How Neural Networks Are Reshaping Cybersecurity

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AvenueE
Roadmap to Your Career in Engineering & Computer Science

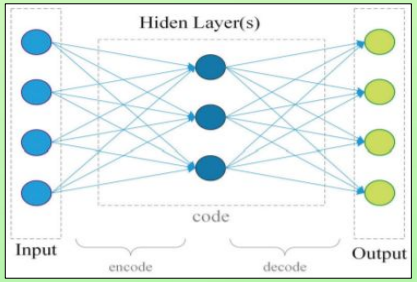
Are We Safe in a Digital Age?

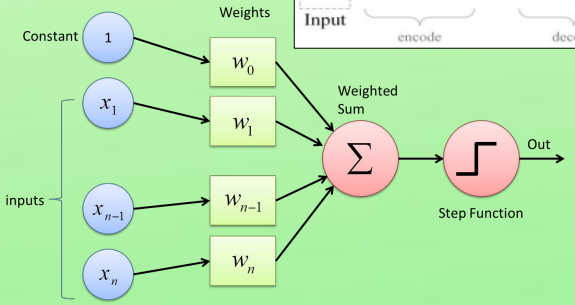
As technology and the internet grow at a rapid pace our lives are moving online, surrounding us with cyber threats and attacks every day.

- Apps track personal data
- Bank information and passwords stored on digital devices
- Life-changing decisions made based on data which can be compromised

What are Neural Networks?

- Multi-layer networks that utilize labeled data sets to mimic how the human brain learns
- Work through formulas containing “weights” and “biases” on hidden layers between input and output





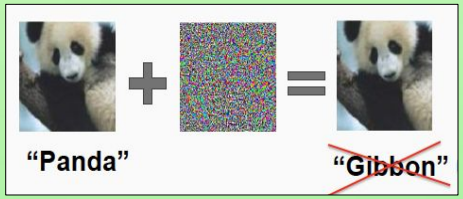
- Ex: Facial/voice recognition, social media algorithms, virtual assistants, predictive search
- Different kinds of neural networks
  - Feedword Neural Networks
  - Convolutional Neural Networks
  - Recurrent Neural Networks

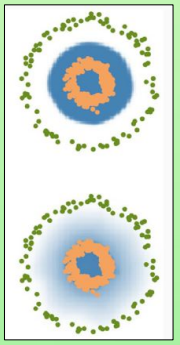
Neural Networks in Cybersecurity

- With the rise of technologies such as AI come new security threats that can only be addressed with modern solutions.
  - Viruses hidden in code of AI applications
  - Adaptable, intelligent malicious attacks
- Neural networks (NN) provide enhanced approaches for detecting attacks without the need for human supervision.
  - Reduced false positives in Intrusion Detection and Prevention Systems (IDS/IPS)
  - Improved and more efficient malware analysis, preventing network attacks
  - Natural Language Processing (NLP) detects social engineering hacks, ex: spam emails

NN Vulnerabilities and Solutions

- Adversarial Attacks — exploit AI and force them to miscategorize





  - Smooth decision boundaries make it difficult to confuse the neural network
  - A Generative Adversarial Network (GAN) consists of 2 NN working together to produce false data to train against
- Data Poisoning — injecting inaccurate data into a NN, causing it to function incorrectly.
- Deep Learning-Based Malware — malware hidden in AI-based applications can take advantage of the advanced capabilities and target victims selectively

Main Takeaway

- AI has made daily life more convenient through utilizing an individual’s data for a personalized experience
- As AI moves into prominence in fields such as criminal justice and HR, the data it trains on is increasingly valuable
- Vulnerabilities in AI can have far-reaching consequences and must be addressed

AI in Cybersecurity Going Forward

- GAN and smoothing detection boundaries to protect against Adversarial Attacks
- Higher data integrity to combat Data Poisoning
- Optimization of Neural Networks

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