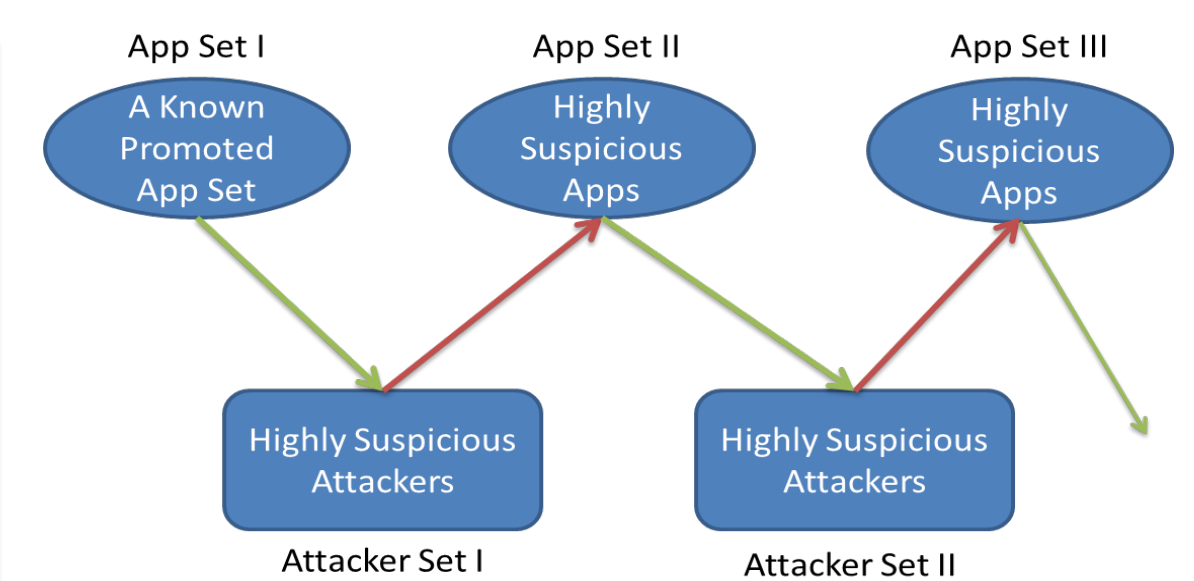
## AppWatcher:

- A crawler for penetrating underground app rating manipulation markets. It exposes 645 apps promoted in app stores and 29, 680 apps promoted in some popular websites.
- Revealed statistics of underground markets
- Identified characteristics of promoted apps and attackers

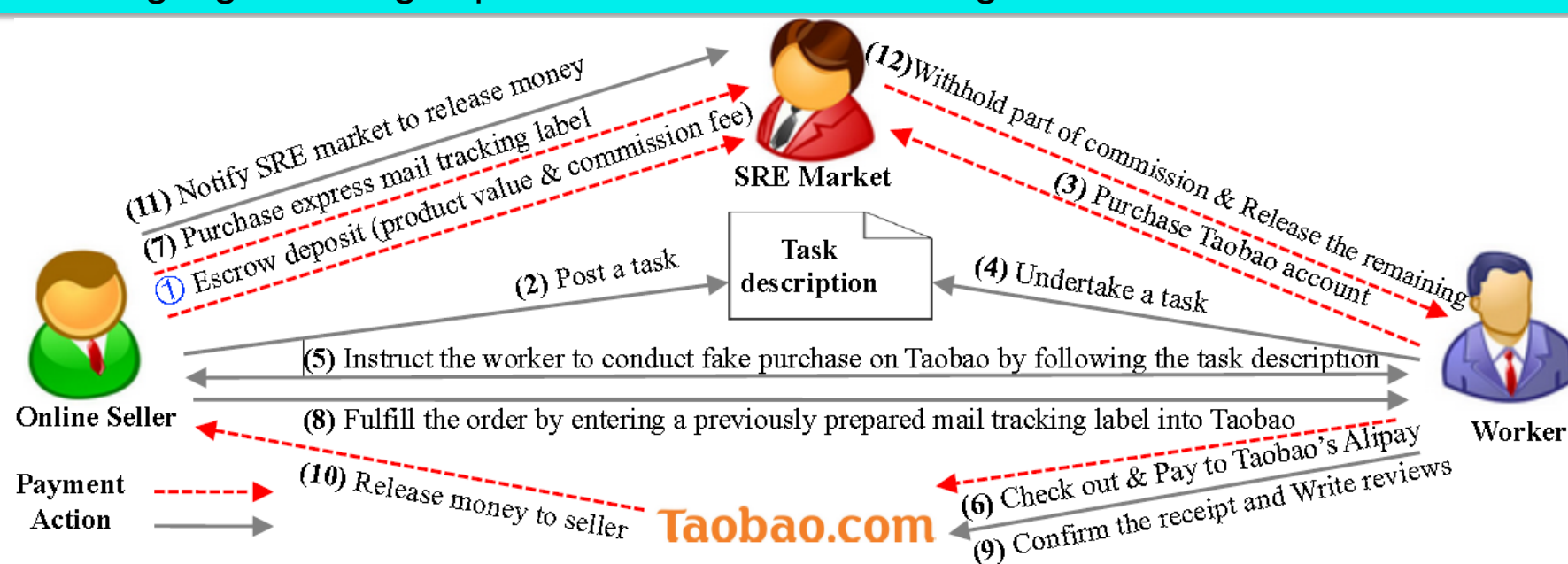


## An iterative approach to identify abused apps and promotion attackers

- Identified four types of attack signatures
- Based on bi-clique community detection
- Analyzed over 30K apps from iTunes US, UK and China and reported 0.4~0.7% promoted apps



Lifecycle of a fake-purchase task on the SRE market Taobao. Insincere online stores can remarkably increase their reputation scores by posting tasks on SRE markets, achieving higher ratings up to 10 times faster than legitimate stores.



## Related Publications:

- Z. XIE, S. ZHU, Q. LI AND W. WANG. YOU CAN PROMOTE, BUT YOU CAN'T HIDE: LARGE-SCALE ABUSED APP DETECTION IN MOBILE APP STORES. PROCEEDINGS OF ANNUAL COMPUTER SECURITY APPLICATIONS CONFERENCE (ACSAC), 2016.
- Z. XIE AND S. ZHU. APPWATCHER: UNVEILING THE UNDERGROUND MARKET OF TRADING MOBILE APP REVIEWS. PROCEEDINGS OF THE 8TH ACM CONFERENCE ON SECURITY AND PRIVACY IN WIRELESS AND MOBILE NETWORKS (WISEC), 2015.
- Z. XIE AND S. ZHU. GROUPTIE: TOWARD HIDDEN COLLUSION GROUP DISCOVERY IN APP STORES. PROCEEDINGS OF THE 7TH ACM CONFERENCE ON SECURITY AND PRIVACY IN WIRELESS AND MOBILE NETWORKS (WISEC), 2014.
- H. XU, D. LIU, H. WANG, AND A. STAVROU. E-COMMERCE REPUTATION MANIPULATION: THE EMERGENCE OF REPUTATION-ESCALATION-AS-A-SERVICE. IN WWW 2015, FLORENCE, ITALY, MAY 2015. (BEST PAPER NOMINEE)

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