Presentation by

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Cybercrime and insider threat: Can AI save us from these adversaries?

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UWE Bristol | University of the West of England

Cybercrime: Current Landscape

- *"global cybercrime damages predicted to cost $6 trillion annually by 2021"*
- *…bitcoin mining. … 8,500 percent increase in the detection of coinminers. …many cybercriminals are more than happy to just use a victim's computer power and resources to mine cryptocurrencies instead of stealing any personal data or money."*
- *"ransomware has taken center stage, stealing the limelight from most other forms of malware."*

https://www.comparitech.com/vpn/cybersecurity-cyber-crime-statistics-facts-trends/

Cybercrime: Current Landscape

- *Globally, cybercrime was the 2nd most reported crime in 2016. (Source: PWC), and more than 50% of all crimes in the UK. (Source: National Crime Agency).*
- *An attacker resides within a network for an average 146 days before detection. (Source: Microsoft)*
- *Most network intrusions—63 percent—are the result of compromised user passwords and usernames. (Source: Microsoft)*
- *At 91.6 percent, "Theft of Data" continues to be the chief cause of data breaches in 2016 counting total by identities stolen. "Phishing, Spoofing, and Social Engineering" were a distant second at 6.4 percent. (Source:Symantec)*

https://www.comparitech.com/vpn/cybersecurity-cyber-crime-statistics-facts-trends/

Insider Threat: Current Landscape

- 90% of organizations feel vulnerable to insider attacks.
  - The main enabling risk factors include too many users with excessive access privileges (37%), an increasing number of devices with access to sensitive data (36%), and the increasing complexity of information technology (35%).
- 53% confirmed insider attacks against their organization in the previous 12 months (typically less than five attacks).
- 27% of organizations say insider attacks have become more frequent.
- Data Loss Prevention (DLP), encryption, and identity and access management solutions. To better detect active insider threats, companies deploy Intrusion Detection and Prevention (IDS), log management and SIEM platforms.

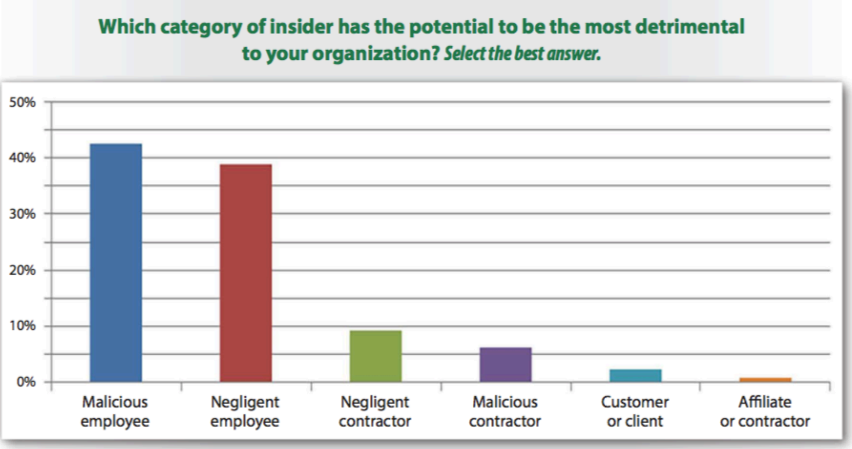
https://www.ca.com/content/dam/ca/us/files/ebook/insider-threat-report.pdf

Insider Threat: Current Landscape

- Almost **58%** of organizations that had security incidents over 2017 blamed them on insiders.
- **45%** respondents, whether or not they experienced a security incident, still see their own employees as the biggest threat to security.
- The majority of respondents have only partial visibility into what is happening in the cloud, and only **28%** of organizations have visibility into IT staff activity.

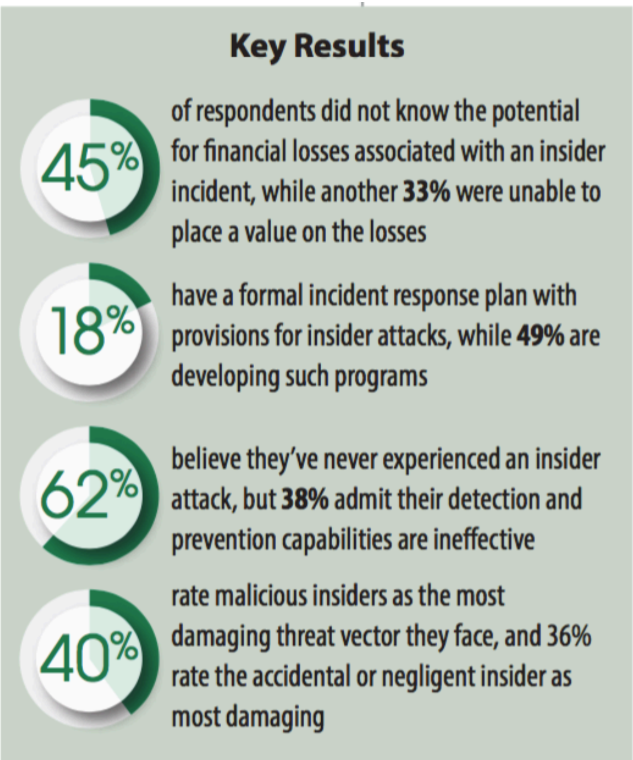
https://itsecuritycentral.teramind.co/2018/04/03/insider-threat-research-reports-and-sur
top-facts/

Defending Against the Wrong Enemy: 2017 SANS Insider Threat Survey



Which category of insider has the potential to be the most detrimental to your organization? *Select the best answer.*

Figure 11. Malicious and Negligent Employees Potentially Damaging



Key Results

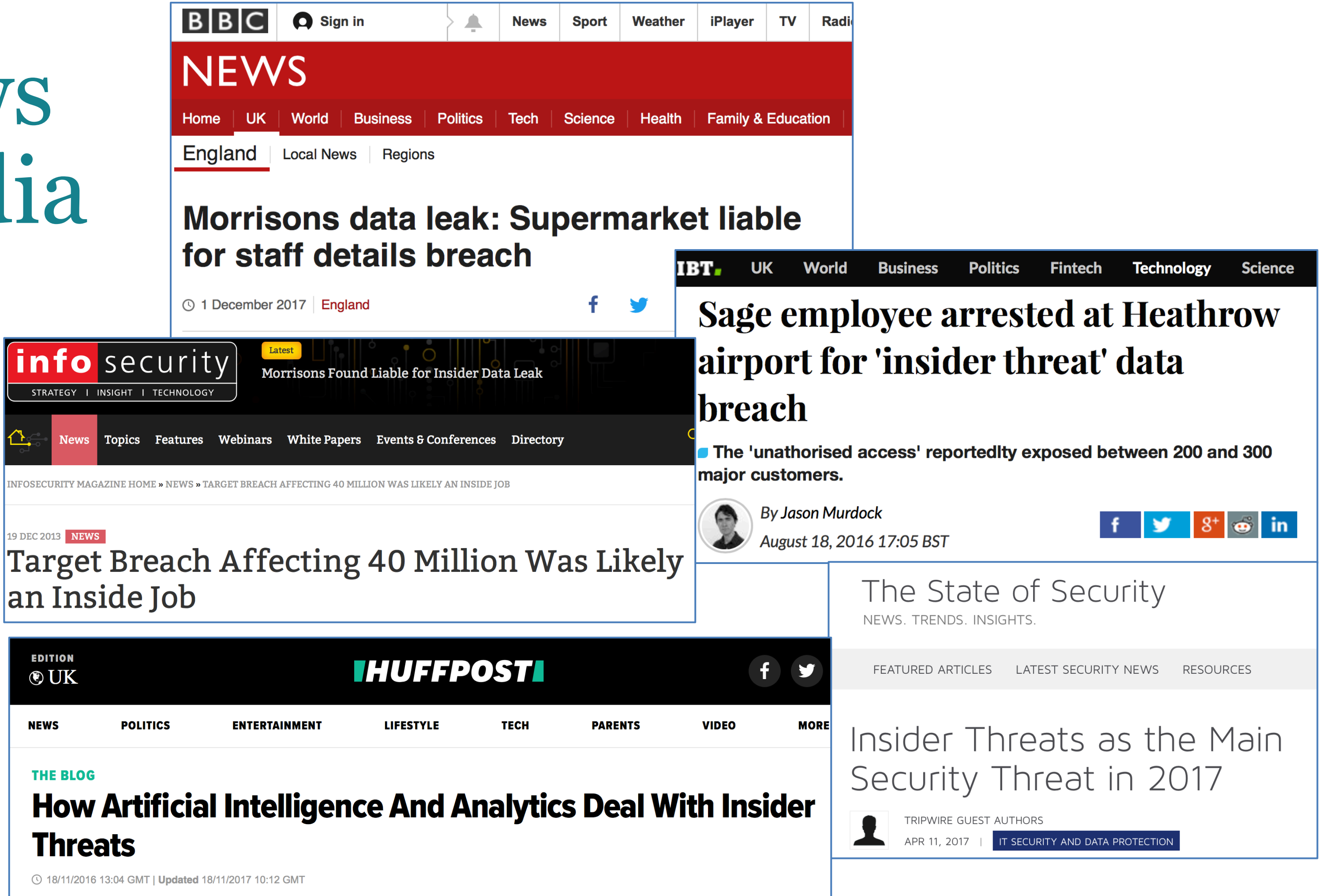
45% of respondents did not know the potential for financial losses associated with an insider incident, while another **33%** were unable to place a value on the losses

18% have a formal incident response plan with provisions for insider attacks, while **49%** are developing such programs

62% believe they've never experienced an insider attack, but **38%** admit their detection and prevention capabilities are ineffective

40% rate malicious insiders as the most damaging threat vector they face, and 36% rate the accidental or negligent insider as most damaging

News Media



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1 December 2017 | England

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Sage employee arrested at Heathrow airport for 'insider threat' data breach

The 'unathorised access' reportedlty exposed between 200 and 300 major customers.

By Jason Murdock
August 18, 2016 17:05 BST

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THE BLOG

How Artificial Intelligence And Analytics Deal With Insider Threats

18/11/2016 13:04 GMT | Updated 18/11/2017 10:12 GMT

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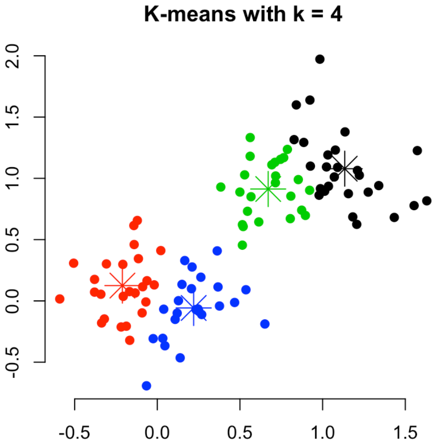
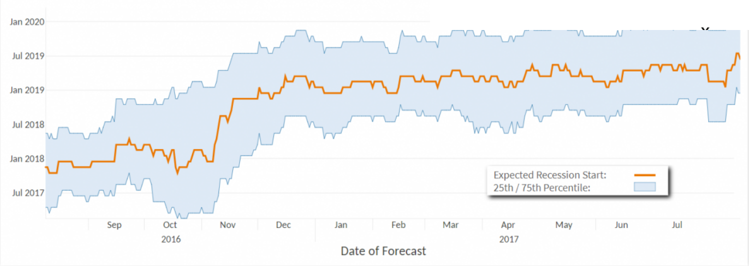
Artificial Intelligence

- AI works well for
  - classifying (cats v dogs)
  - clustering (similar users),
  - recognising patterns (time-series change)



- Works best when success can be quantified and when historical data is available



Behavioral Analytics

- AI has the potential to learn about ‘normal’ behaviour of users
  - If we can determine normal behaviour, can we then determine abnormal behaviour?

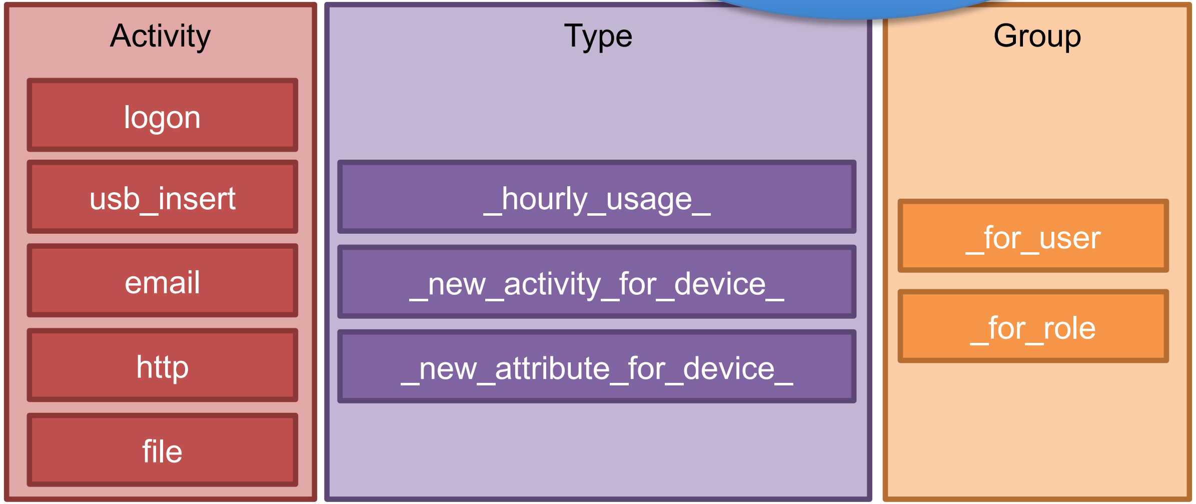
- How does an AI system achieve this?
  - Features! Typically numerical values that characterise behaviour of a user or a machine
    - Machine: CPU usage, #network connections, #processes executed
    - User: login time, #files accessed, #emails sent, #web pages browsed
      - Can assess #new events (so we know what is typical for a user)

How may we attempt to detect insider threat?

- What data can we gather about users?
  - Log-on, E-mail, USB, File access, Web access?
  - Job role (any other HR related data)?

- What kind of 'features' can we calculate based on users?

This describes 30 numerical 'features' for each user per day to characterize the user behaviour

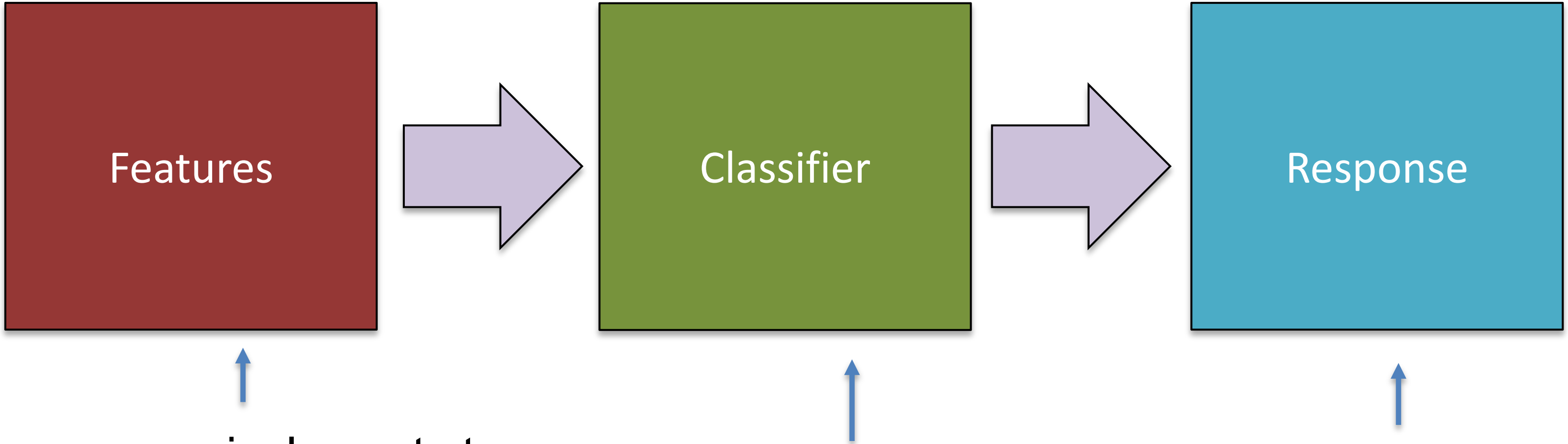


Activity
- logon
- usb_insert
- email
- http
- file

Type
- _hourly_usage_
- _new_activity_for_device_
- _new_attribute_for_device_

Group
- _for_user
- _for_role

AI to the rescue?



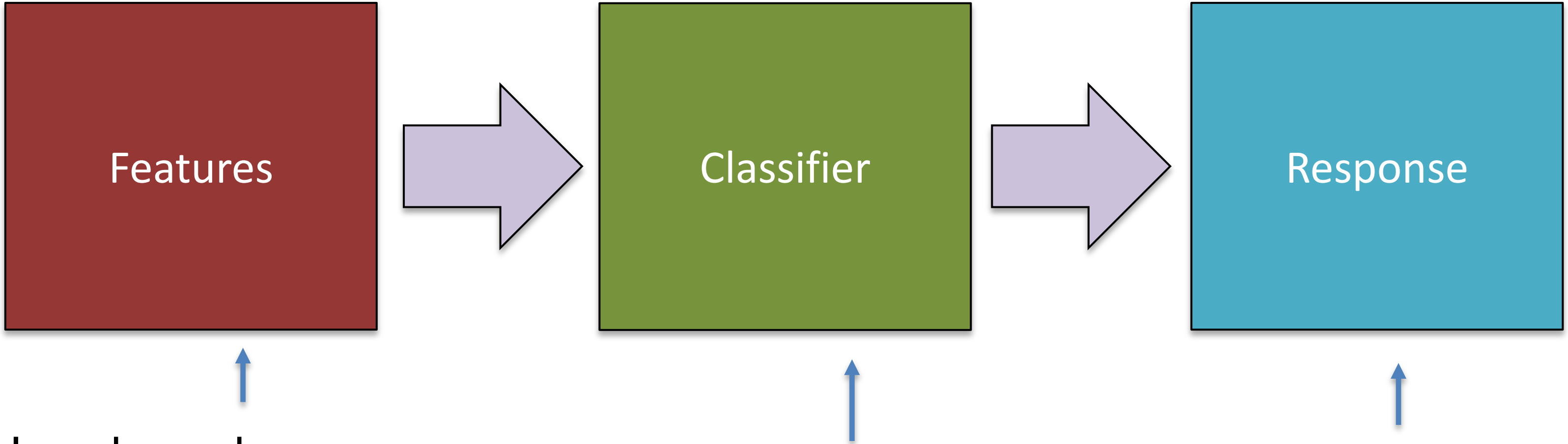
e.g., numerical counts to characterise activity

e.g., neural network, SVM,

e.g., threat / non-threat

e.g., some score of ‘normal’

AI to the rescue?



Features

Classifier

Response

How do we know we have suitable features?

How do we know this is learning well?

What does it really mean to be abnormal? Does abnormal mean malicious?

Takeaway

- Cybercrime and insider threat are dynamic challenges and constantly evolving!

- AI works well for classifying (cats v dogs), clustering (similar users), recognising patterns (time-series change) – works best when success can be quantified and when historical data is available

- Data 'features' are the biggest challenge – images rely on pixels to show the full picture, however other domains can be more challenging
    - Only have a partial view on employee activity – so we need to account for uncertainty. How do you measure more abstract features such as 'employee disgruntlement', or 'personal hardship'?

- Attackers will **always** aim to circumvent the 'features' of your detection tool over time – so the distribution of the trained model may be unreliable for predicting or detecting future events.

- AI Assistant / active learning / human-in-the-loop – use statistics and models to filter and analyse the available data, identify outlier cases. Time-series analysis and cluster analysis to identify behavioural changes. Interactive AI is required for complex decision-making tasks.

Thank you

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http://www.plegg.me.uk

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