How to Use Machine Learning for a Phishing Incident Response

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WHOAMI

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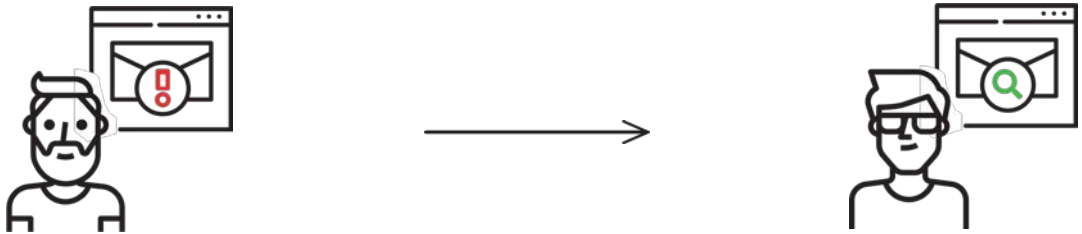
Agenda

- Introduction to phishing incidents and response processes at SOC teams
- Phishing problem definition
- Datasets used
- Process followed to build the model
- Model deployment
- Q&A

Phishing Incidents and Response Processes at SOC Teams



- What is a phishing alert?
  - User receives a suspicious email, so forwards it to phishing@organization.com
- What happens behind the scenes?
  - SOC (security operation center) analyst is assigned to investigate the suspicious email

Classic Phishing Handling Process

1

EXTRACT URLs/ HASH/DOMAINS FROM ATTACHMENTS, EMAIL BODY & HEADERS

2

ENRICH THOSE WITH THREAT INTEL SERVICES (VIRUSTOTAL)

3

SEND ATTACHMENT TO SANDBOX

4

LOOK AT THE EMAIL BODY CONTENT AND HEADER

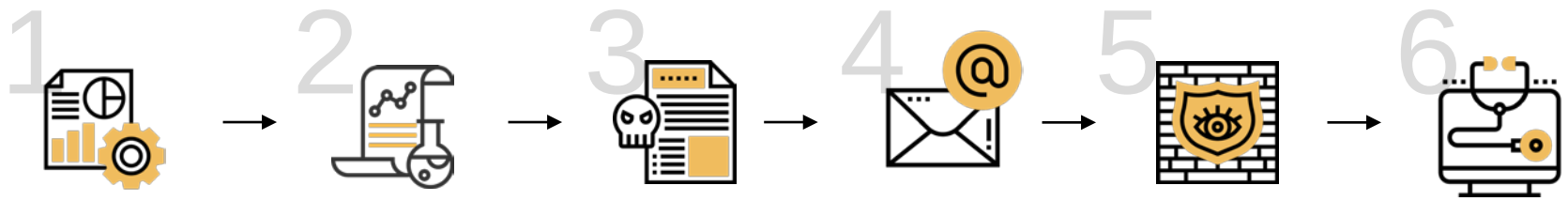
5

DECIDE IS IT: MALICIOUS/SPAM/ SCAM/ VALID

6

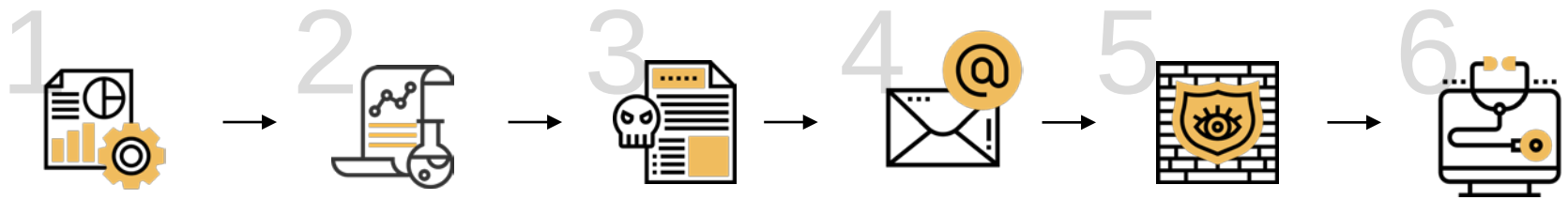
RESPOND TO USER

Classic Phishing Handling Process



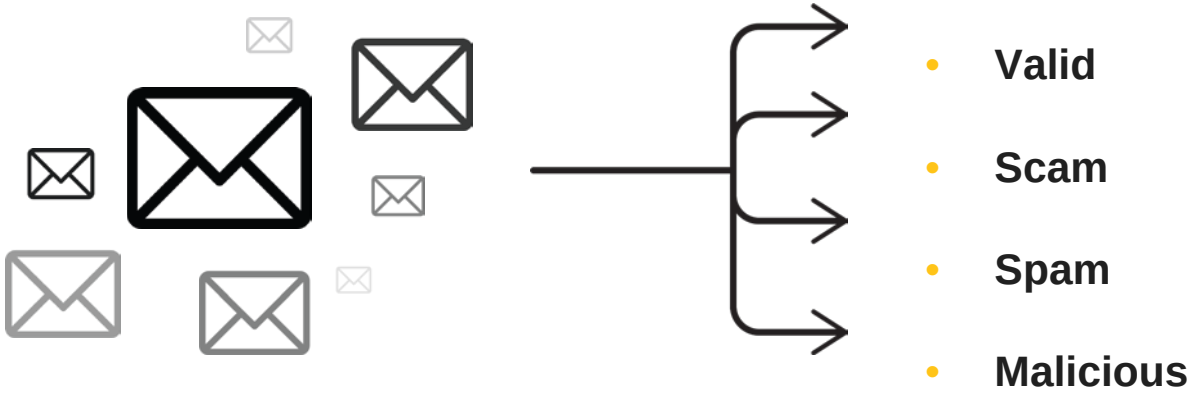
SOC teams waste a
significant amount of time
investigating these emails

Goals Definition



- Decrease the amount of time to make a decision
- Help the analyst make a better decision

Datasets

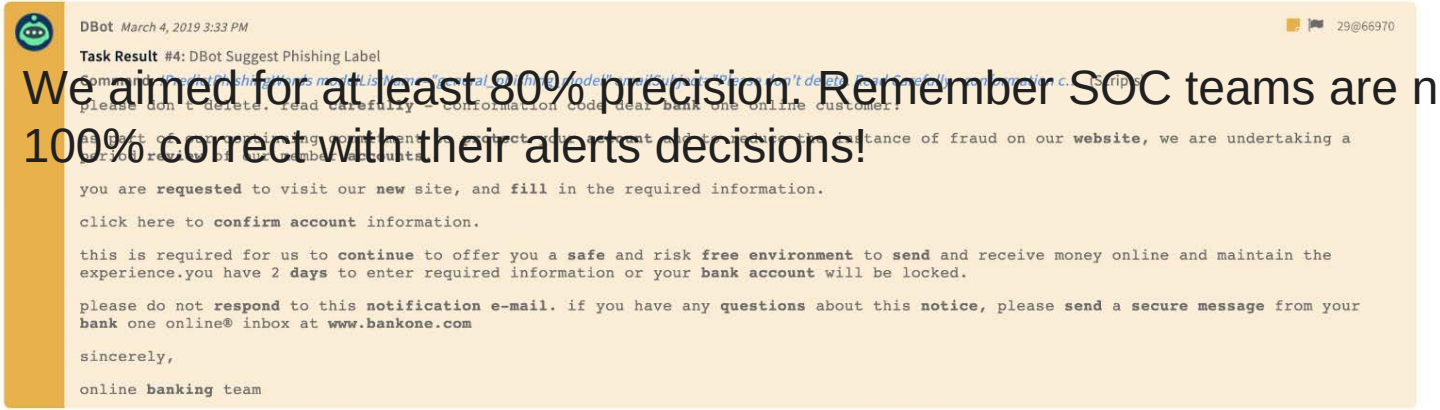


- **Valid**
- **Scam**
- **Spam**
- **Malicious**

- We collected **~100K labeled emails** from 10 different customers
- All the emails are suspicious emails, other than the most email gateway datasets

Process Followed to Build the Model

- Research: email headers, IOCs, email body
- Text classification model: FastText (word embedding & NN)
- Explainability - highlighting important words, using Lime
  https://github.com/marcotcr/lime



- We aimed for at least 80% precision. Remember SOC teams are not 100% correct with their alerts decisions!

Example: Customer A

- Categories: Malicious, Other
- Precision & Recall: ~95% for each class

		Predicted		
		Malicious	Other	All
True	Malicious	**722**	**45**	**767**
	Other	**18**	**317**	**335**
	All	**740**	**362**	**1102**

~95%

~95%

Example: Customer B

- Categories: Malicious, Valid, Spam

Precision is high, but the coverage is very low
Model confidence is low for malicious emails

Predicted True	Valid	Malicious	Spam	All
Valid	60%	0	9	83
Malicious	2	24	14	40
Spam	6	3	291	300
All	82	27	314	423

Probability > 0.85

Predicted True	Valid	Malicious	Spam	All
Valid	48	0	75%	50
Malicious	0	6	3	9
Spam	2	1	25%	259
All	50	7	261	318

Combine Internal Datasets

- Text normalization using SpaCy
  - Word lemmatization
  - Replace email addresses a const string
  - Replace URLs with a const string

- Fine tuning of a pre-trained model (based on internal datasets) using the customer data

Example: Customer B

Original confusion matrix

Predicted True	Valid	Malicious	Spam	All
Valid	**74**	**0**	**9**	**83**
Malicious	**2**	**24**	**14**	**40**
Spam	**6**	**3**	**291**	**300**
All	**82**	**27**	**314**	**423**

Combine other customer data
Probability > 0.85

Predicted True	Valid	Malicious	Spam	All	Coverage
Valid	**48**	**5**	**1**	**54**	~88%
Malicious	**1**	**25**	**2**	**30**	~83%
Spam	**1**	**5**	**221**		~97%
All	**50**	**30**	**218**	**303**	
Precision	~96%	~83%	~98%		

25%

25%

Model Deployment

- We support 2 ways of using our phishing models:

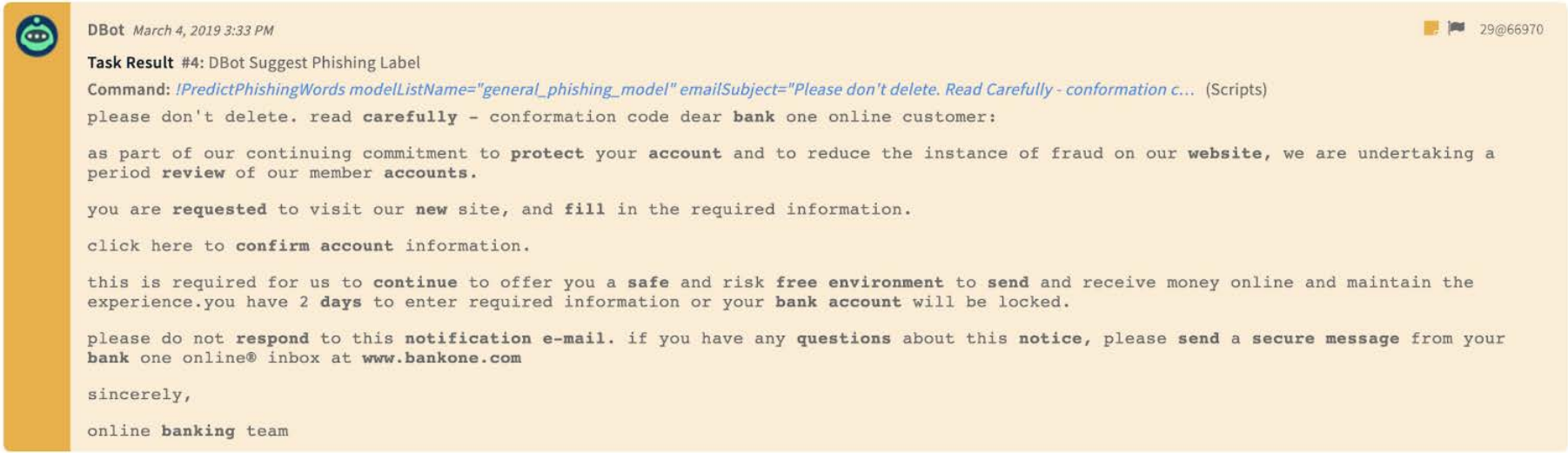
  a. Building a dedicated model based on a specific customer env within Demisto on a permanent env
     - Supervised
     - Semi-Supervised

  a. Upon request, Demisto DS builds a model and deploys it within Demisto

Using a Model in Demisto

- Use as part of scoring/severity set
- Close incidents automatically with probability > THRESHOLD
- Handle incidents that were not handled in the past due to low capacity

Using a Model in Demisto



DBot *March 4, 2019 3:33 PM* 29@66970

Task Result #4: DBot Suggest Phishing Label

Command: *!PredictPhishingWords modelListName="general_phishing_model" emailSubject="Please don't delete. Read Carefully - conformation c…* (Scripts)

please don't delete. read **carefully** - conformation code dear **bank** one online customer:

as part of our continuing commitment to **protect** your **account** and to reduce the instance of fraud on our **website**, we are undertaking a period **review** of our member **accounts**.

you are **requested** to visit our **new** site, and **fill** in the required information.

click here to **confirm account** information.

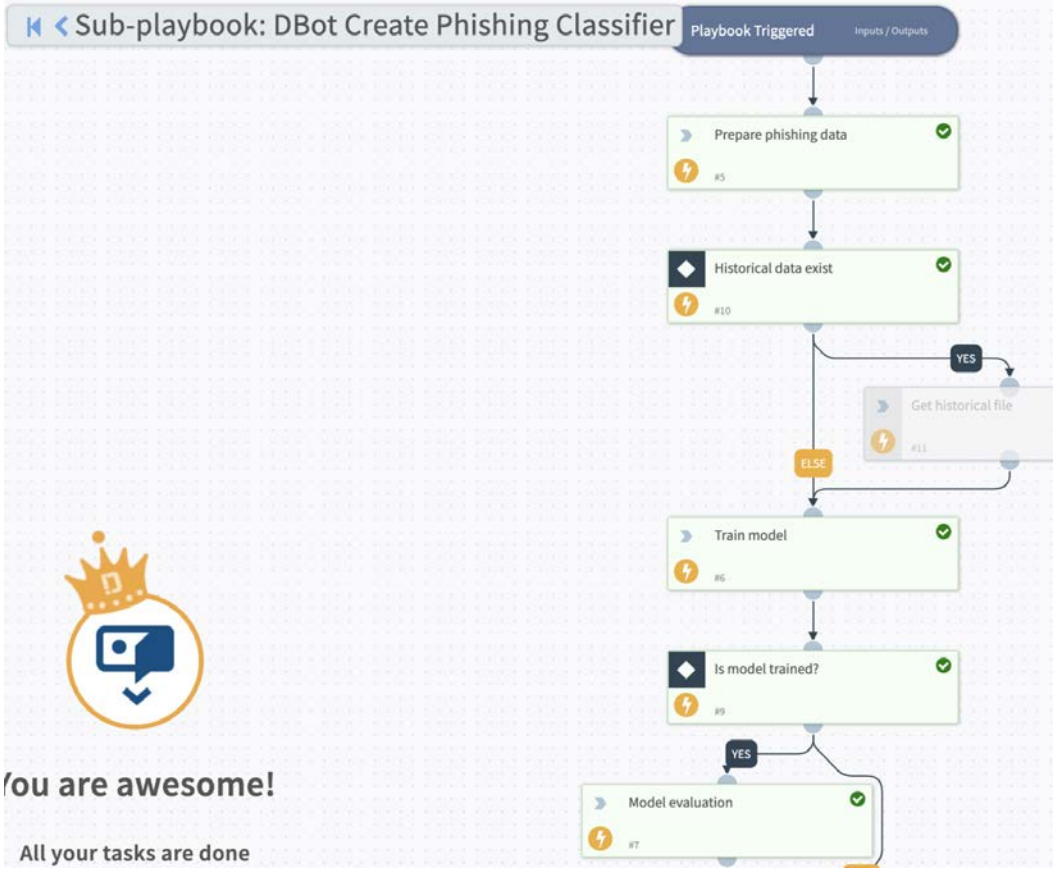
this is required for us to **continue** to offer you a **safe** and risk **free environment** to **send** and receive money online and maintain the experience.you have 2 **days** to enter required information or your **bank account** will be locked.

please do not **respond** to this **notification e-mail**. if you have any **questions** about this **notice**, please **send** a **secure message** from your **bank** one online® inbox at **www.bankone.com**

sincerely,

online **banking** team

Building a Model in Demisto Platform



Q&A

THANK YOU

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