Cyber Threat Intelligence Using Machine Learning

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INTRODUCTION

- Every type of cyberspace is exposed to some type of cyberattack.
- On the dark web hackers post data on their most recent attacks to share with the community.
- This research project focuses on how we can use machine learning to detect cyber threats from dark web forum posts.

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RESULTS

- The Support Vector Machine algorithm had the highest overall accuracy rate of 85.0%.
- The Artificial Neural Network had a weighted average of 66.4%.
- The Artificial Neural Network did not report an average MCC. To be discussed later in discussion section.

	Support Vector Machine (SVM)		Artificial Neural Network (ANN)	
Exploit Type	**Accuracy**	**MCC**	**Accuracy**	**MCC**
System	95.6 %	0.698	99.9%	0.69
Web	72.8%	0.774	0.00%	
Network	58.4%	0.633	0.00%	
Database	77.3%	0.832	0.00%	
Website	70.6%	0.737	0.023%	0.13
Mobile	60.0%	0.158	0.00%	
Weighted Average	85.0%	0.695	66.4%	

DISCUSSION

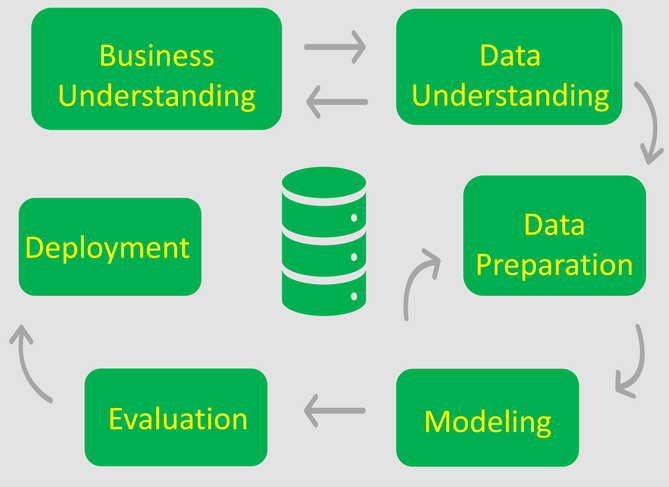
- The effectiveness of each machine learning was determined by the Average Accuracy Rate and Matthew Correlation Coefficient
- Therefore, we fail to reject the null hypothesis that the SVM models have high accuracy and reliability.
- The ANN did not report any significant percentages because it needs a lot of training data before it can make accurate models.
- Only the System type exploits reported a high accuracy because out of our 15,000+ data points 58% of them were system. This was enough for the ANN to work but the other exploits did not have enough to model.

MATERIALS

Most of our materials include bibliographic sources and archived projects which are listed in the bibliography section.

- mySQL: database management system
- Excel: clean and prepare data
- Tableau: data visualization tool
- WEKA: machine learning software to analyze data

METHODS



The infographic above shows the Cross Industry Process for Data Mining method (CRISP--DM). This is the basic methodology we followed while carrying out the research.

1. Obtained dataset of darknet forum post collected from University of Arizona
2. Filtered dataset removing duplicate instances and converted data into usable format for Tableau.
3. Uploaded data to Tableau software to visualize the data. (Not analysis yet)
4. Analyzed data using Artificial Neural Network (ANN) and Support Vector SVM machine learning algorithms from WEKA

DISCUSSION CONT.

- To transition to a proactive approach, machine learning might be the answer with its various algorithms and predictive capabilities
- Machine learning can quickly examine content posted on cyberspace and determine whether it is a threat or not

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