



# Machine Learning: It changes *everything...*

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CTO, Scalar Decisions



Creating unparalleled client  
experiences through technology  
transformation.

# Established in 2004



**900**

Clients



**9**

Locations



**425M**

Revenue





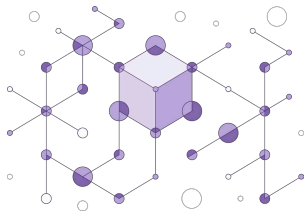
Scalar Recognized

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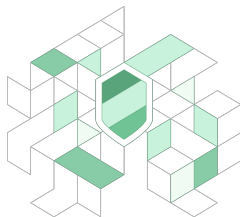


# Scalar Client Solutions



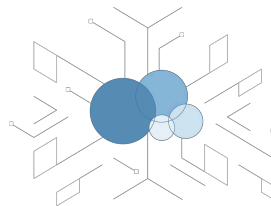
## Infrastructure

Integration of  
Emerging  
Technologies



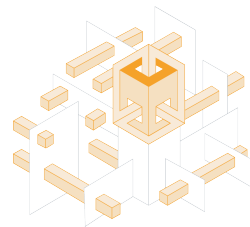
## Security

Context-Based  
Enterprise Security  
& Risk  
Management



## Cloud

Hybrid Cloud  
Solutions



## Digital Transformation

Enabling new  
Business Models via  
enterprise platforms





Lets start at the beginning...

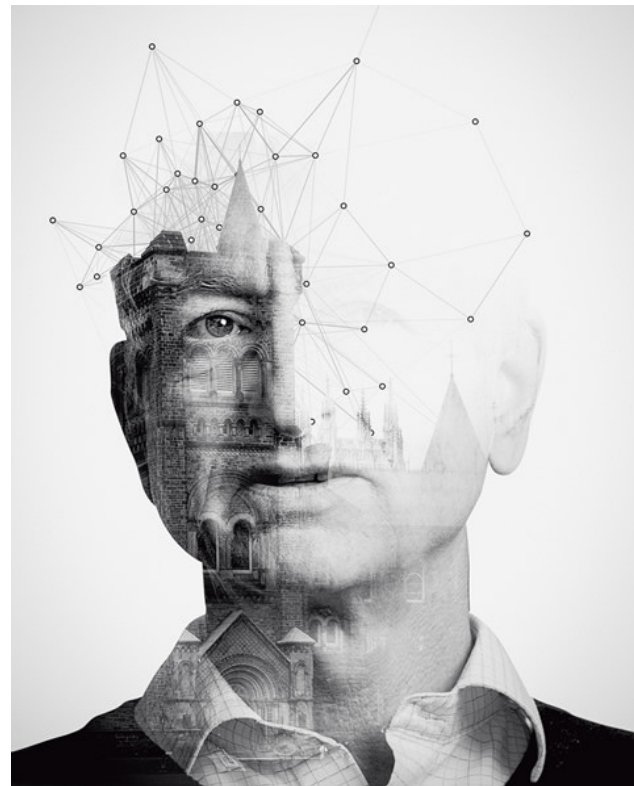
# What is Machine Learning

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*“Machine learning is a method of data analysis that automates analytical model building. Using algorithms that iteratively learn from data, machine learning allows computers to find hidden insights without being explicitly programmed where to look.”*

# Why Now?

- It isn't new... postulated and theorized since the 1950's...
- Largely abandoned in research circles for a period of time, but Canada continued funding with CIFAR...
- Leading to breakthroughs in the 2000's due to available computational power and new approaches to the mathematics.
- Prof. Geoff Hinton, of Google/UofT is considered the “Godfather” of modern machine learning →
- Due to gov'n't funding Canada is a hotbed of Machine Learning...

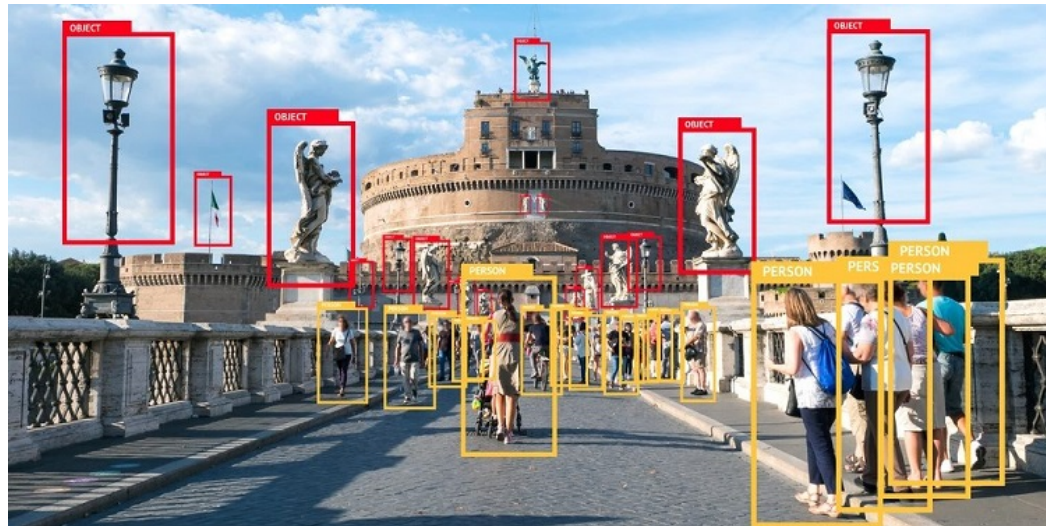


Source: University of Toronto

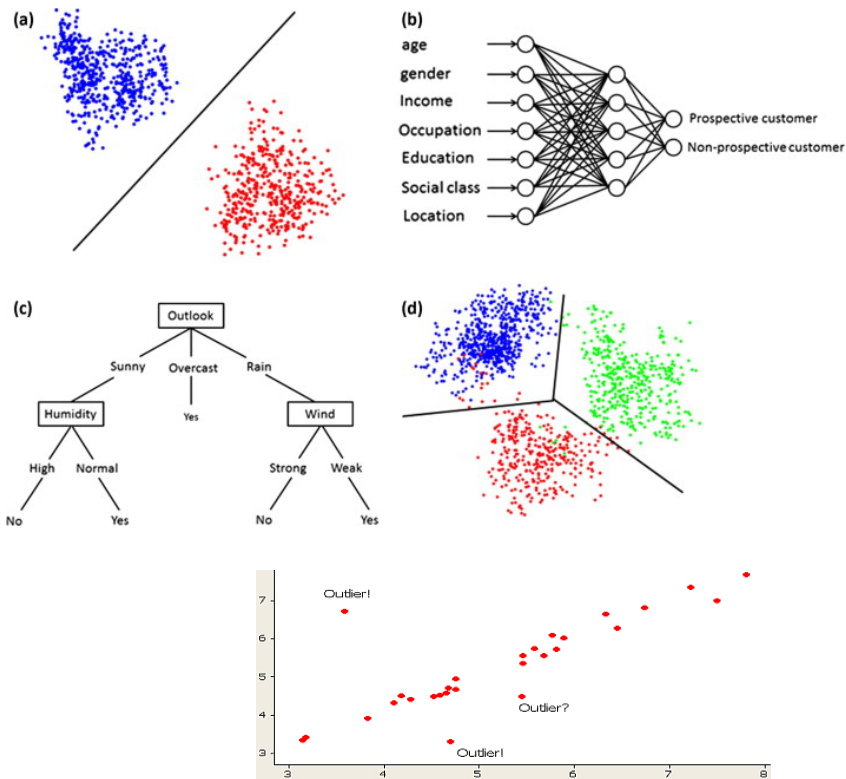


# What can you do with it?

Machines can now find and classify things very effectively, then take actions based on classification.



Source: Intel Corp.



# How does it work...

- Most ML operates using a variety of approaches to creating neural networks, doing successive computations. Effectively all a pile of probability calculations.
- Inputs are operated on by successive layers, forwarding new weights to subsequent layers and outputting a set of probabilities.
- Key terms... Tensors, Deep Neural Networks...

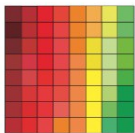
tensor = multidimensional array

vector



$$\mathbf{v} \in \mathbb{R}^{64}$$

matrix



$$\mathbf{X} \in \mathbb{R}^{8 \times 8}$$

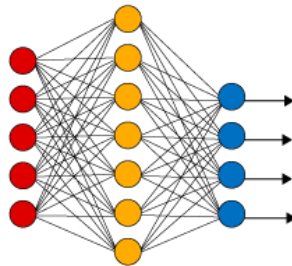
tensor



$$\mathbf{X} \in \mathbb{R}^{4 \times 4 \times 4}$$

Source: becominghuman

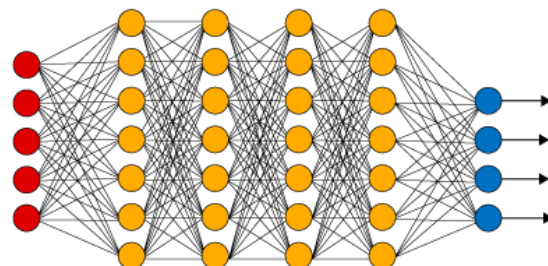
Simple Neural Network



● Input Layer

Source: becominghuman

Deep Learning Neural Network



● Hidden Layer

● Output Layer

# Training machines...

- **Supervised (ex. Images/objects)**

- Trained using labeled examples
- Desired output is known
- Methods include classification, regression, etc.
- Uses patterns to predict the values of the label on additional unlabeled data

- **Unsupervised (ex. Security/Behaviour)**

- Used against data that has no historical labels
- The system is not told the "right answer"
- Goal is to explore the data and find some structure within the data
- Clustering

- **Reinforcement (ex. Games)**

- Algorithm discovers through trial and error which actions yield the greatest rewards.
- Three primary components:
  - the agent (the learner or decision maker),
  - the environment (everything the agent interacts with)
  - actions (what the agent can do).
- Objective: the agent chooses actions that maximize the expected reward over a given amount of time.



# Implications

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Many areas of “managed” decision making can now be “outsourced” to machines.

- Network Traffic Security
- Natural Language Processing
- Behavior Analysis (one person is unpredictable, but as a group we are (un)fortunately herd like)
- Sentiment Analysis & Actions
- Robotic Process Automation
- Indicators of Breach / Breach Detection



# Our Challenge...



Source: IBM



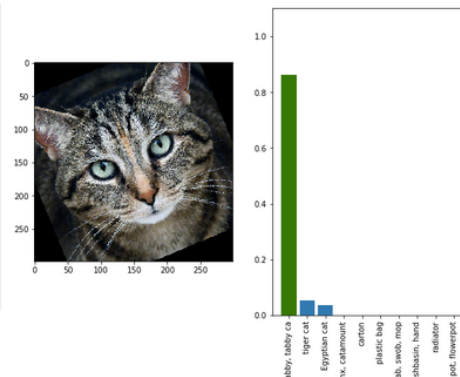
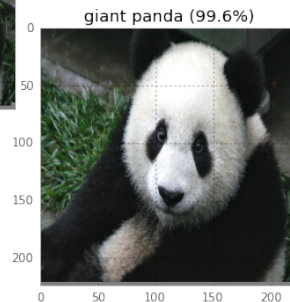
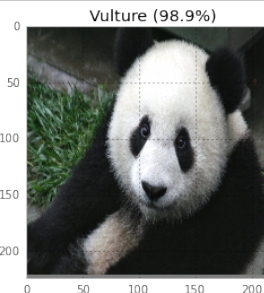
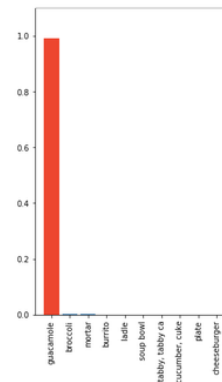
Source: Gizmodo



Source: Waymo



Source: Labsix





Whew... let's do something practical?

# Option 1: Build it Ourselves

- Machine learning has never been more accessible. (I know, a cliché)
- Broad open-source frameworks (Tensorflow, Pytorch, Caffe, Theano...)
- Freely available tooling (NVIDIA CUDA)
- Simple access:
  - Major cloud providers (AWS, Google, Azure)
  - Consumer hardware (stop with the bitcoin, do something useful!)
  - Specialized hardware...



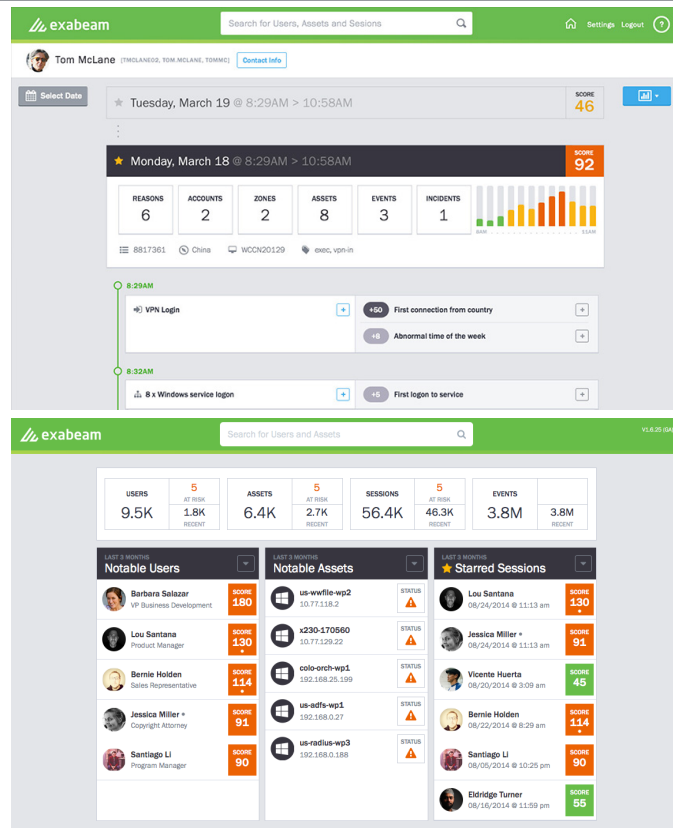


Option 2: Let other's do it for you...



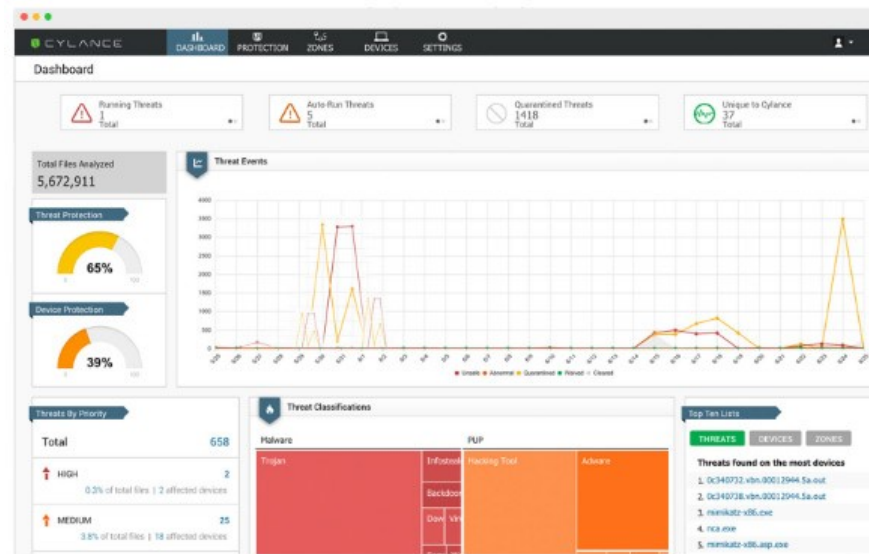
# User & Entity Behaviour and Analytics

- Defining normal in a chaotic world
- Approach
  - Unsupervised machine learning for
    - User & Entity Classification (because LDAP ain't gonna cut it)
    - Defining normal
    - Detecting patterns
  - Raises profile for human intervention, cuts through the noise of normal event management

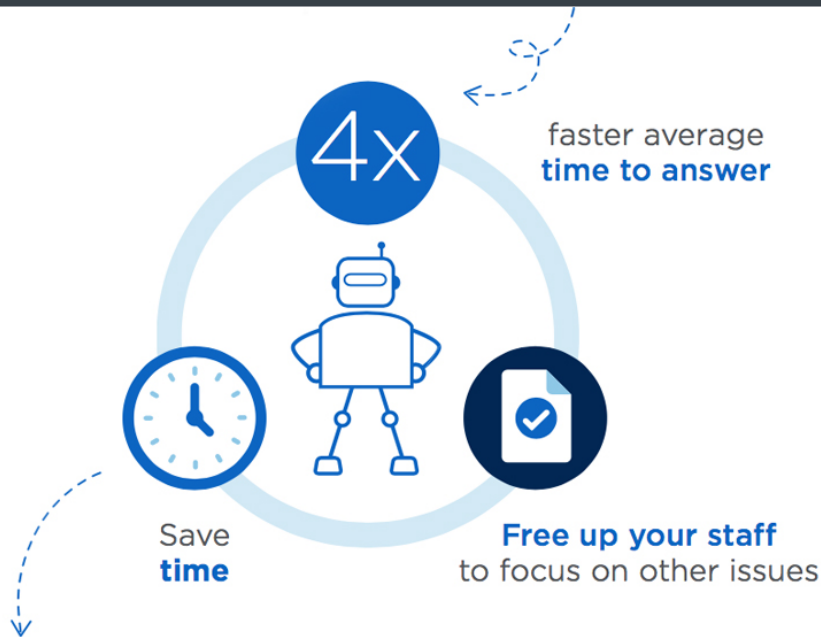


# Endpoint Protection

- Because malware isn't dumb... it likes to hide
- Like the cat/guacamole earlier, malware has changed to be able to avoid “signature” based detection
- Much more difficult problem to avoid a dynamic learning algorithm, and thus machine learning based endpoint can be more effective in more circumstances
- Vendors have to carefully balance calculations vs. impact



# Administrative Efficiency



- Application of natural language processing, no more “how do I make the right google search for this”
- Increasing use of natural language lookups, chatbots and other technology to drive service efficiency
- Future of “helpdesk” might be “self-helpdesk”





Thank You