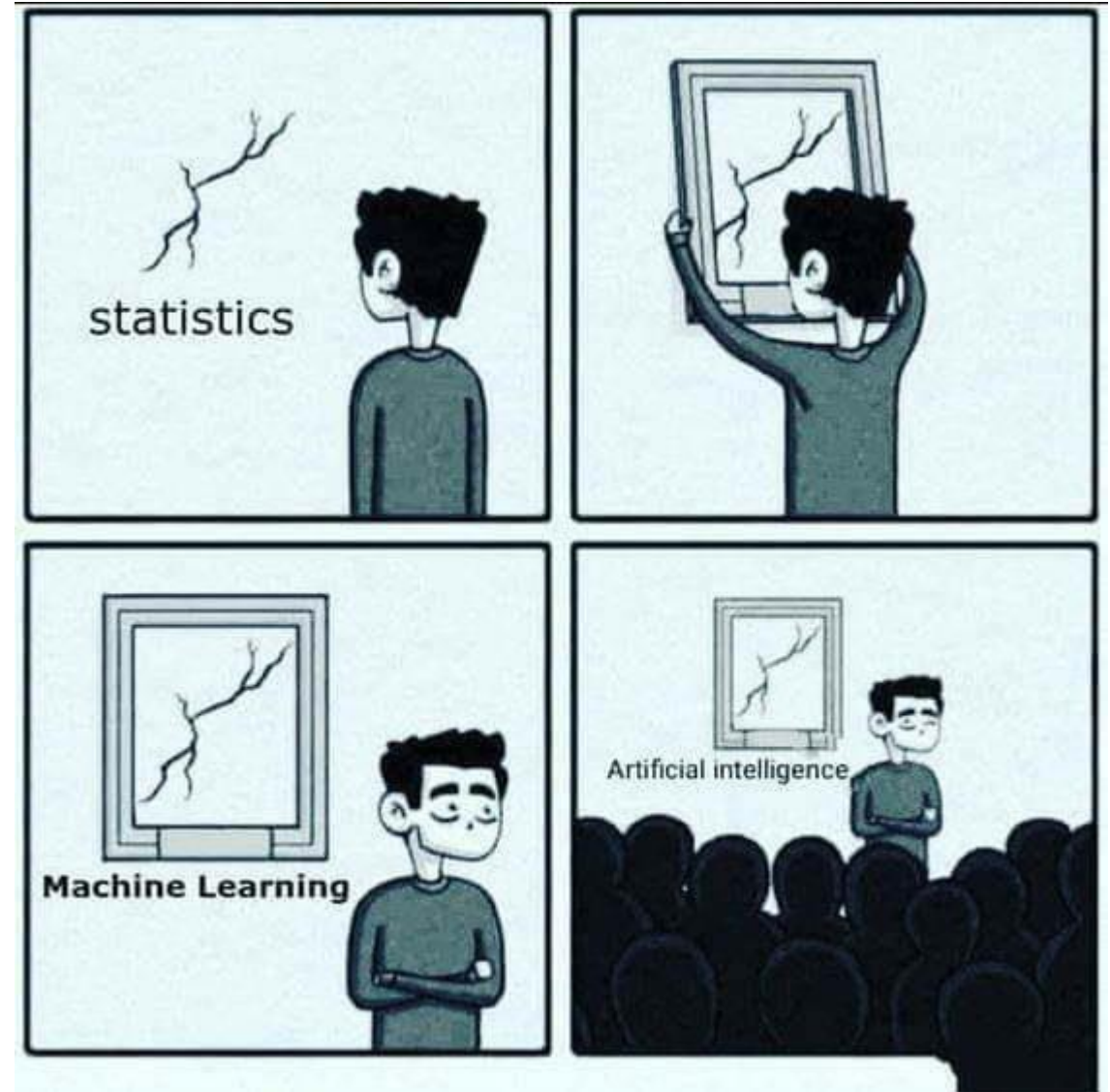


# Operational Intelligence

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AI AND MACHINE LEARNING IN IT OPERATIONS

A solid blue horizontal bar spanning the width of the slide at the bottom.



# Outline

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What is machine learning?

Applying ML to IT Ops (AIOps)

Use cases

Getting started

# About me

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Mark Kalal

Software development / technology solutions

[mdkalal@gmail.com](mailto:mdkalal@gmail.com)

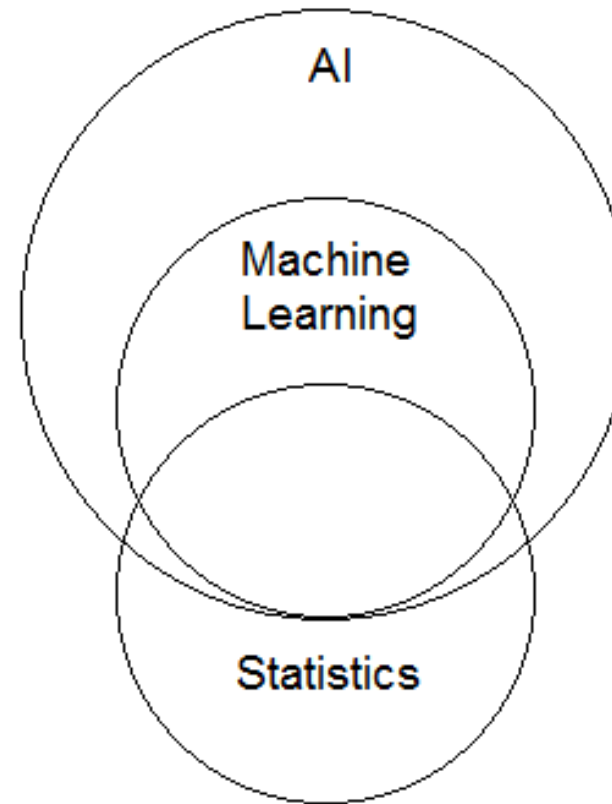
@MarkKalal

# What is Machine Learning

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Statistics?

Artificial Intelligence?



Learns by experience



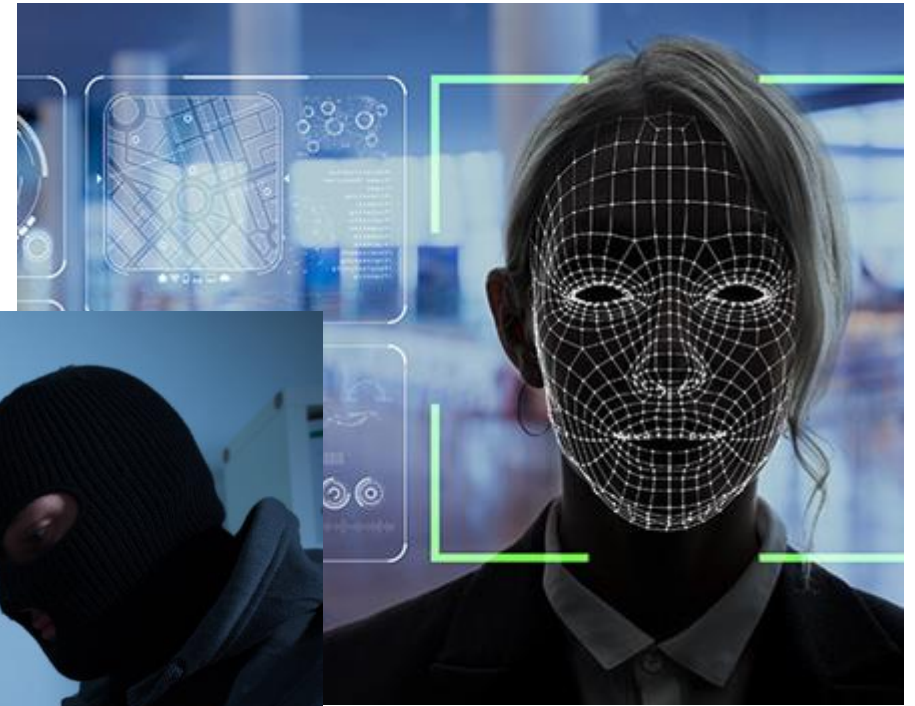
Gets specific instructions



Learns by ~~experience~~ data



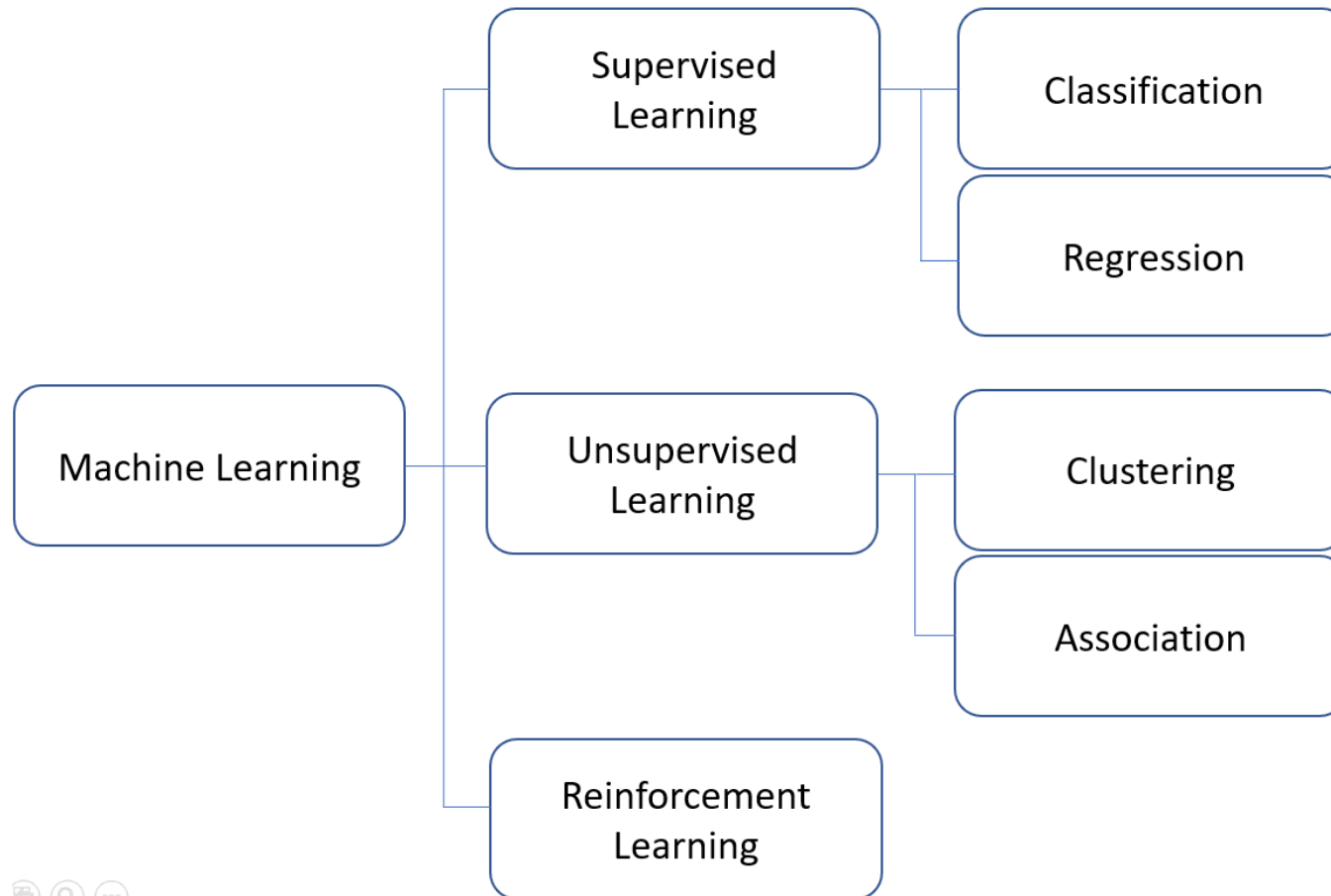
Application of artificial intelligence (AI) that provides systems the ability to learn and improve from “experience” (data) without being explicitly programmed





# Learning types

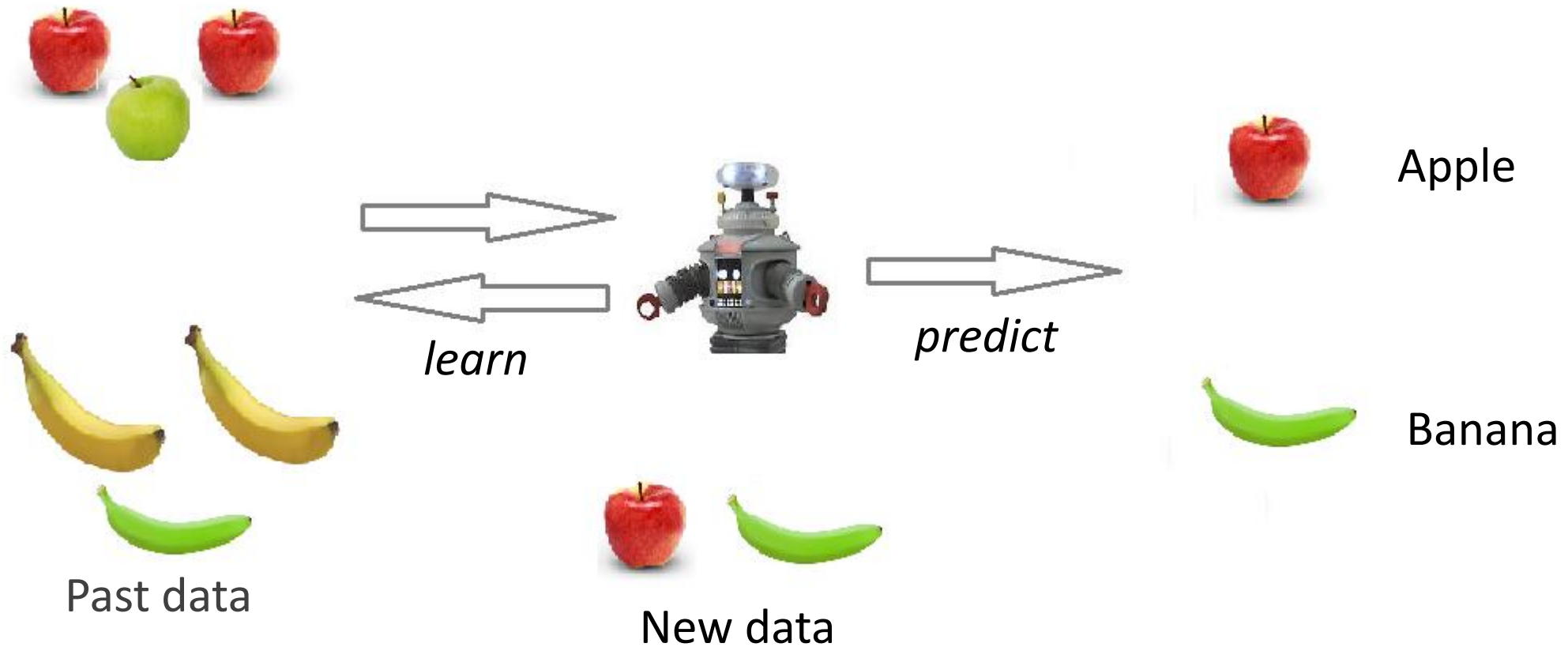
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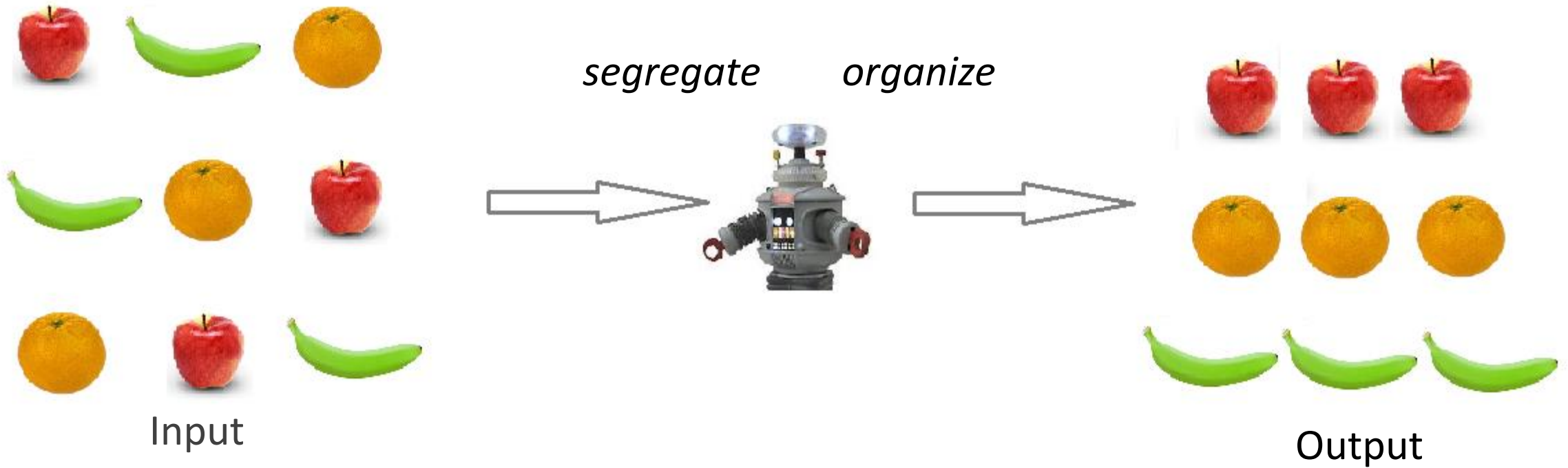
# Supervised Learning – make predictions

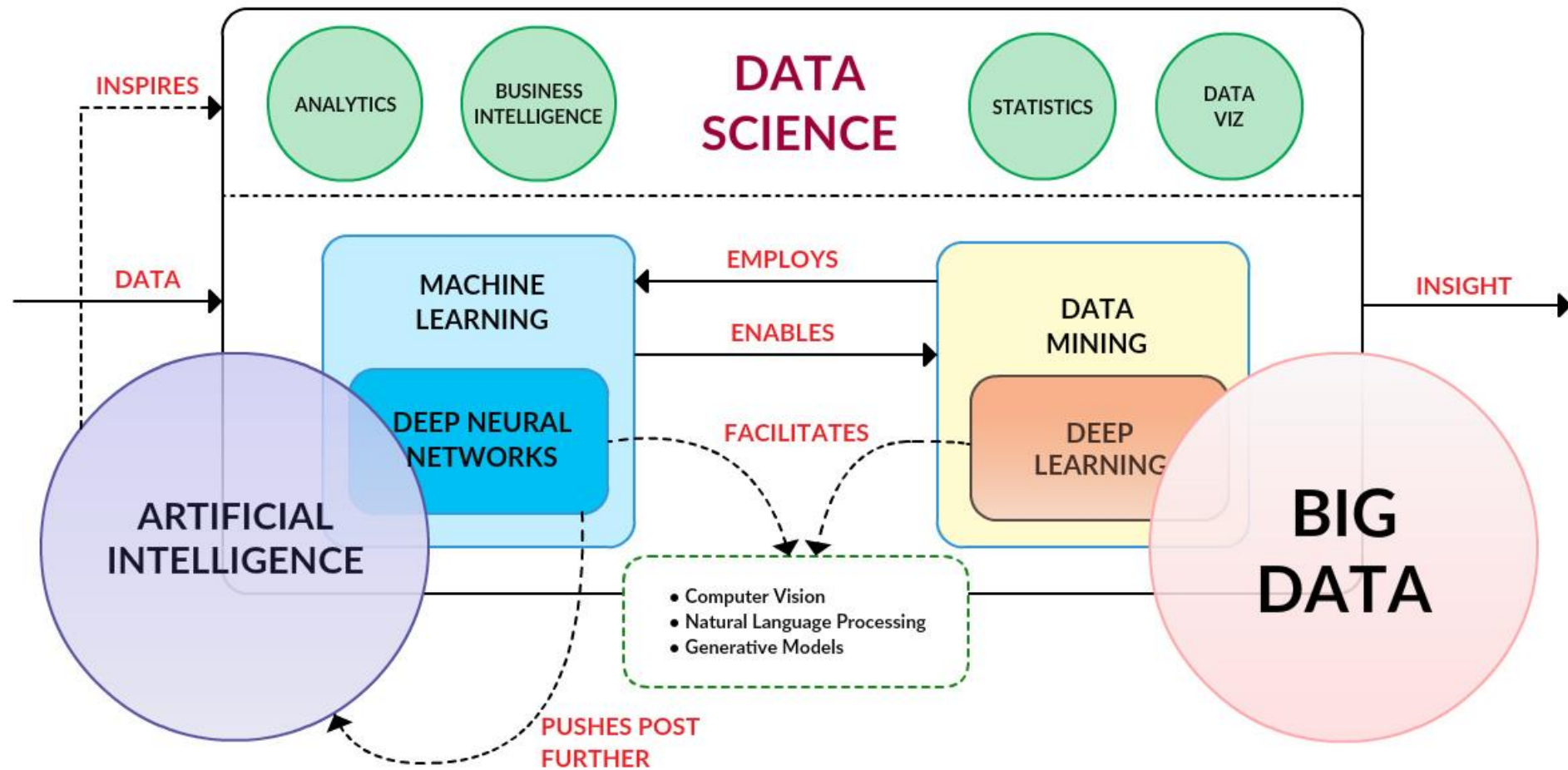
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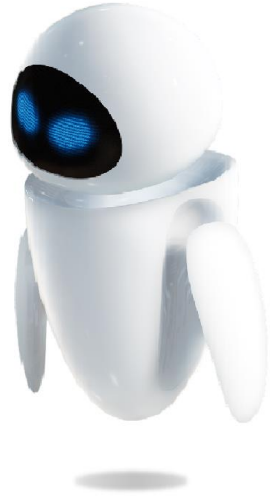


# Unsupervised Learning – finding hidden patterns

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My computer suddenly started  
singing "Hello from the other side"!

Of course it did, after all ...



*It's A Dell!*

# Applying ML

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Addressing pain points

New capabilities

# Challenges for IT Operations

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Support innovation and digital transformation – while maintaining legacy and traditional systems

Difficulty getting actionable insights out of monitoring tools

“Noisy” and incomplete data

Difficulty performing root cause analysis

High volume of persistent and recurring issues

High ticket volumes (especially for low-level issues)

Pressure from the business to do more without increasing staff

Difficulty addressing issues proactively

Productivity loss and decreased employee satisfaction due to poorly performing technology

Loss of visibility into the environment as organizations adopt SaaS and cloud services

# Cont-

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Netflix – Three Billion new containers each week

Google – Four Billion containers each week

-451 Research

*Every 100ms delay costs 1% of sales*

-Greg Linden, developer of Amazons recommendation engine



# Machine Learning can help

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Learns about your environment

Can handle the known knowns and the unknown unknowns

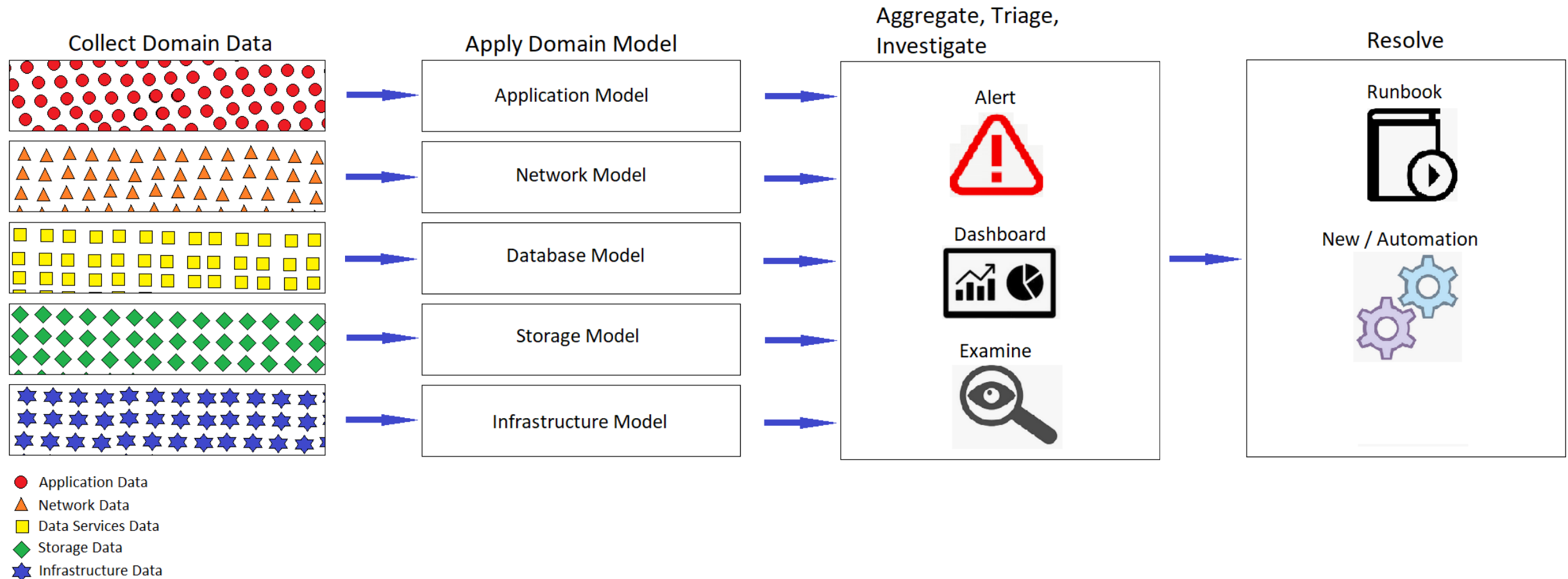
Cost effective and scales

Autonomously respond 24X7X365

New term evolved and tools/platforms are developing with it - AIOps

# Traditional approach

Best-of-breed tools, manual processes, ad-hoc automation



# ML / AI enables

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Move away from silod operations management

Provides intelligent insight

Drive automation and collaboration

Enhance and/or replace a broad range of tasks, including availability and performance monitoring, event correlation and analysis, it service mgmt. and automation

# Like what?

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Broad category of tools

Incident and problem management

IT operations analytics

Infrastructure management

Capacity management



# How?

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Event correlation

Anomaly Detection

Predictive Analytics

Root Cause Analysis and Reactive Support

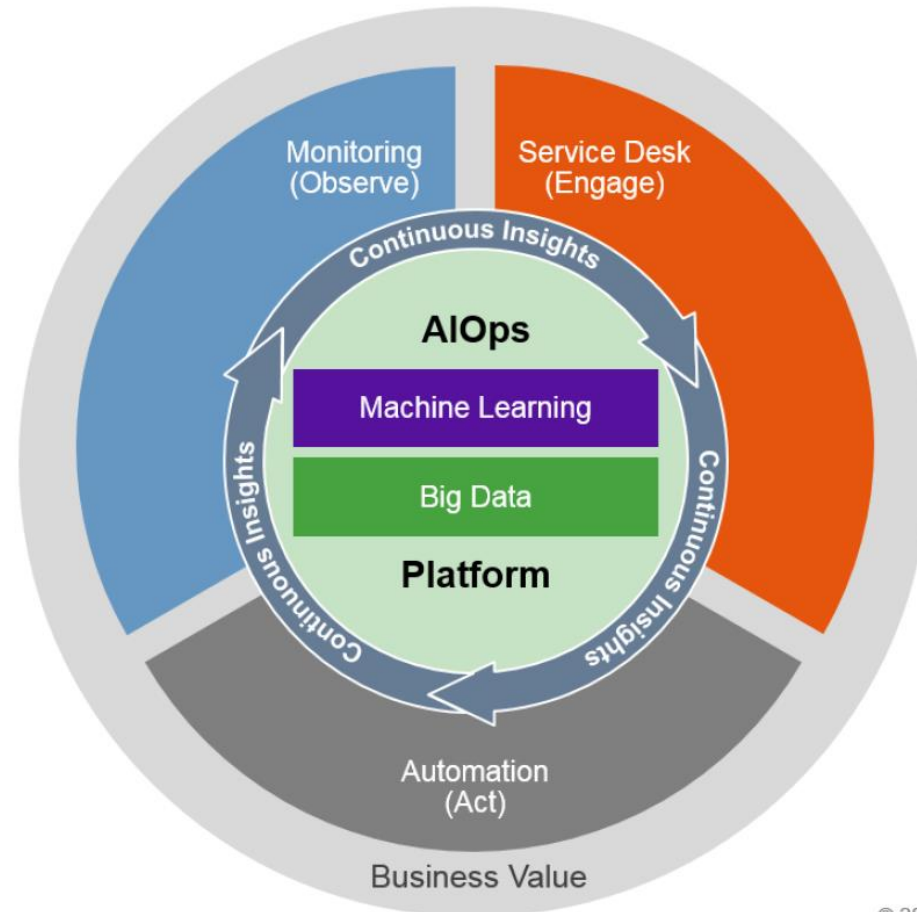
Proactive Support

Help Desk Optimization



# Visualization

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# Operational Analytics

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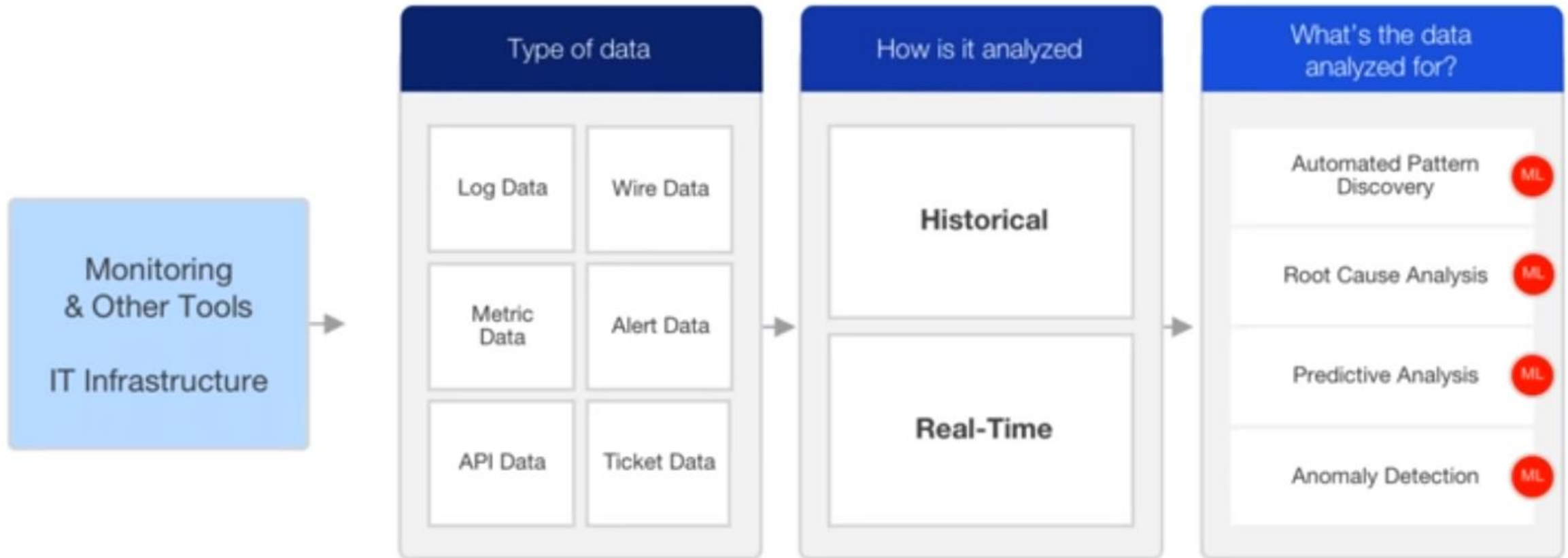
“Operational analytics is a more specific term for a type of business analytics which focuses on improving existing operations. This type of business analytics, like others, involves the use of various data mining and data aggregation tools to get more transparent information for business planning.”

<https://www.techopedia.com/definition/29495/operational-analytics>



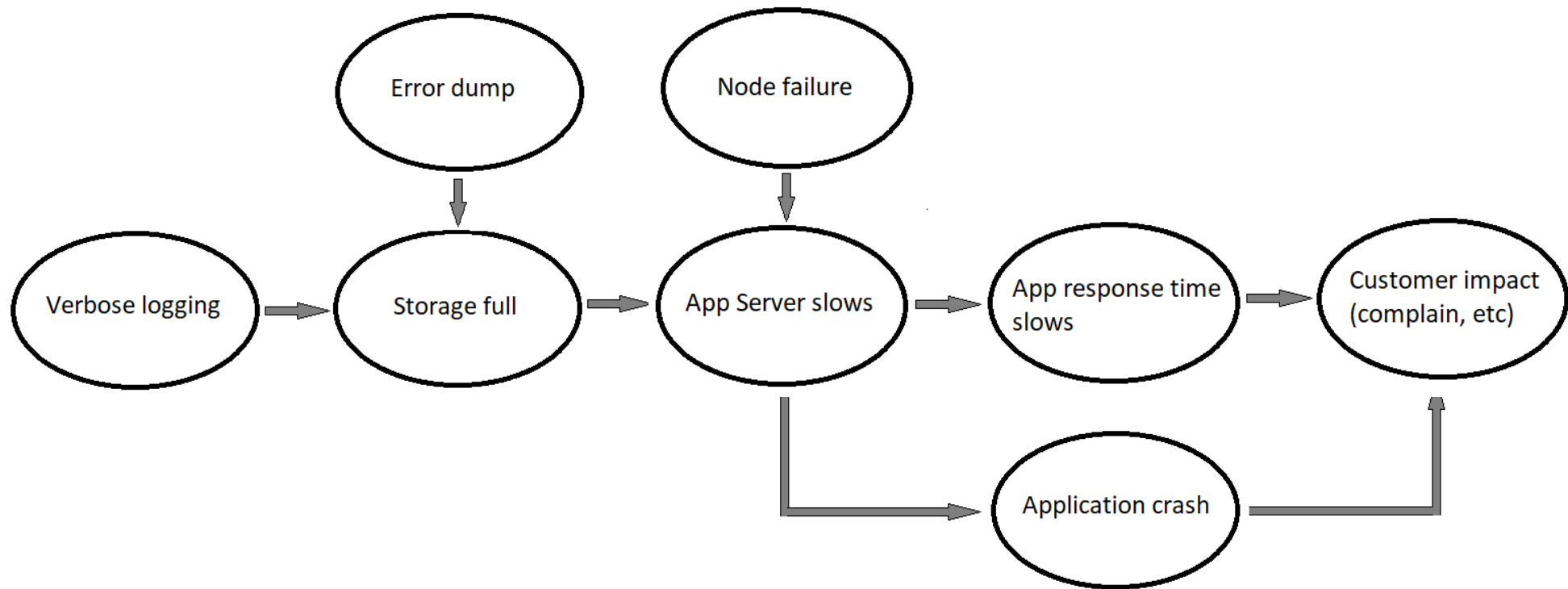
# Data

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# Correlation / Causation

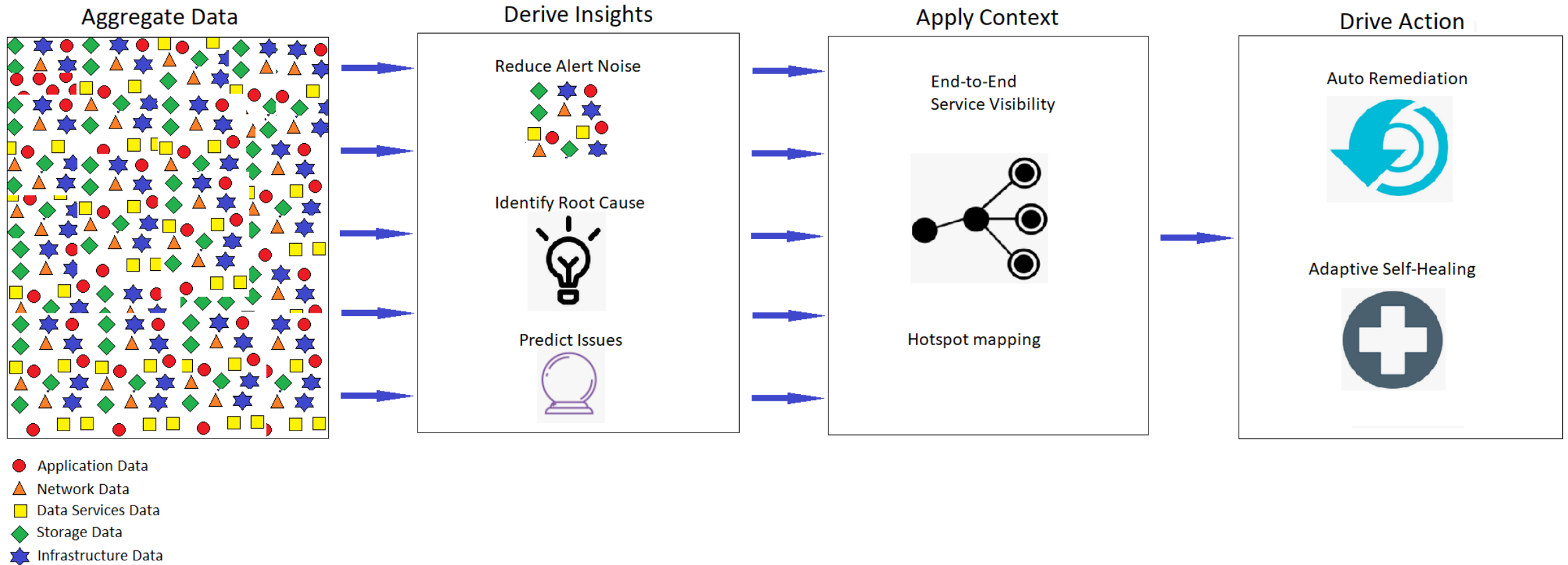
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*Correlation doesn't imply causation, but it does waggle its eyebrows suggestively and gesture furtively while mouthing 'look over there'*  
-Randall Munroe

# AIOps Approach

Augment IT Ops through comprehensive intelligence and automation





The journalist asked a programmer: "What makes bad code"? His reply?

*No Comment!*



# Benefits

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Predict Earlier

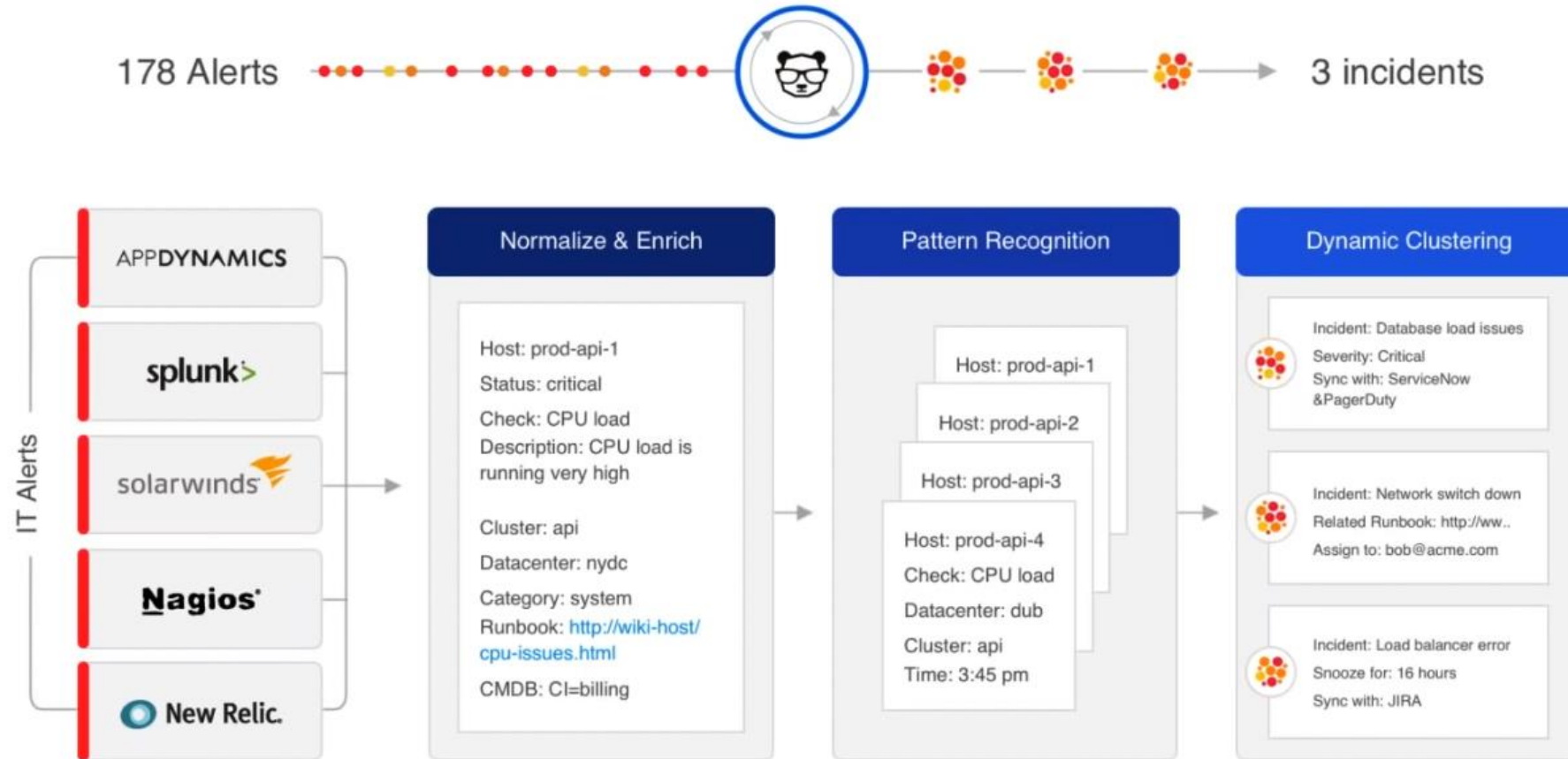
Remediate Faster

Collaborate more efficiently

Continuously Improve



# Event Management



Big Panda

# Network Availability

Ernest: Efficient Performance Prediction for Large-Scale Advanced Analytics, University of California

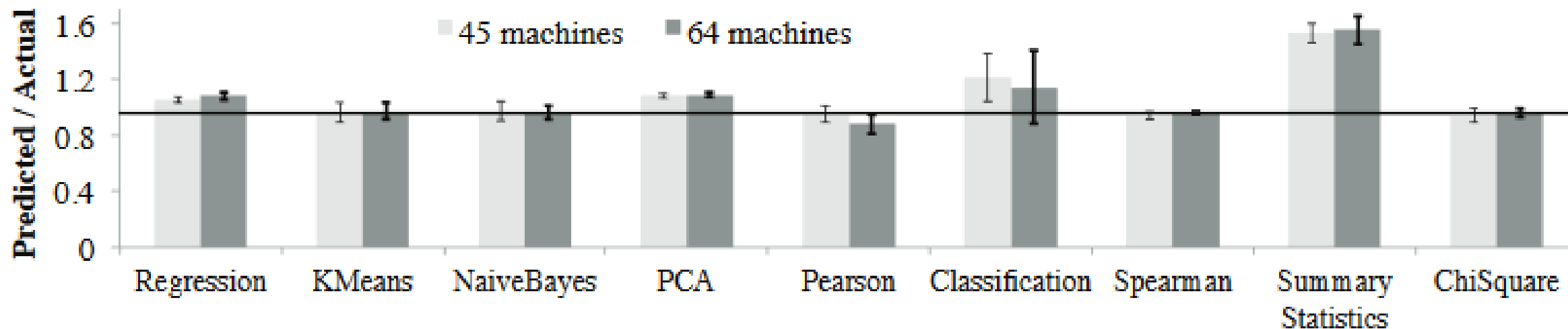


Figure 10: Prediction accuracy using Ernest for 9 machine learning algorithms in Spark MLlib.

UNENIX Symposium on Networked Systems Design and Implementation

<https://www.usenix.org/system/files/conference/nsdi16/nsdi16-paper-venkataraman.pdf>



# Automated Problem Resolution

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## Automated handling of tickets

- Prioritization
- Categorization
- Assignment

## Supervised learning classification

- Achieved accuracy up to 90% in automated ticket assignment

[https://www.researchgate.net/publication/281740475\\_Automated\\_Bug\\_Assignment\\_Ensemble-based\\_Machine\\_Learning\\_in\\_Large\\_Scale\\_Industrial\\_Contexts/link/55f66f7908ae6a34f6633a76/download](https://www.researchgate.net/publication/281740475_Automated_Bug_Assignment_Ensemble-based_Machine_Learning_in_Large_Scale_Industrial_Contexts/link/55f66f7908ae6a34f6633a76/download)

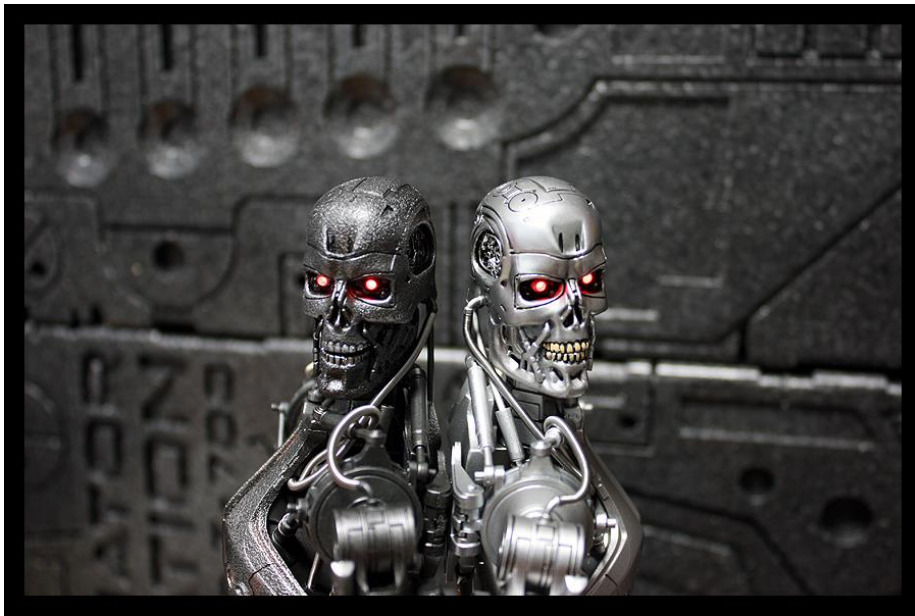
# Security

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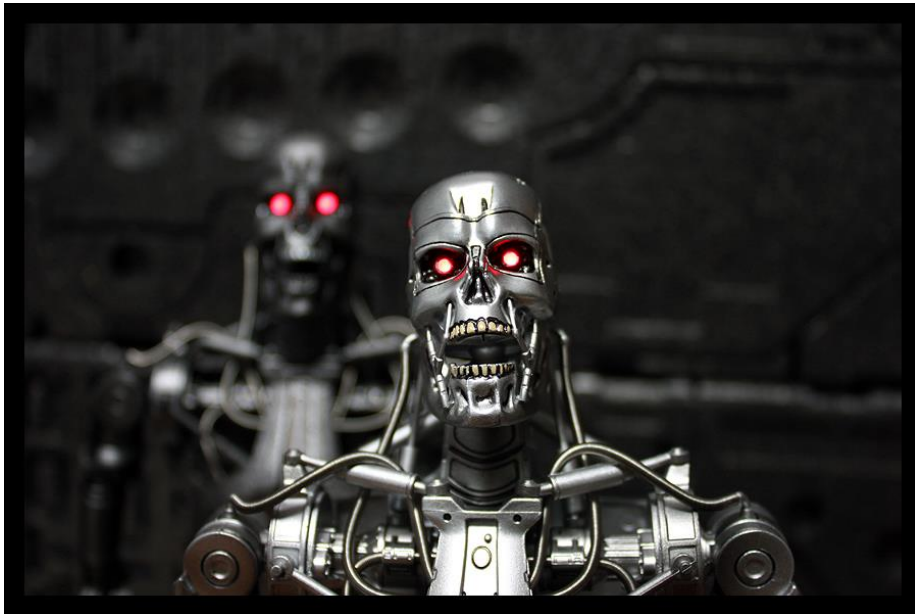
Anomaly detection techniques from machine learning

- Clustering or identifying outliers
- Time series anomaly detection

Feature of many commercial platforms, e.g. IBM X-Force, Anomali ThreatStream, Logz.io



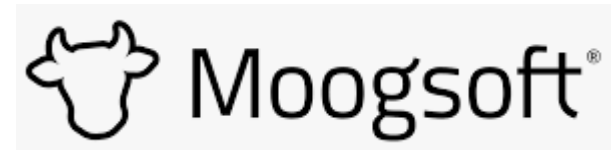
I walked down a street where the houses were numbered 64k, 128k, 256k, 512k, and 1mb



It was a trip down *memory lane*!

# Vendors/Products

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# Starting challenges

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1 in 4 companies, half of AI solutions fail

Cost of solution, lack of qualified staff, data quality issues, unrealistic expectations

Broad and ambitious initiatives

Not enough focus

Too many systems

Too much data

# Good to know

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Can your existing data sources align with desired outcomes?

Does ROI from ML require major changes to tools/processes?

Where does the training data come from?

Insights from historical and active data?

Ability to audit?



# Capabilities

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Quick wins or rapid ROI?

Can you deploy ML capabilities incrementally

Who develops the ML model?

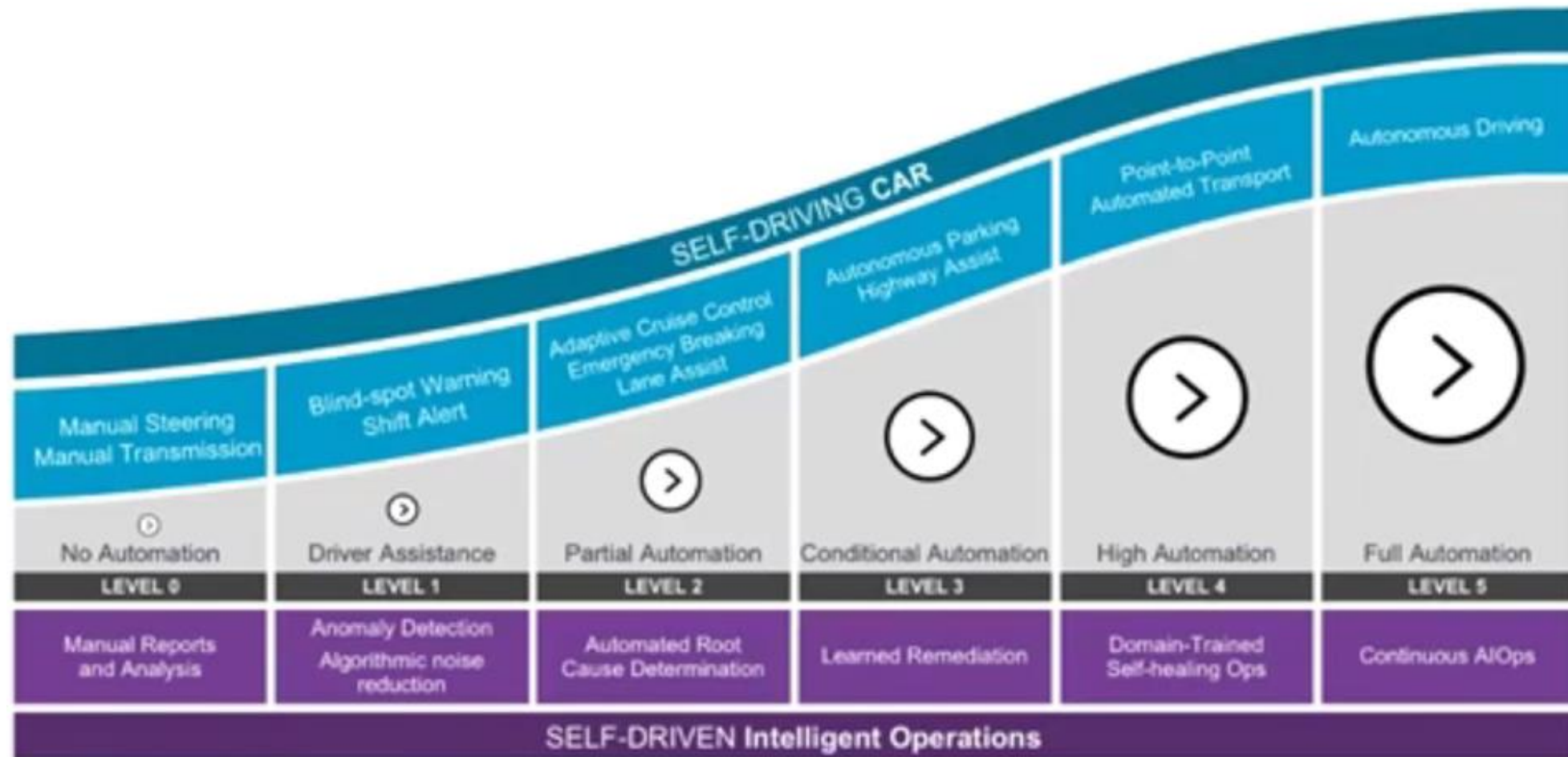
Algorithms – supervised, unsupervised?

Amount of training data needed?





# Journey



# Summary

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- ✓ What is machine learning
- ✓ Applying ML to IT Ops (AIOps)
- ✓ Use cases
- ✓ Getting started

# For more information

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Url List -

Introduction to AI - <https://www.coursera.org/learn/ai-for-everyone>

Big Panda webinar - <https://www.youtube.com/watch?v=UYNygjTY4xw>

UNENIX Symposium - <https://www.usenix.org/system/files/conference/nsdi16/nsdi16-paper-venkataraman.pdf>

Automated Bug assignment -

[https://www.researchgate.net/publication/281740475 Automated Bug Assignment Ensemble-based Machine Learning in Large Scale Industrial Contexts/link/55f66f7908ae6a34f6633a76/download](https://www.researchgate.net/publication/281740475_Automated_Bug_Assignment_Ensemble-based_Machine_Learning_in_Large_Scale_Industrial_Contexts/link/55f66f7908ae6a34f6633a76/download)

This slide deck – <https://github.com/mdkalal/??>

# Thank you!

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Feedback welcome

Mark Kalal - [mdkalal@gmail.com](mailto:mdkalal@gmail.com)

@MarkKalal