A Deep Learning Framework for Intelligent Active and Passive Measurements in the Age of Internet of Things



Armin Sarabi, Mingyan Liu (University of Michigan)

https://www.nsf.gov/awardsearch/showAward?AWD_ID=2012001



Challenge

- Rapid proliferation of IoT and emerging security threats highlight the need for automated network monitoring.
- Develop an intelligent measurement platform combining ML with active and passive measurements.
- Retrainable tools that can keep up with rapid changes in the Internet ecosystem.

Solutions

- Predictive/exploratory network scanning.
- Intelligent network honeypots.

Scanner

Probe

Executor

Probe

Executor

Probe Executo

• Transformer-based language modeling.

Interface

Scientific Impact

- Automated and efficient monitoring producing early security alerts.
- Protocol-agnostic embeddings for MLbased applications.
- Human-readable representations with actionable outputs.
- Novel data-driven applications promoting use of ML for security and measurement.
- ML-generated device profiles using text annotation models.



Broader Impact

- Prevent or reduce the impact of incidents.
- Enable proactive security by producing actionable security alerts.
- Risk assessment for self-protection and insurance.

Education and Outreach

- Interdisciplinary research opportunity combining both theory and practice.
- Research areas: Data-driven security, applied ML/DL, language modeling, big data, networking.



Q