Detecting DGA-based Botnet with Outlier Detection

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Problem

- **Goal: Detect DGA-based botnet.**
- **Each bot dynamically generate numerous random domain names and use a small subset as C&C.**
- **Difficulties to detect DGA-based botnets**
  - C&C domain names continue to be updated
  - We don't know details of the algorithm
  - Algorithm continue also changes

Proposed Approach

Insight

- DNS queries for DGA-generated domain names increase suddenly only a short period of time (temporal locality)

Approach

1. Extract suspicious domains applying outlier detection to total number of requests per day
2. Classify by the statistical features(n-gram, entropy, etc.)

Methodology

Input: Non-existent domains which were queried in the academic network.

Extraction:

1.For each domain, calculate time-series data about total number of requests per day

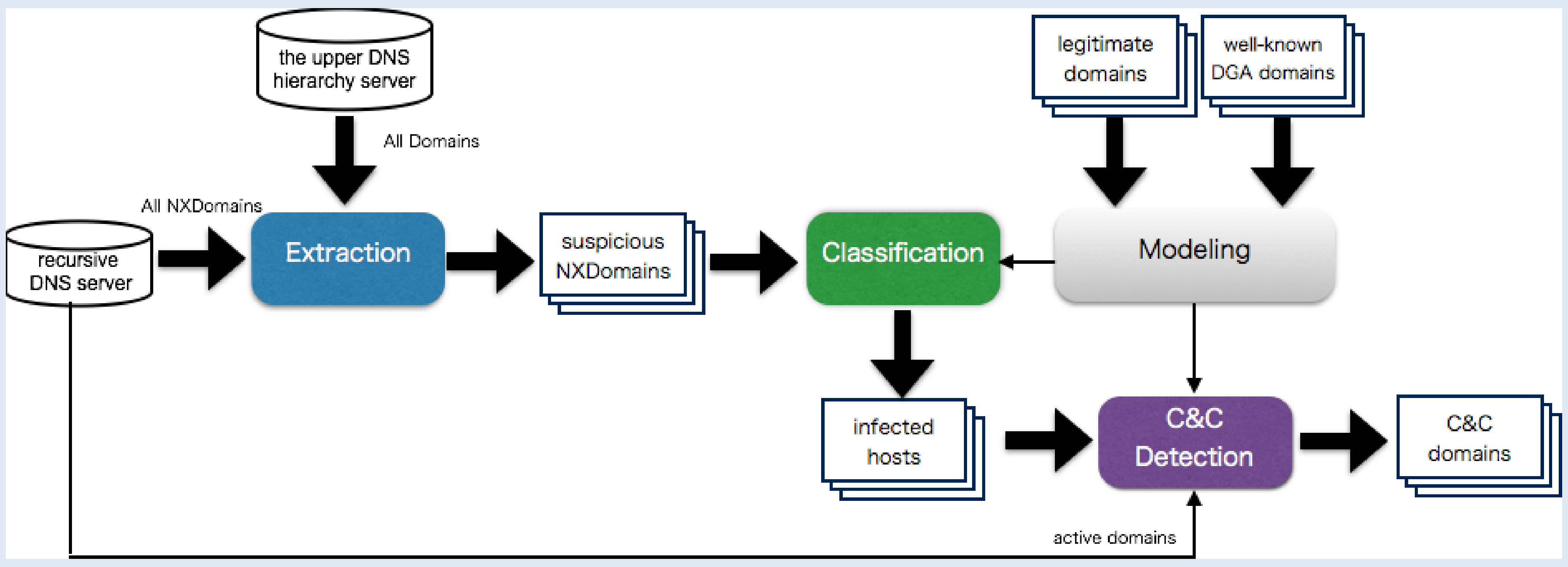
2.Apply median-absolute-deviation (MAD) based outlier detection for above data

3.Extract domains which have outlier as suspicious domains

Classification:

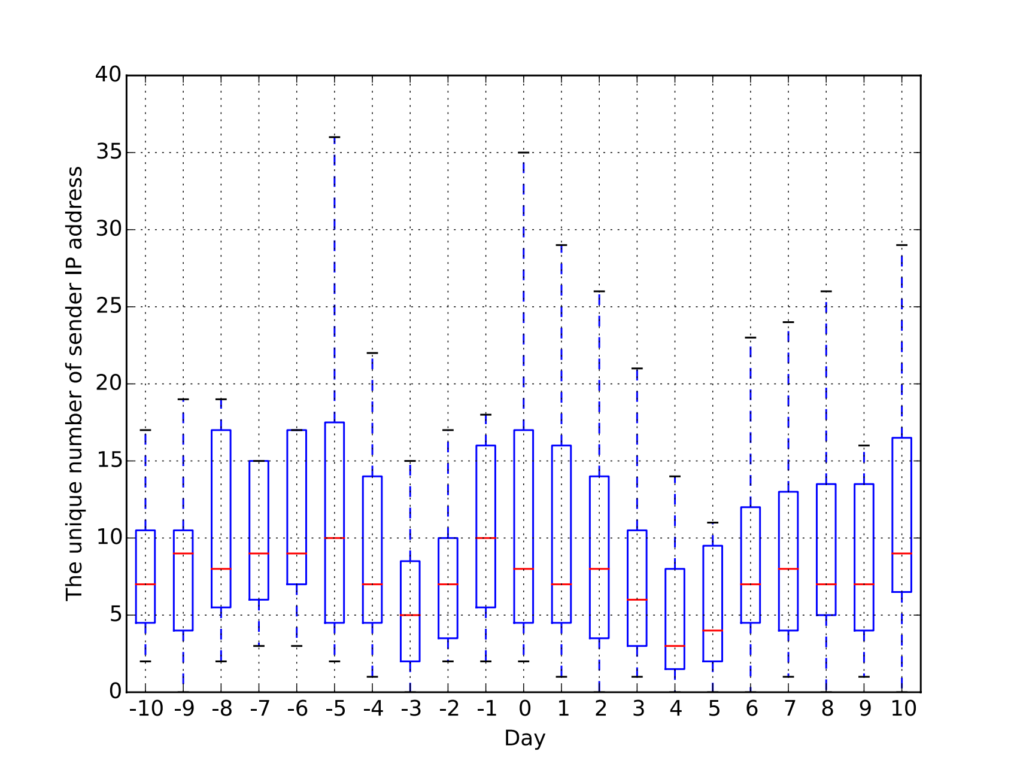
Prepare: Build SVM models for DGAs by well-known DGA domains

4.Classify DGA domains by SVM using the statistical features

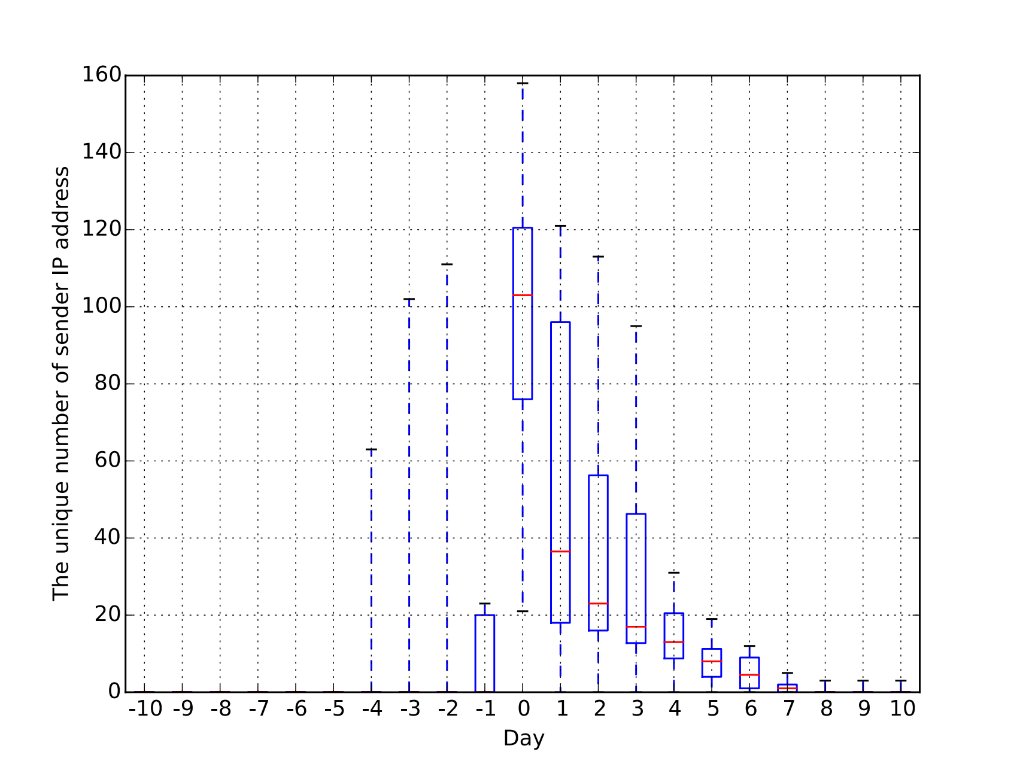


Temporal Locality

Dataset: DNS traffic at the Upper DNS Hierarchy
Span: 2014/04~2014/05



antivirus software



DGA
(Zeus Gameover)

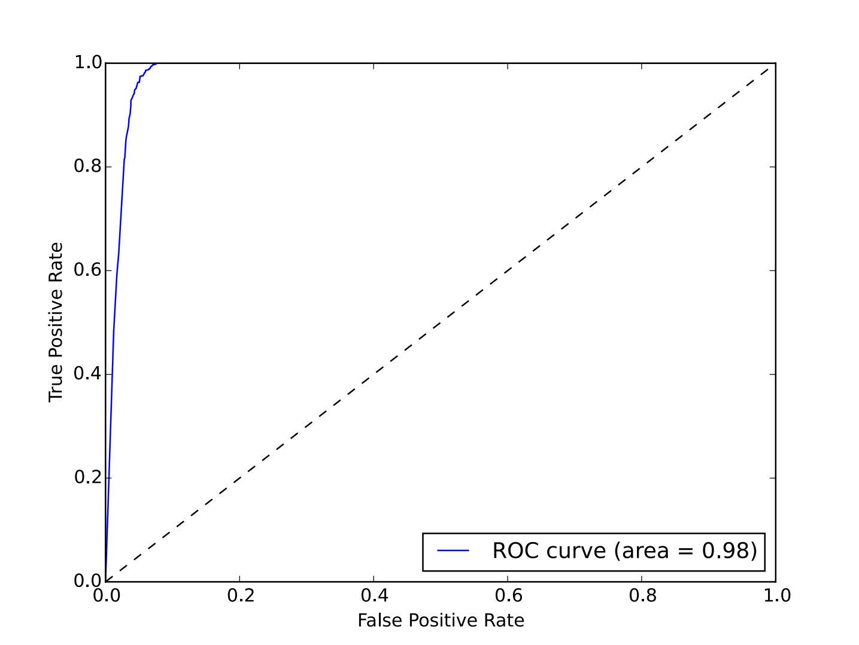
Unique number of sender IP address which query non-existent domains generated by DGA or antivirus software.

Results

Dataset: DNS traffic at cache DNS server
Span: 2014/04/21~2014/05/05

1. ROC for SVM from cross validation

AUC: 0.982925



2. C&C detection result a day on average
Truth: blacklist(DNS-BH)

		Predict	
		C&C	Legitimate
Truth	C&C	5	1
	Legitimate	9	991679

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