

Anomaly Detection: The DecayRank Algorithm

Date: 7/26/24

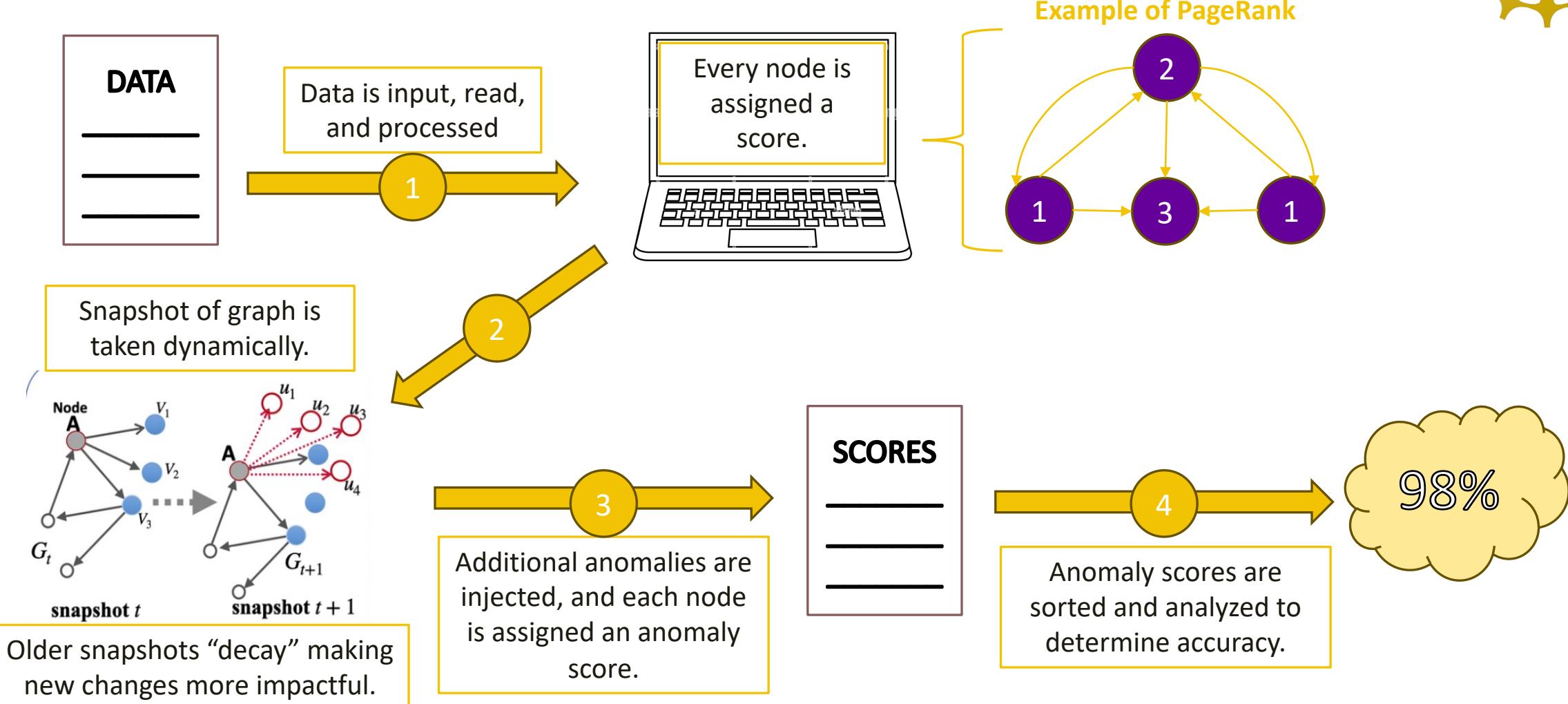
PRESENTER: JARED CHRISTOPHER

ADVISOR: DR. WILLIAM EBERLE

GRADUATE MENTOR: ANTHONY EKLE

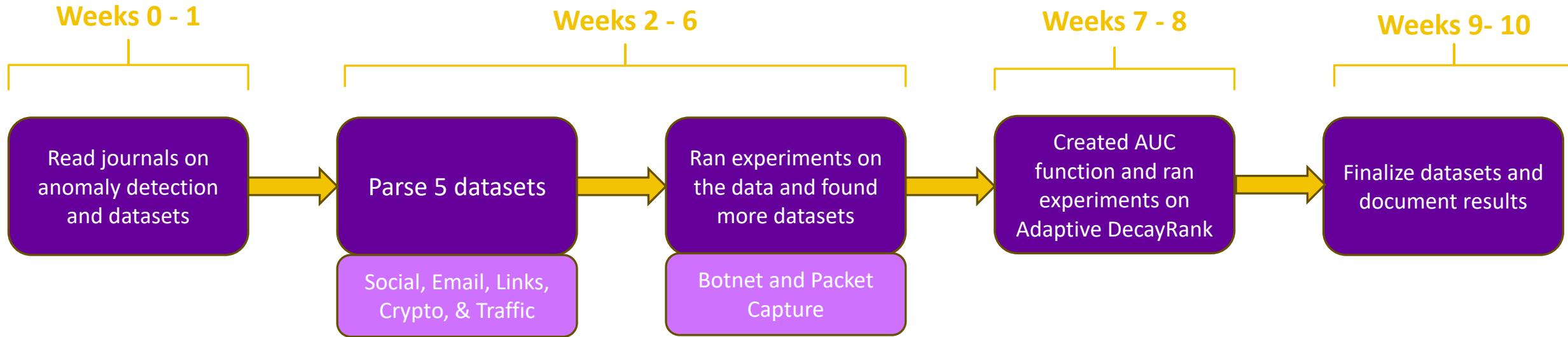


ADAPTIVE DECAYRANK





Timeline of Project





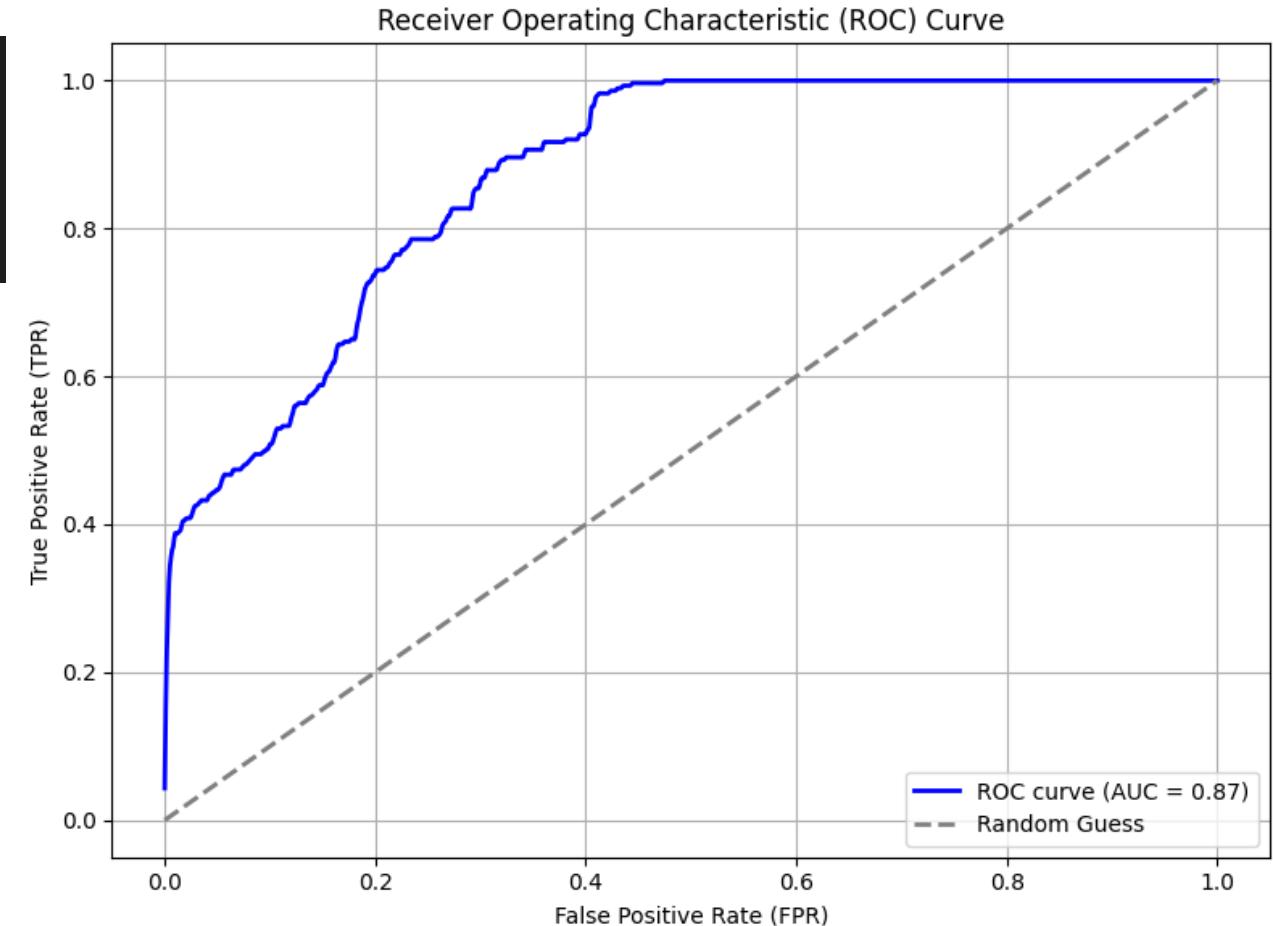
Performance

Dataset Name	Data Type	Highest Precision
DARPA	Network Traffic	98%
ENRON	Social Network	88%
BITCOIN	Crypto Transactions	40%
WIKI	Link Traffic	32%
CTU	Botnet	28%

Improvements

```
#define EPSILON 0.001
#define c 0.85          // Damping factor
#define DECAY_FACTOR 0.95 // Base decay factor
#define ALPHA 0.2        // Hyperparameter for Bayesian updating
#define BETA 1.0         // Hyperparameter for Bayesian updating
```

```
[TOP50] precision: 0.98, recall: 0.16955
[TOP100] precision: 0.96, recall: 0.33218
[TOP150] precision: 0.82, recall: 0.425606
[TOP200] precision: 0.685, recall: 0.474048
[TOP250] precision: 0.612, recall: 0.529412
[TOP300] precision: 0.56, recall: 0.581315
[TOP350] precision: 0.537143, recall: 0.650519
[TOP400] precision: 0.5375, recall: 0.743945
[TOP450] precision: 0.504444, recall: 0.785467
[TOP500] precision: 0.478, recall: 0.82699
[TOP550] precision: 0.467273, recall: 0.889273
[TOP600] precision: 0.441667, recall: 0.916955
[TOP650] precision: 0.427692, recall: 0.961938
[TOP700] precision: 0.411429, recall: 0.99654
[TOP750] precision: 0.385333, recall: 1
[TOP800] precision: 0.36125, recall: 1
AUC: 0.873171
Total time without I/O: 74.5116 seconds
```



What have I learned?

1. Research Methods: Read, watch, ask.
2. ML Fundamentals: Basics of models and anomaly detection algorithms.
3. How to improve a ML model.
4. Dataset handling and processing.
5. The importance of cybersecurity, AI, and machine learning.
6. My potential field of study.
7. And a lot more...



THANK YOU