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Automaton Models for Netflow Analysis

Fingerprinting and Classifying Participants

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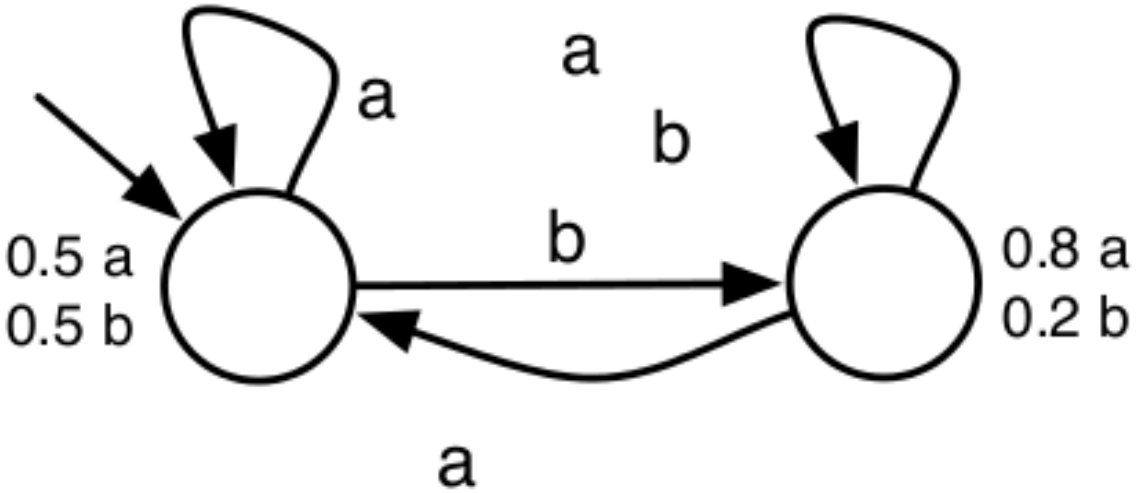
Automaton Models

Short Overview



Fingerprinting with Automatons

Prediction, Classification, and Visualization (I)

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Prediction

- predicting next states
- detecting outliers and anomalies

unsupervised

Classification

- classifying flows
- identifying type of activity or infection

(semi-) supervised

Fingerprinting with Automatons

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Fingerprinting with Automatons

Prediction, Classification, and Visualization (II)

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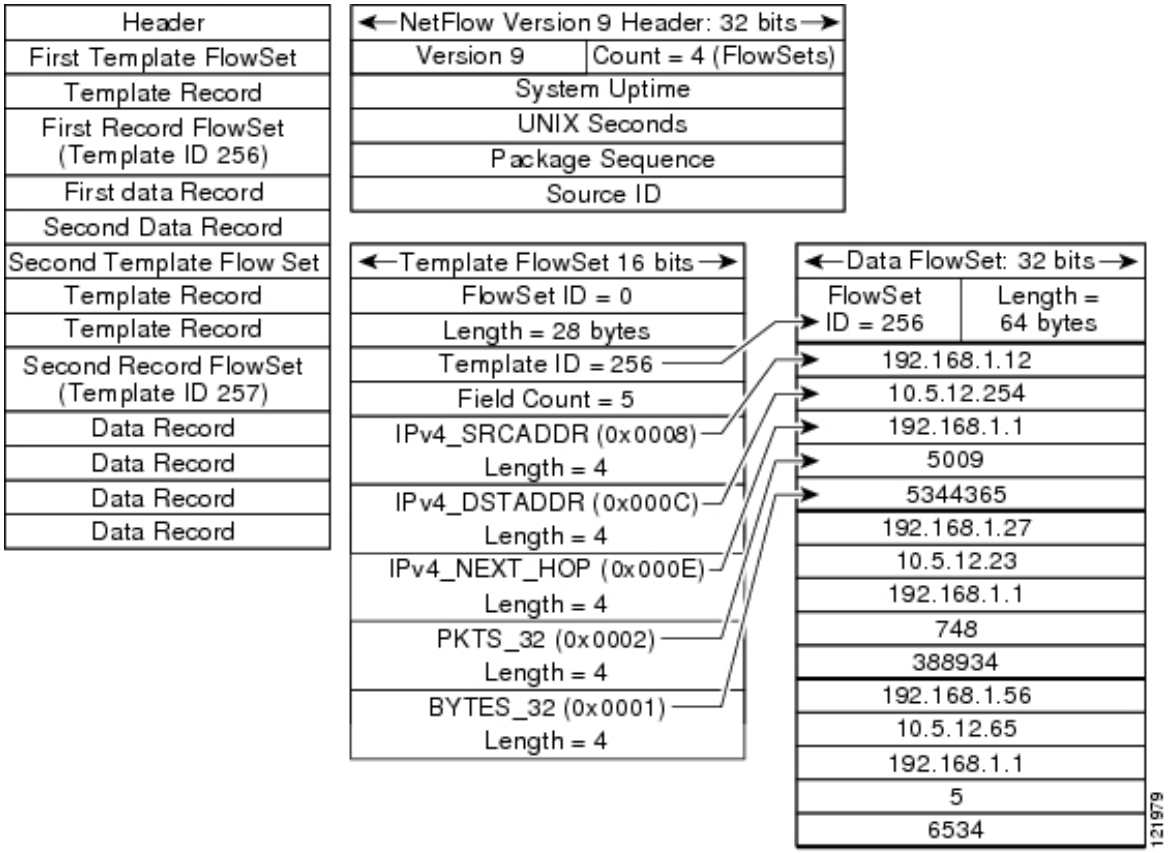
animation of automaton

Challenges

NetFlow Data as a (Regular) Language



[1]

[1] http://www.cisco.com/c/dam/en/us/td/docs/ios/ipv6/configuration/guide/ip6-netflow_v9.fm/_jcr_content/renditions/ip6-netflow_v9-1.jpg

Challenges

NetFlow Data as a (Regular) Language

From regression of numeric values to classification:

- via clustering to obtain few representatives

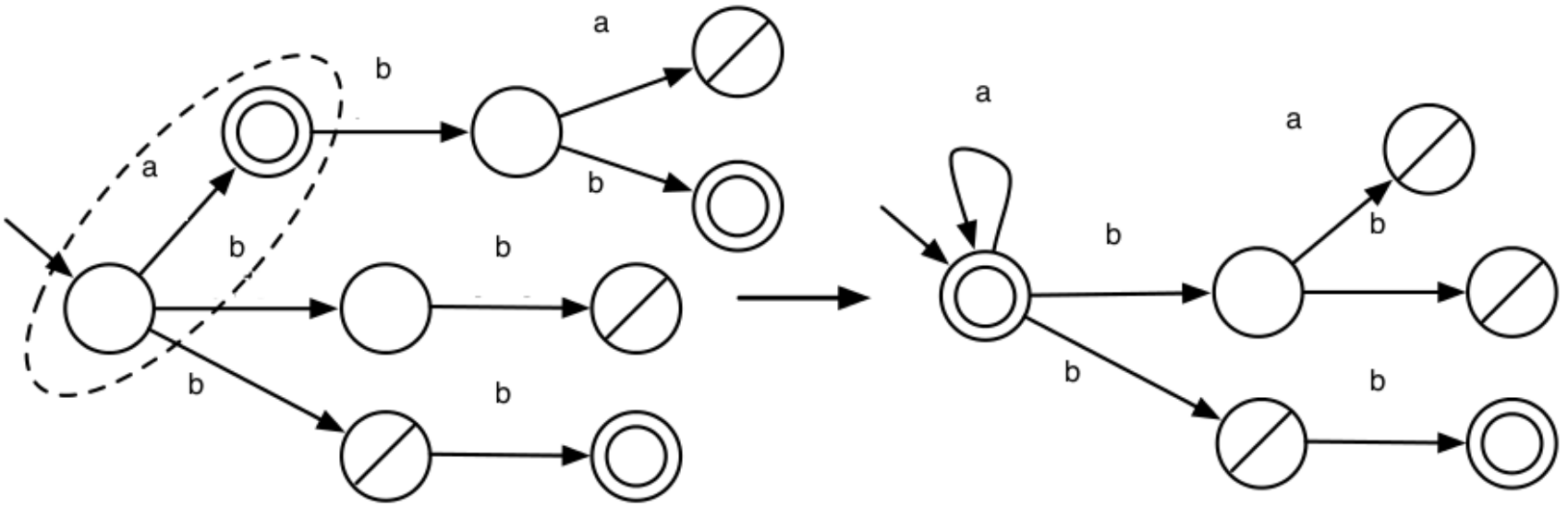
or through discretization

- via binning to obtain a discrete state space

What to choose?

Method

Learning State Structure from Data



2

[2] Taken from [2]

Evaluation

Data Set

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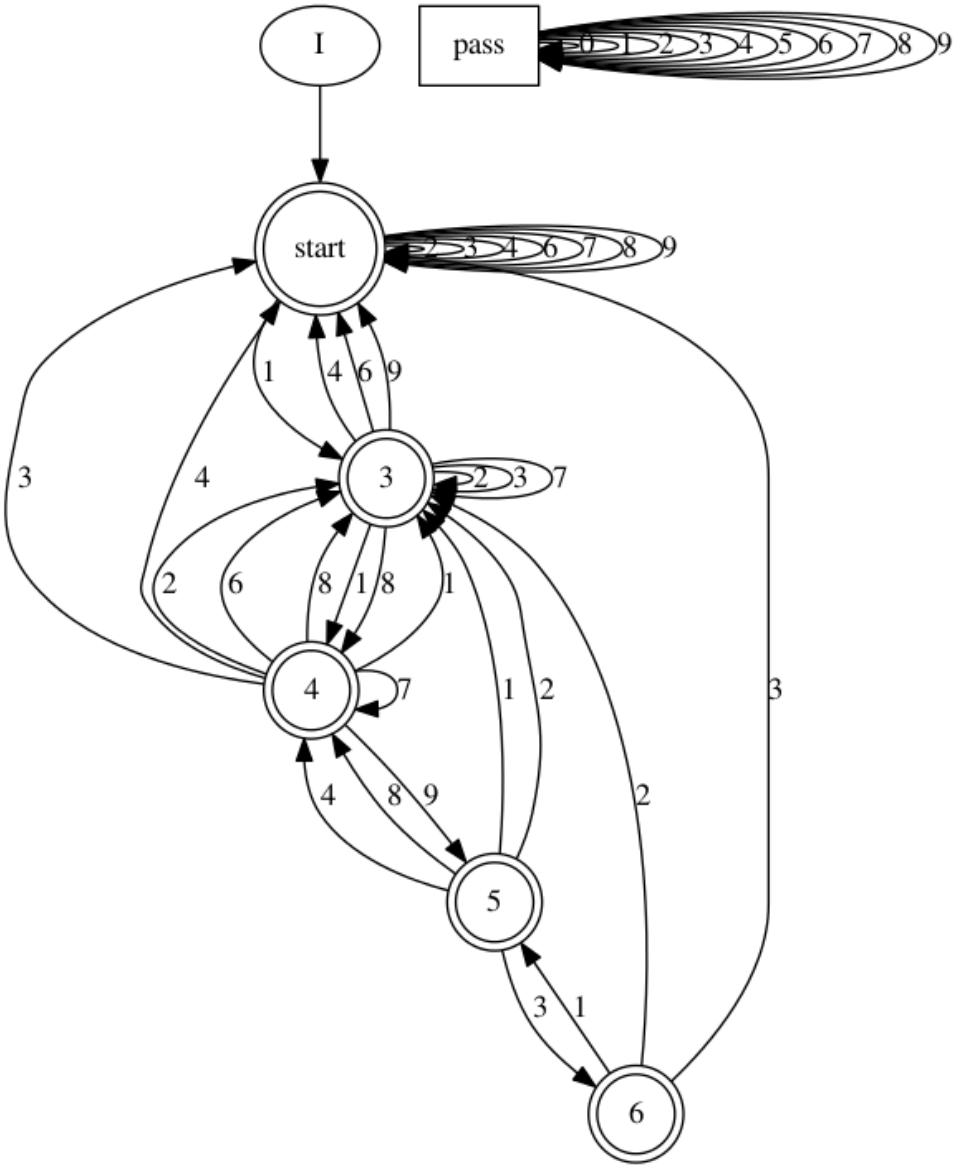
Experiments (on time-aggregated flow data):

1. predicting statistics for next flows
2. classifying flows on unlabeled data
3. classifying flows on labeled data[3]

[3] Using a botnet traffic data set[1]

Evaluation

Generated Automatons



Evaluation

Excerpt

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Data Set	Experiment	Error / F_1 / *FPR*

Conclusion

Conclusion and Future Work

Results

- structure learning on netflow data is feasible
- initial results look very promising
- this is still work-in-progress and offers a number of ways to improve

Further Research

- compare performance to other fingerprinting solutions
- apply a more expressive automaton model

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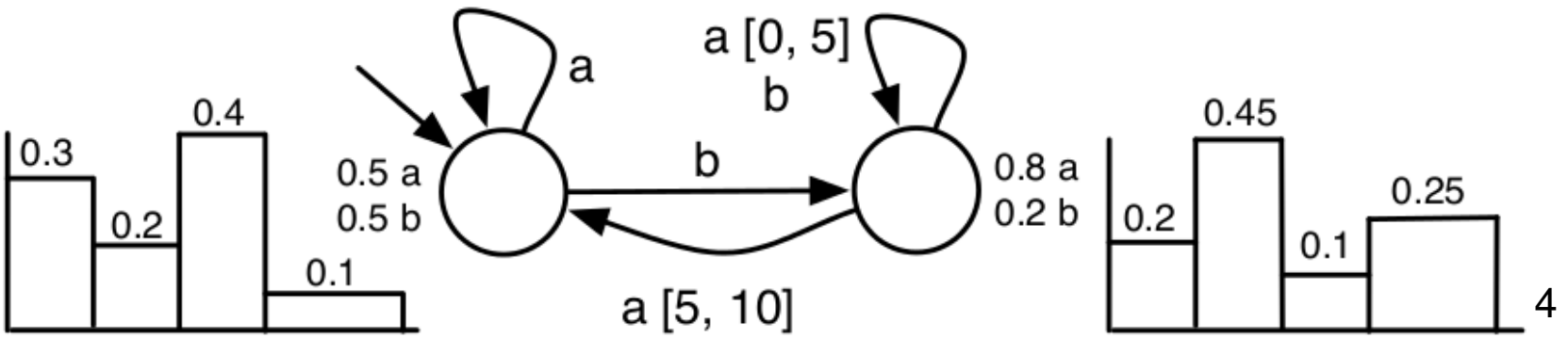
Future Work and Extensions

Currently Ongoing Research



[4] Taken from [2]

Thank You!

Time for questions.

References I

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