Evaluating Evasion in Network Intrusion Detection Systems

Three-Phase Project Summary

Miguel Pinto   Mátyás Szikra   Ahmed Lotfy

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Phase 1: Initial Modeling

- Dataset selected: CICIDS2017
- Trained Isolation Forest for unsupervised anomaly detection
- Aimed for high recall while maintaining class balance
- Unsupervised model underperformed on real traffic
- Switched to Random Forest (supervised)
- Performed initial tuning and evaluation

Reference: Liu et al. (2012) – Isolation-Based Anomaly Detection

Phase 2: Real Traffic Generation

- Deployed two VMs: victim and attacker
- Generated low-and-slow `nmap` attack traffic
- Collected realistic benign traffic in controlled setup
- Some additional synthetic samples used
- Custom scripts extracted CIC-style features
- Data exported as labeled CSV files

Reference: Ring et al. (2018) – Detection of Slow Port Scans in Flow-Based Network Traffic

Phase 3: Adversarial Evaluation and Tuning

- Real data used to further tune the supervised model
- Designed and tested:
    - Whitebox attacks
    - Greybox attacks
    - Blackbox attacks
- Integrated strongest evasive samples into retraining
- Created a final optimized blackbox attack
- Final model tested for robustness

Reference: Yazdanpour et al. (2023) – Adversarial Evasion Attacks in NIDS

Thank You!

Project repository: github.com/mcpinto0608/data_sec_project.git