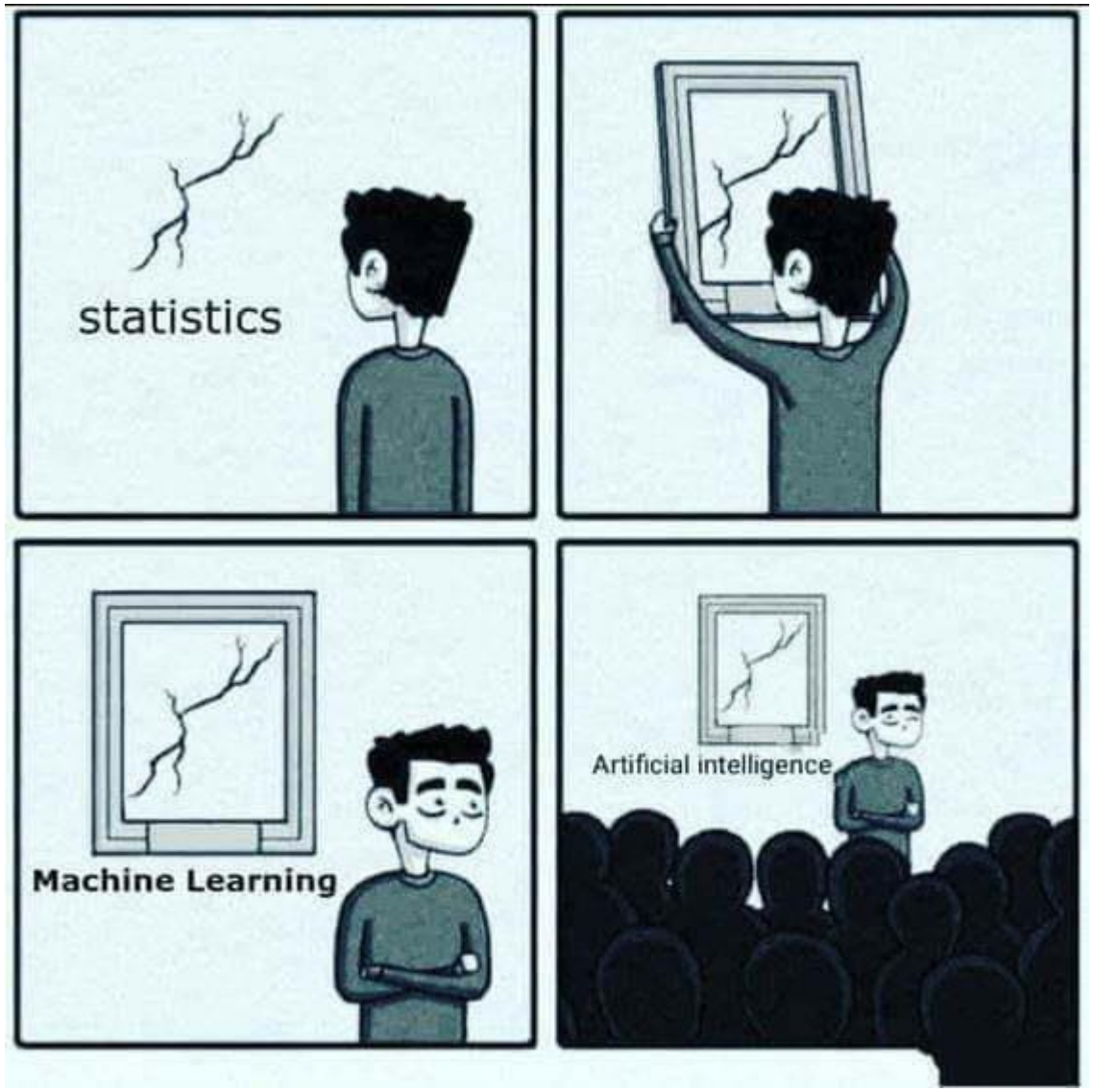
Operational Intelligence

AI AND MACHINE LEARNING IN IT OPERATIONS

ANALYZE
ACT
MONITOR


statistics
Machine Learning
Artificial intelligence

Outline

What is machine learning?

Applying ML to IT Ops (AIOps)

Use cases

Getting started

About me

Mark Kalal

Software development / technology solutions

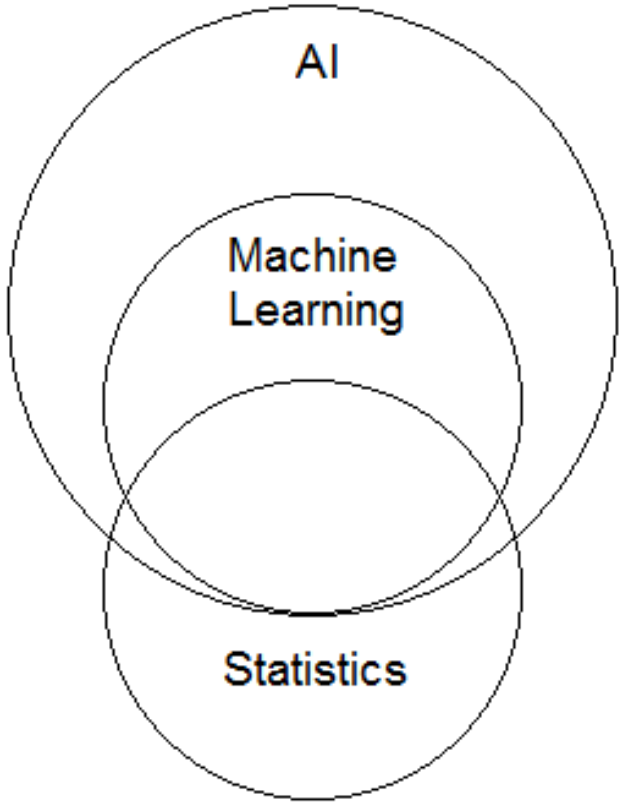
mdkalal@gmail.com

@MarkKalal

What is Machine Learning

Statistics?

Artificial Intelligence?



Learns by experience

Learns by ~~experience~~ data

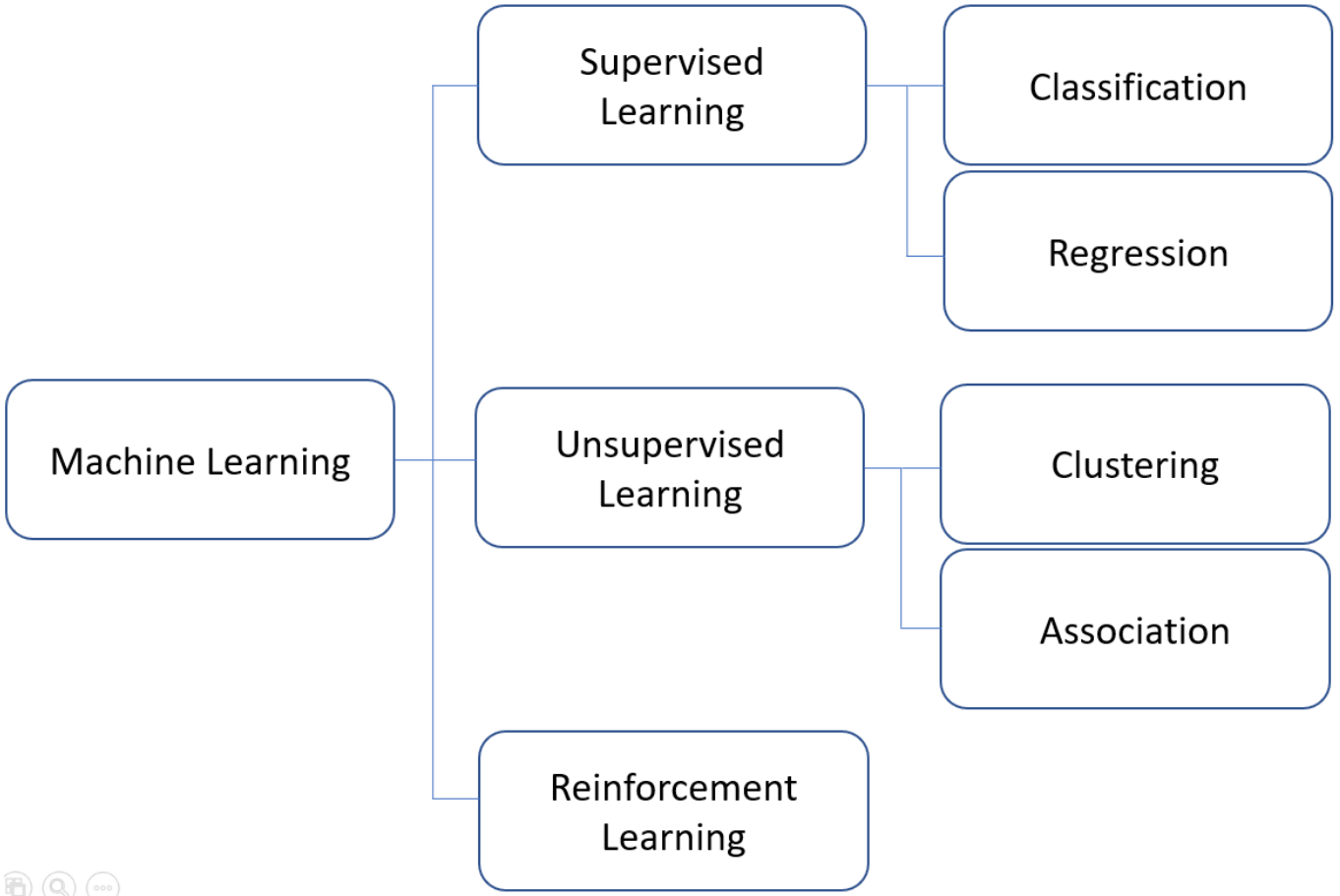
Gets specific instructions

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

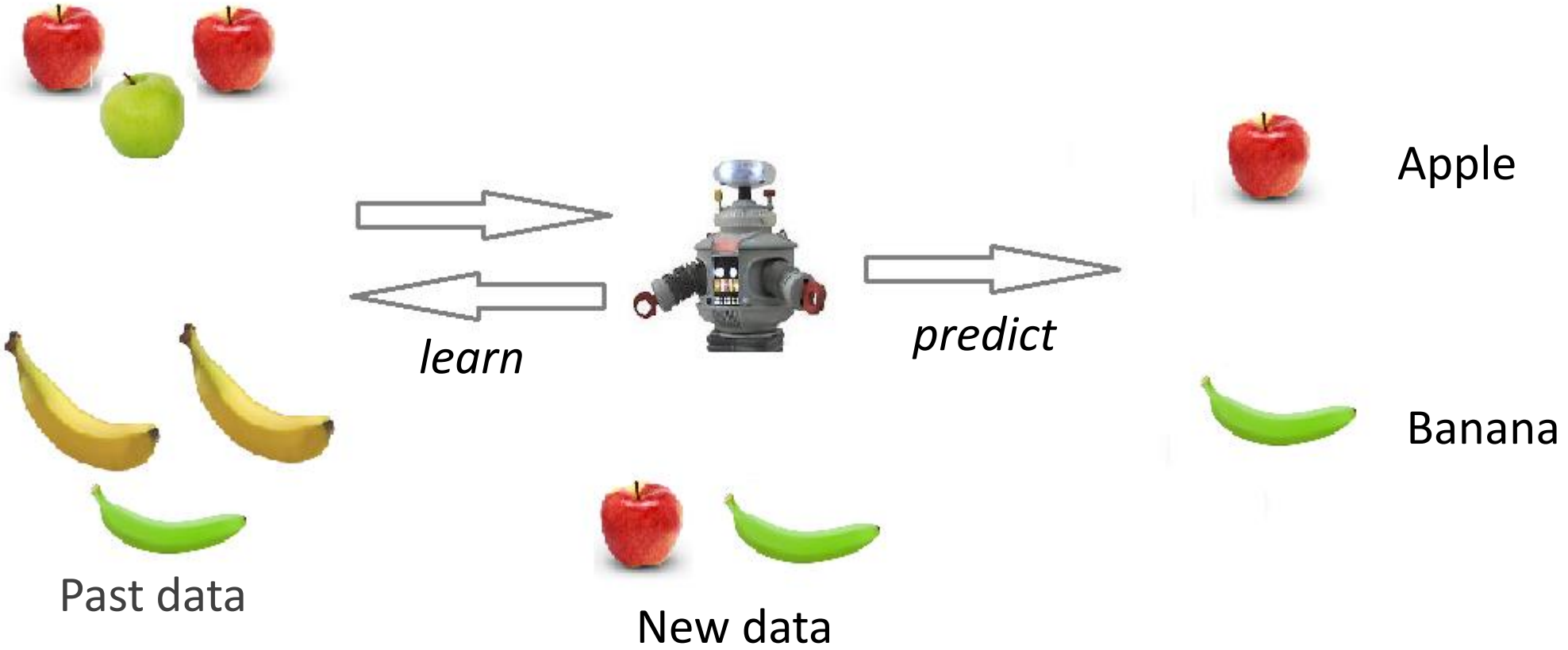
SPAM
Classic
Ingredients: Pork with Ham, Salt, Water, Modified Potato Starch, Sugar, Sodium Nitrite.
Serving Suggestion

Go to basket
Checkout

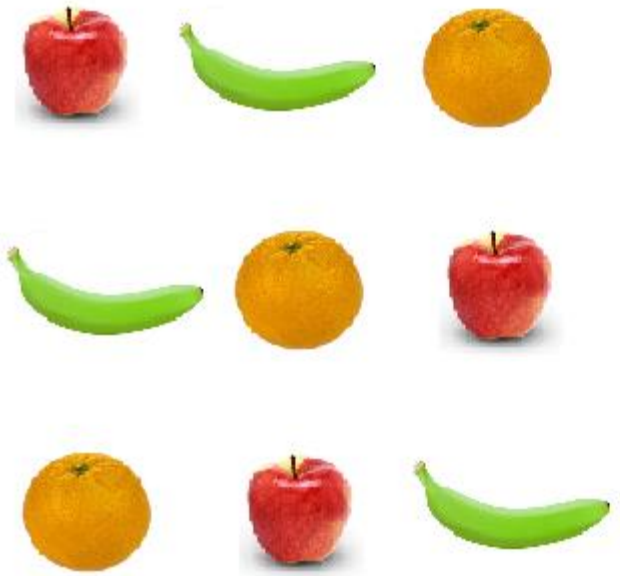
Learning types



Supervised Learning – make predictions

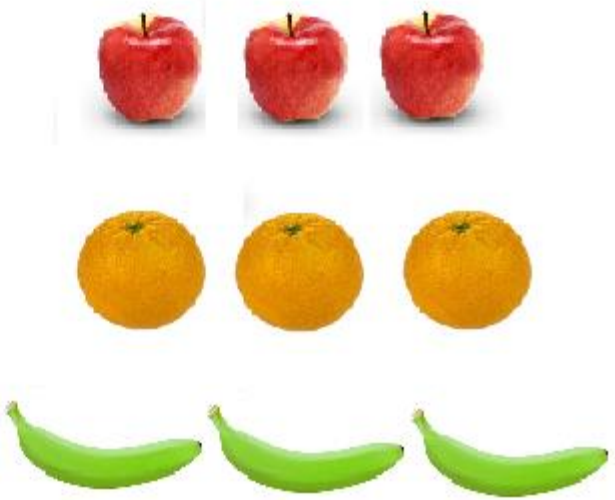


Unsupervised Learning – finding hidden patterns

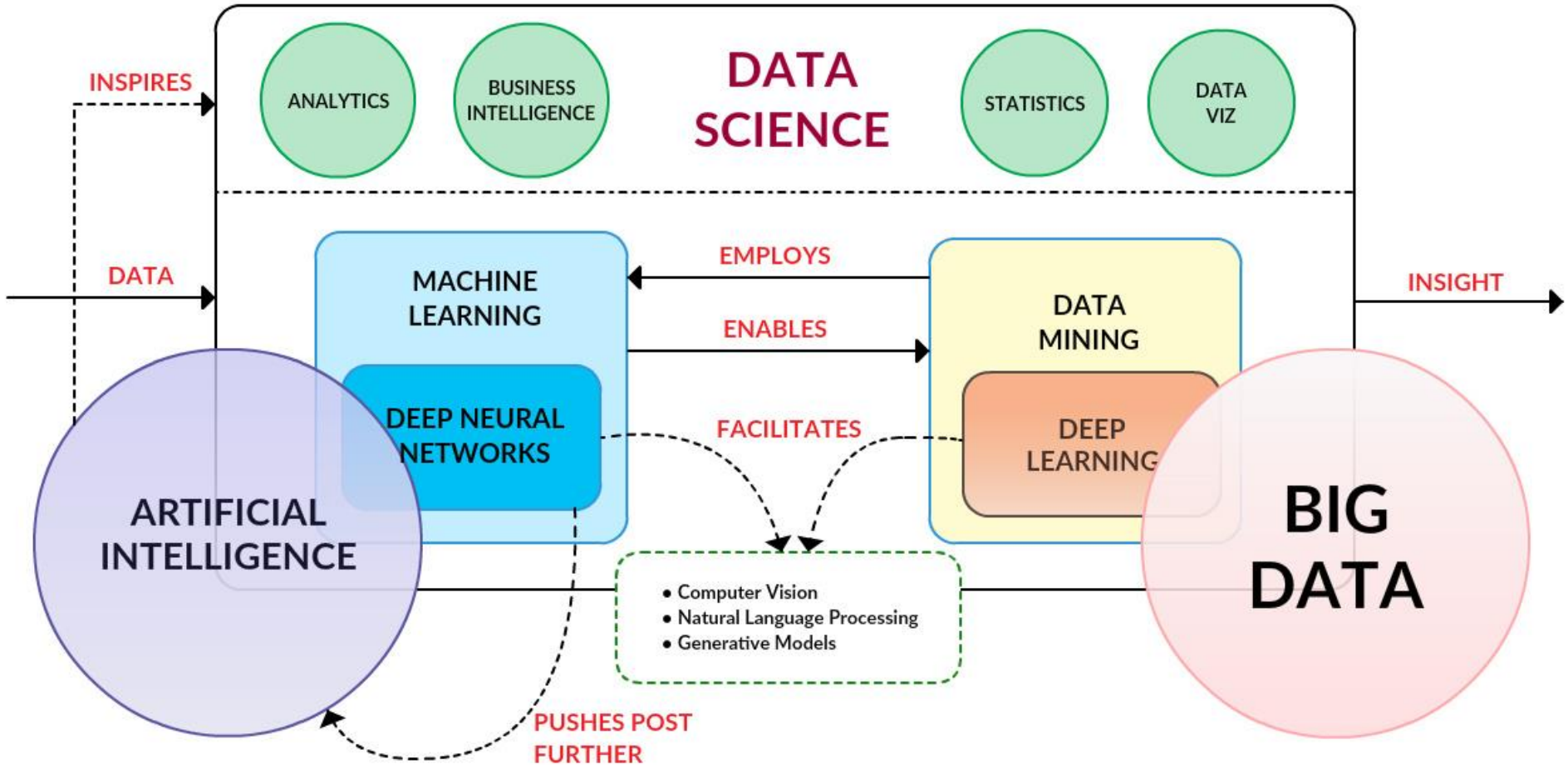


Input

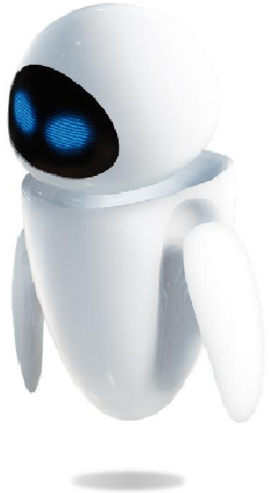
segregate *organize*



Output


INSPIRES
ANALYTICS
BUSINESS INTELLIGENCE
DATA SCIENCE
STATISTICS
DATA VIZ
DATA
MACHINE LEARNING
EMPLOYS
ENABLES
DATA MINING
INSIGHT
DEEP NEURAL NETWORKS
FACILITATES
DEEP LEARNING
ARTIFICIAL INTELLIGENCE
BIG DATA
• Computer Vision
• Natural Language Processing
• Generative Models
PUSHES POST FURTHER

Nand Kishor



My computer suddenly started singing “Hello from the other side”!

Of course it did, after all …

It’s *A Dell!*

Applying ML

Addressing pain points

New capabilities

Challenges for IT Operations

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-

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

Learns about your environment

Can handle the known knowns and the unknown unknowns

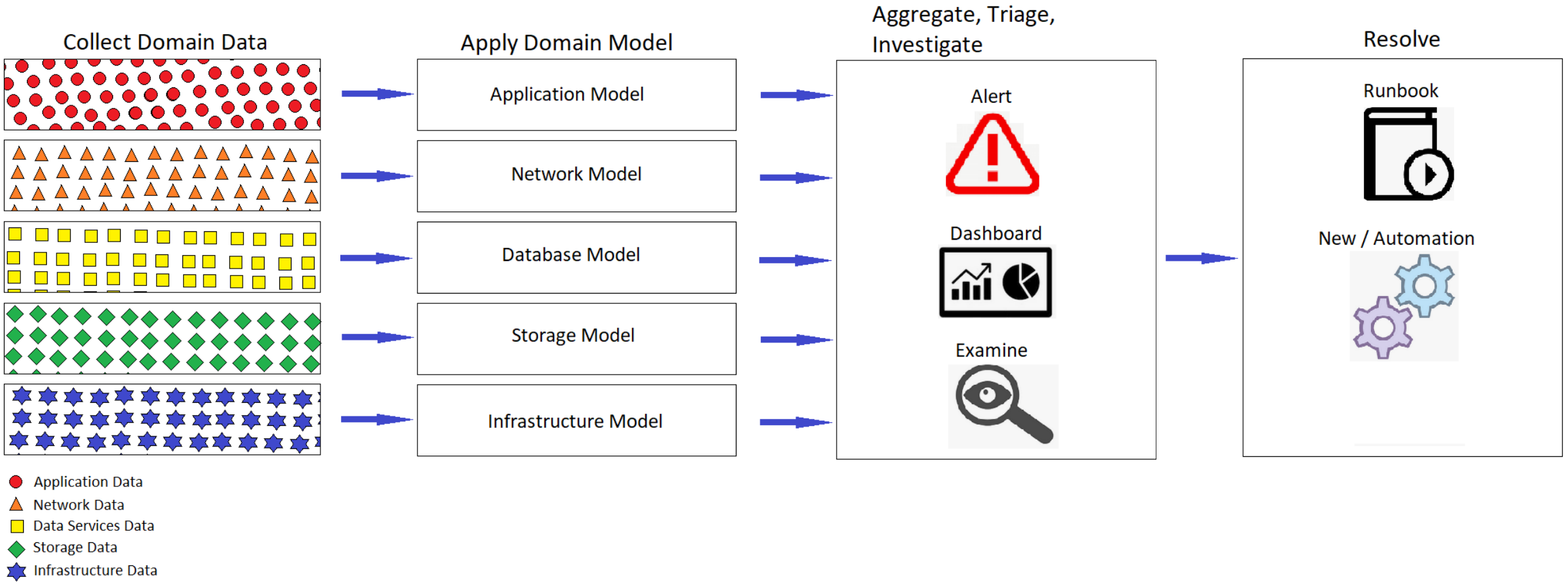
Cost effective and scales

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

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?

Broad category of tools

Incident and problem management

IT operations analytics

Infrastructure management

Capacity management

How?

Event correlation

Anomaly Detection

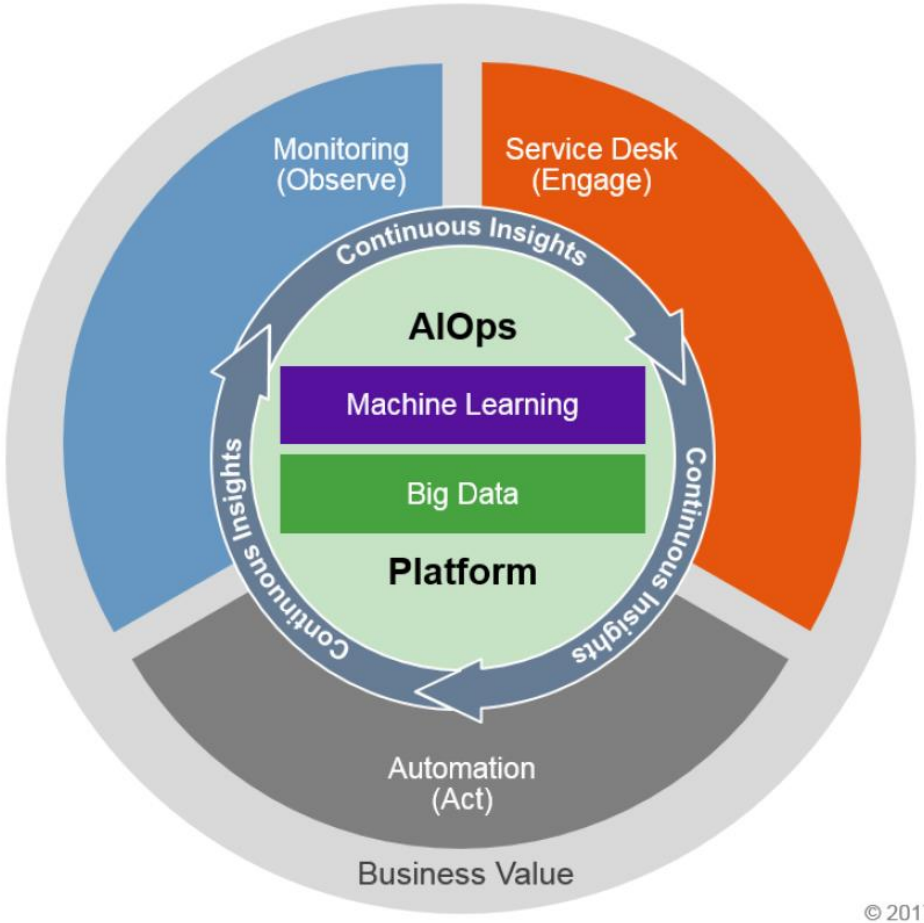
Predictive Analytics

Root Cause Analysis and Reactive Support

Proactive Support

Help Desk Optimization

Visualization



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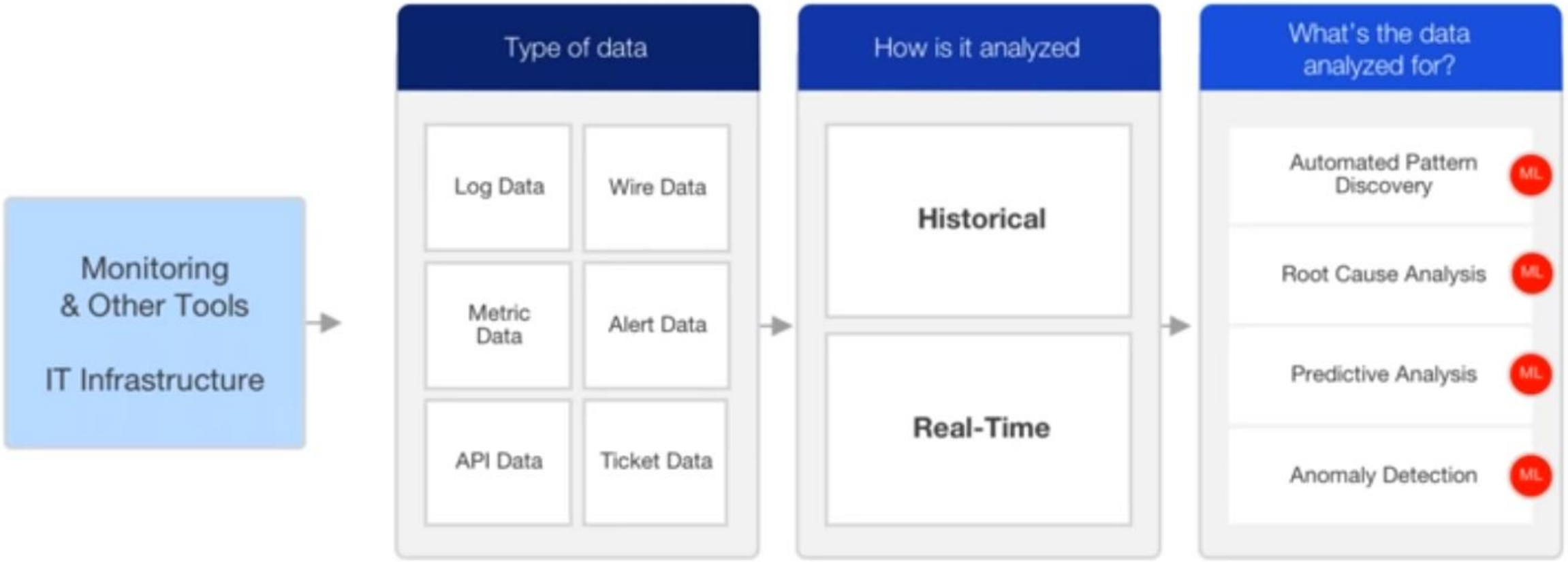
Operational Analytics

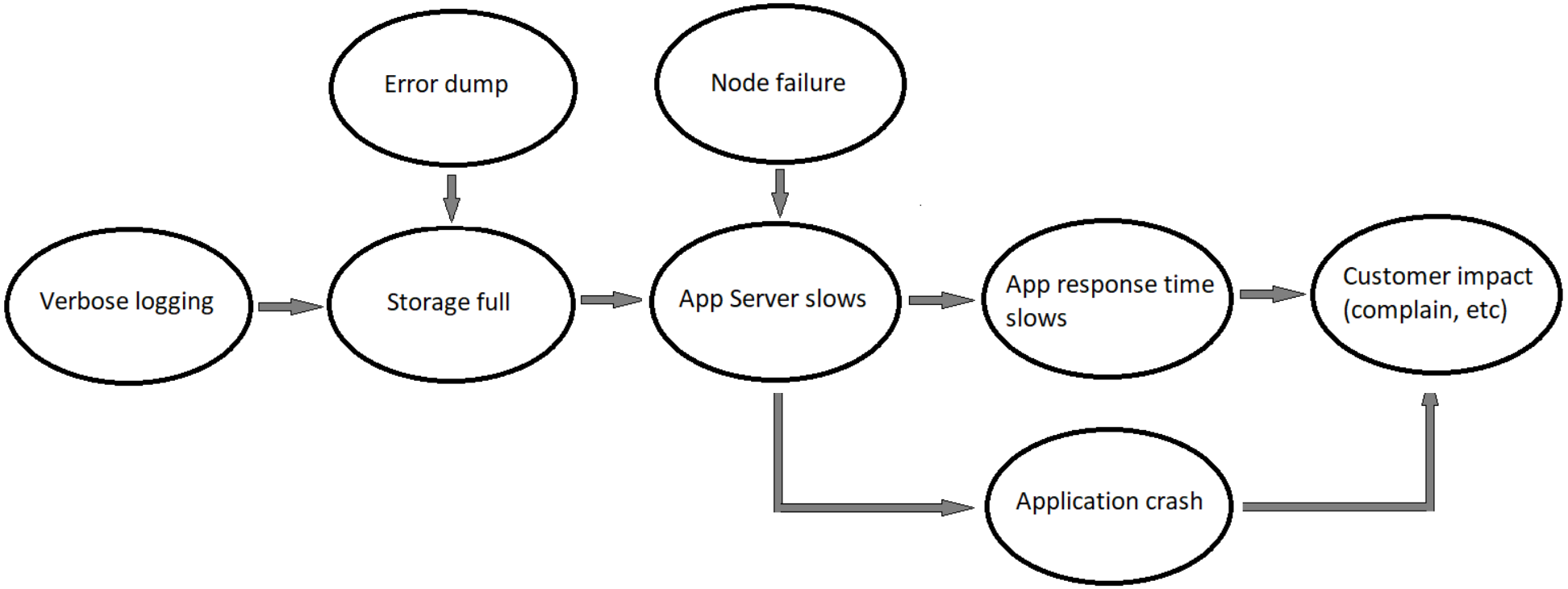
“Operational analytics is a more specific term for a type of business analytics which focuses on improving existing operations. This type of business analytics, like others, involves the use of various data mining and data aggregation tools to get more transparent information for business planning.”

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

Data


Monitoring
& Other Tools
IT Infrastructure
Type of data
Log Data
Wire Data
Metric Data
Alert Data
API Data
Ticket Data
How is it analyzed
Historical
Real-Time
What's the data analyzed for?
Automated Pattern Discovery
ML
Root Cause Analysis
ML
Predictive Analysis
ML
Anomaly Detection
ML

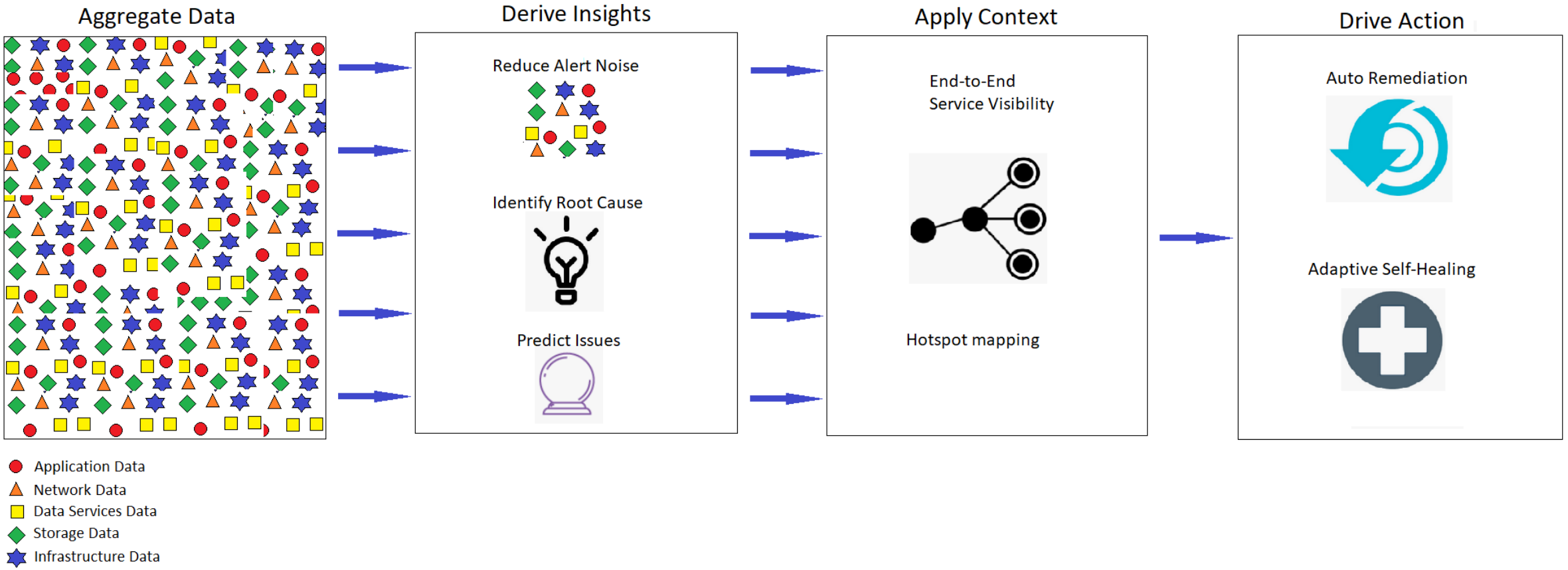
Correlation / Causation



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

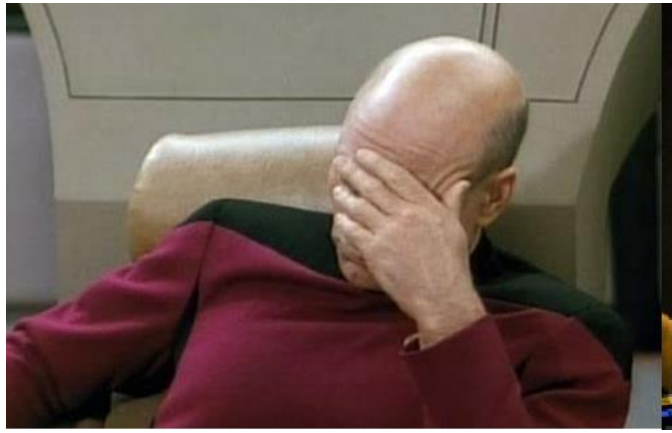
AIOps Approach

Augment IT Ops through comprehensive intelligence and automation



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

No Comment!



Benefits

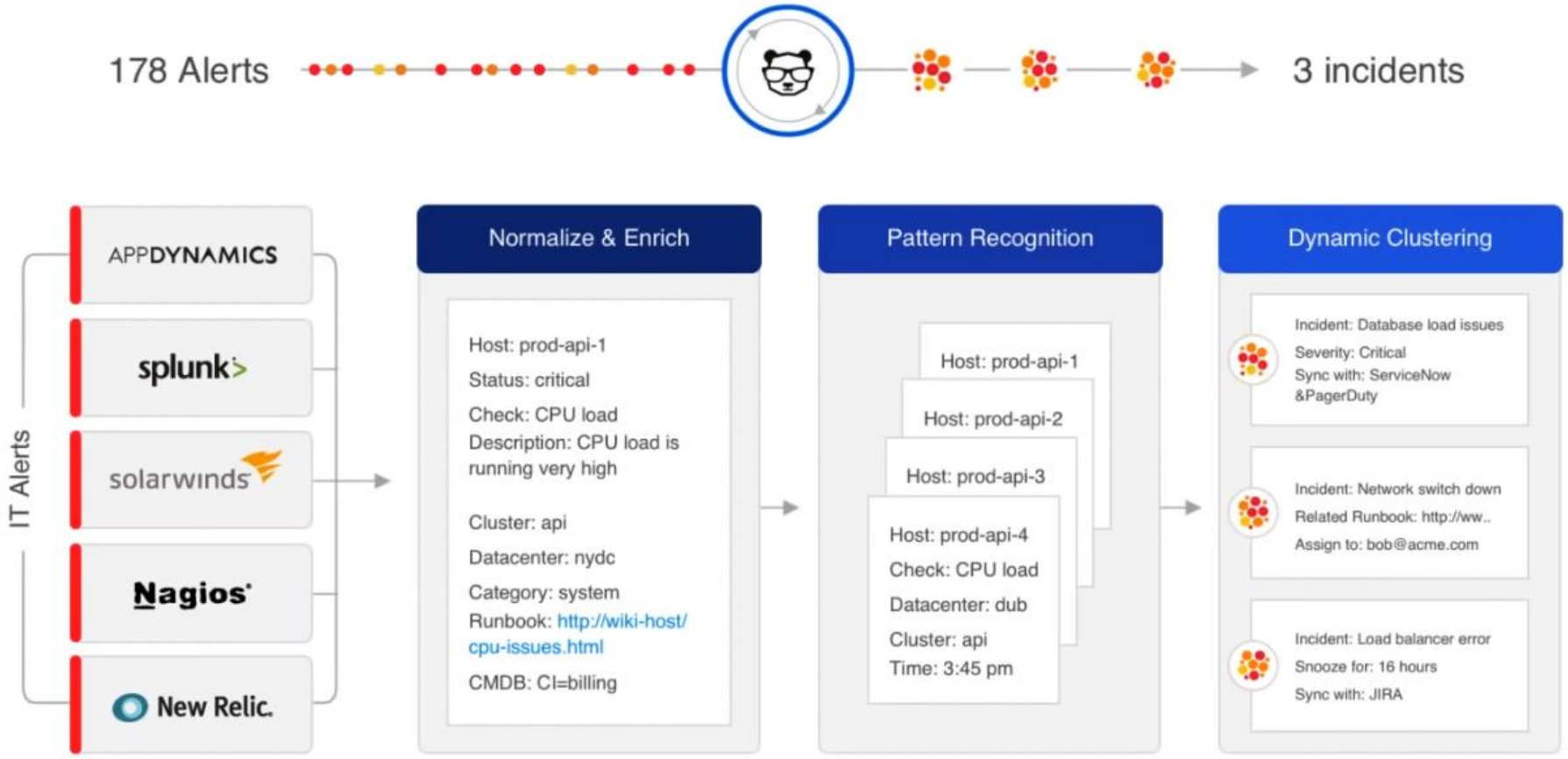
Predict Earlier

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

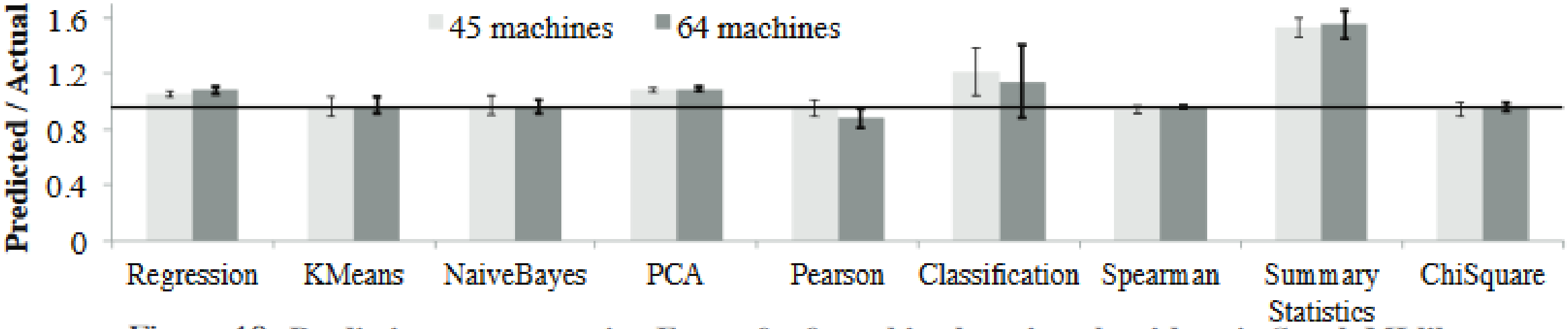


Figure 10: **Prediction accuracy using Ernest for 9 machine learning algorithms in Spark MLlib.**

UNENIX Symposium on Networked Systems Design and Implementation
https://www.usenix.org/system/files/conference/nsdi16/nsdi16-paper-venkataraman.pdf

Automated Problem Resolution

Automated handling of tickets

- Prioritization
- Categorization
- Assignment

Supervised learning classification

- Achieved accuracy up to 90% in automated ticket assignment

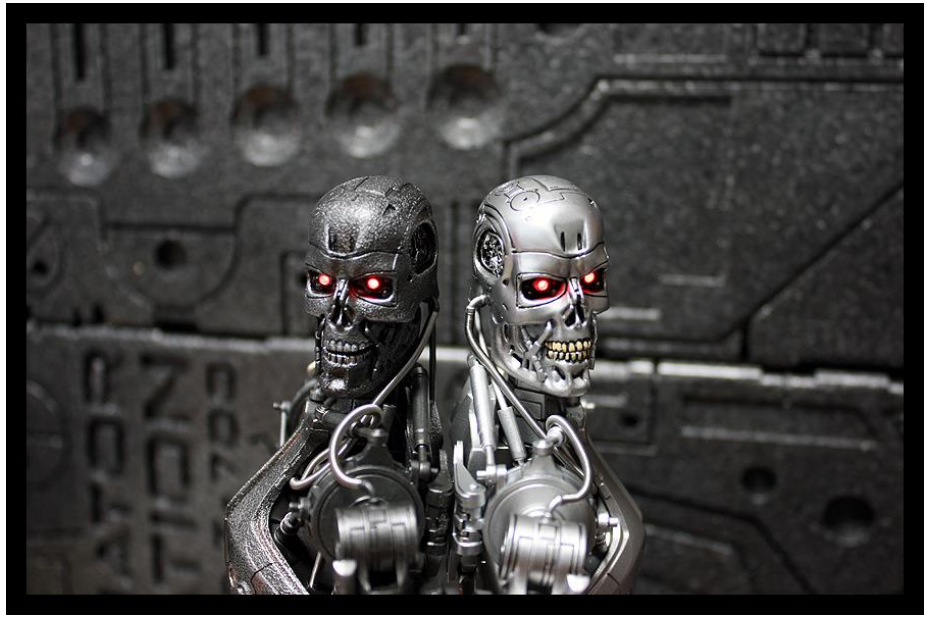
https://www.researchgate.net/publication/281740475_Automated_Bug_Assignment_Ensemble-based_Machine_Learning_in_Large_Scale_Industrial_Contexts/link/55f66f7908ae6a34f6633a76/download

Security

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

Starting challenges

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

Can your existing data sources align with desired outcomes?

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

Where does the training data come from?

Insights from historical and active data?

Ability to audit?

Capabilities

Quick wins or rapid ROI?

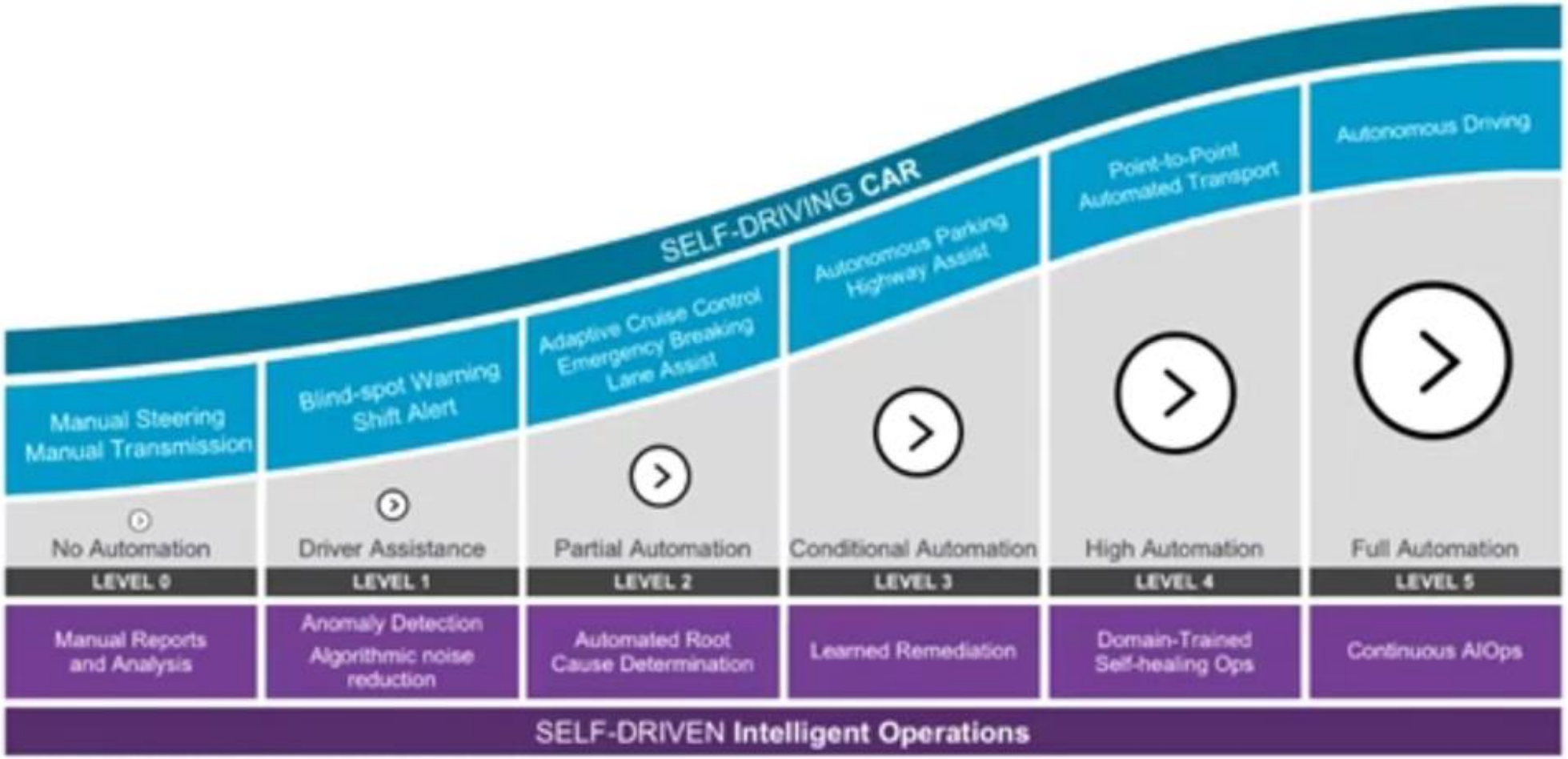
Can you deploy ML capabilities incrementally

Who develops the ML model?

Algorithms – supervised, unsupervised?

Amount of training data needed?

Journey


SELF-DRIVING CAR
Manual Steering
Manual Transmission
Blind-spot Warning
Shift Alert
Adaptive Cruise Control
Emergency Breaking
Lane Assist
Autonomous Parking
Highway Assist
Point-to-Point
Automated Transport
Autonomous Driving
No Automation
Driver Assistance
Partial Automation
Conditional Automation
High Automation
Full Automation
LEVEL 0
LEVEL 1
LEVEL 2
LEVEL 3
LEVEL 4
LEVEL 5
Manual Reports
and Analysis
Anomaly Detection
Algorithmic noise
reduction
Automated Root
Cause Determination
Learned Remediation
Domain-Trained
Self-healing Ops
Continuous AIOps
SELF-DRIVEN Intelligent Operations

Summary

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

For more information

Url List - https://www.theurlist.com/kalal-opsfest-2019

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

This slide deck – https://github.com/mdkalal/aiops

Thank you!

Feedback welcome

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