Microsoft

How to Make Smarter Decisions with Big Data, IoT and Machine Learning.

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![Microsoft]

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About Me: Based in Miami, FL.
Recently Married. Passions are Music,
Aviation and all things Technology

William Hahn

- Guilford College: Mathematics/Physics
- UNC Greensboro: AI
- FAU: PhD Research in Machine Perception
- Co-Director Machine Perception Cognitive Robotics Lab
- Lab Projects: Neural Networks for Computer Vision, Self Driving RC Cars, Self Driving Golf Cart.
- CEO VoxelRx Deep Learning Medical Imaging

> **"** *I need our systems to think.*
> *I need them to learn and*
> *I need them to present issues*
> *and problems and anomalies*
> *to the employees, to the managers.* **"**

Adam Coffey
President and CEO
WASH Laundry Systems

What is Machine Learning?

Computing systems
that become smarter
with experience

"Experience" =
past data + human input

Big Data is Getting Bigger

- ARGUS-IS imager
  - 1.8 GP camera
  - 770 Gb/sec
  - 1M TB/day
- Currently 6B people access mobile phones
- Microelectrode array
  - 100 channels
  - 30 kHz
  - 2 TB/day

(Baraniuk 2012)

PERSPECTIVES

NEUROSCIENCE

The Brain Activity Map

A. Paul Alivisatos,[1*] Miyoung Chun,[2] George M. Church,[3] Karl Deisseroth,[4] John P. Donoghue,[5] Ralph J. Greenspan,[6] Paul L. McEuen,[7] Michael L. Roukes,[8] Terrence J. Sejnowski,[9*] Paul S. Weiss,[10] Rafael Yuste[11*]
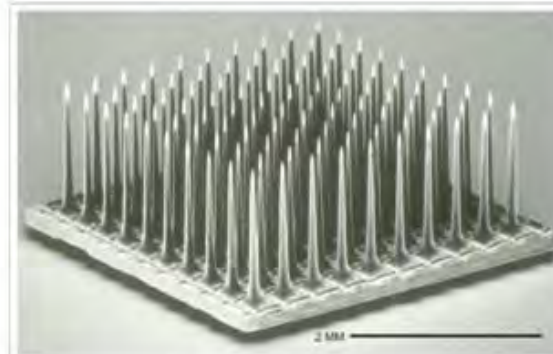
Data Tsunami

Big Data

Global Consumer Internet Traffic Per Month

- 2011: 21 EB
- 2012: 30 EB
- 2013: 38 EB
- 2014: 48 EB
- 2015: 63 EB
- 2016: 83 EB
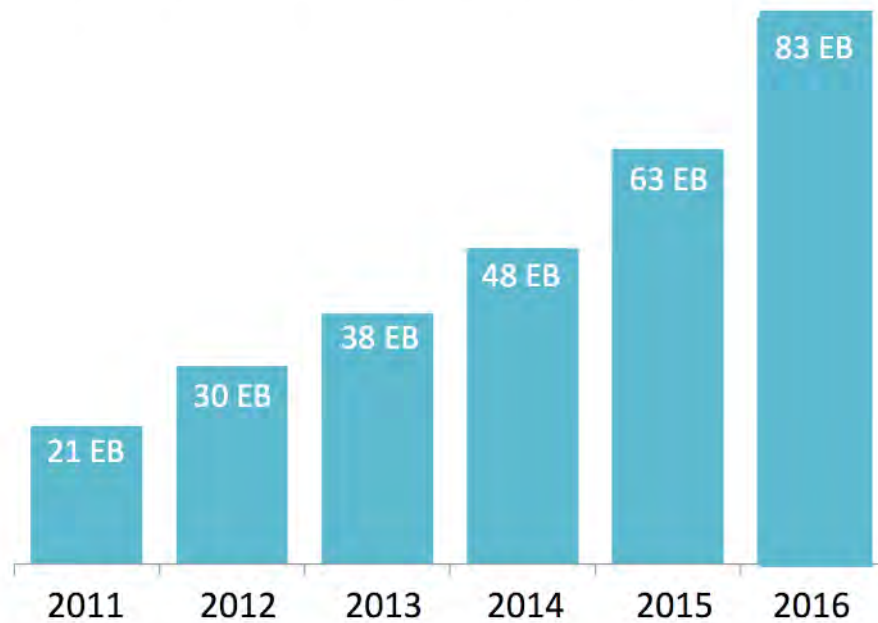
Source: Cisco

Big Data

You Tube™ 72 hours of videos / min

facebook 300 million images / day

83 EB

Visual 86%

2016
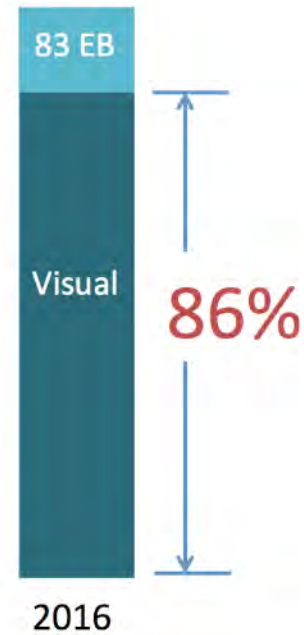
Source: Cisco

Big Data and Machine Learning
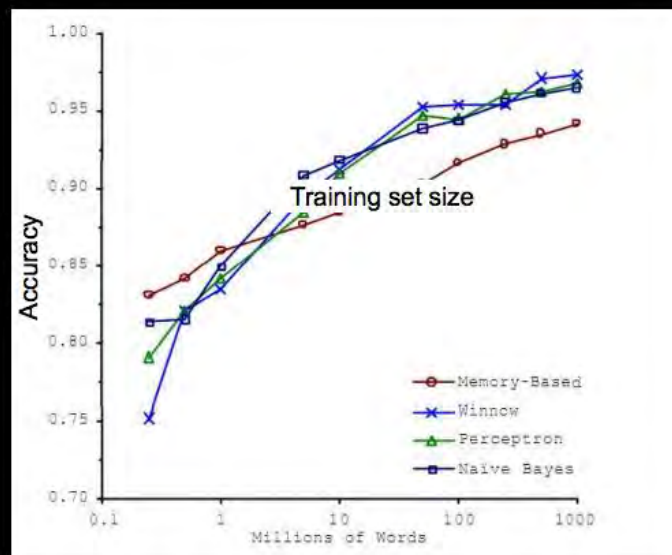
Machine Intelligence LANDSCAPE

Data and intelligence
Power decisions & apps with insights

Support business strategy with any data

Predict and respond proactively

Learn and engage with artificial intelligence

Deep Learning for Medicine

Rovers

http://home.wlu.edu/~levys/software/roverpylot/
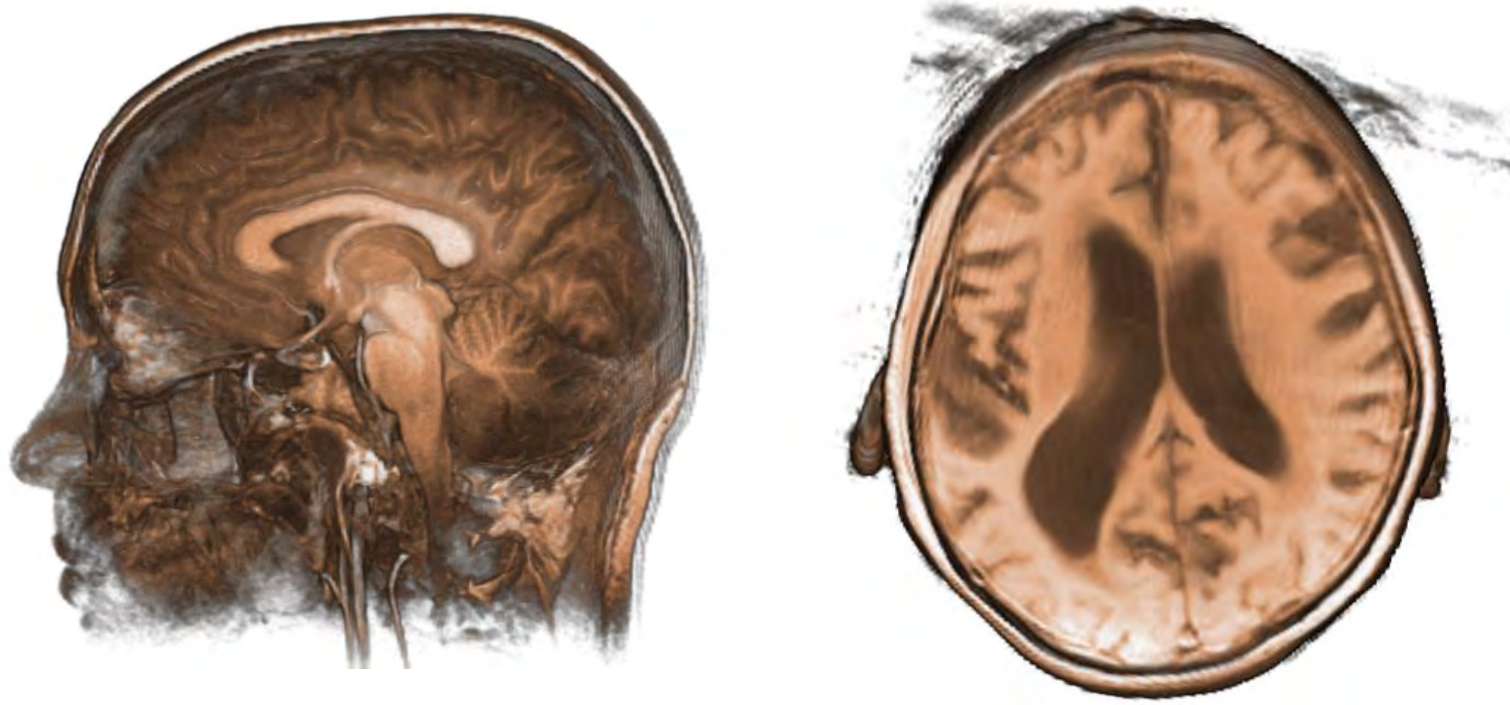
Python Rover Module
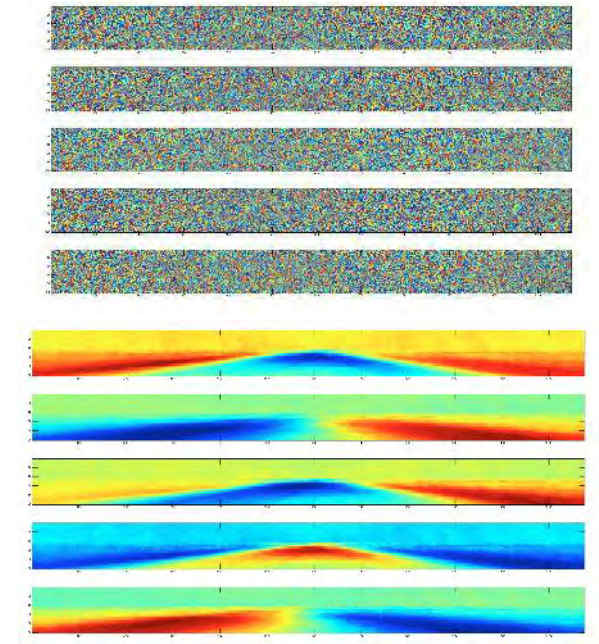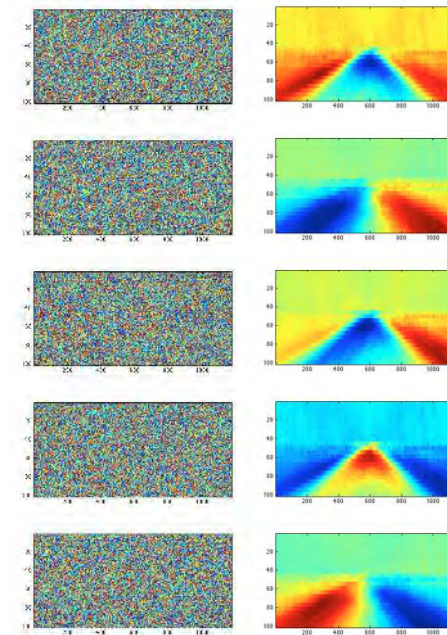
Deep Learning in Rovers

Multi-Modal Input

Learning systems that combine multiple input domains

Images

Text & Language

REUTERS
AP Associated Press
WIKIPEDIA
The Free Encyclopedia

Video

Laser scans

Speech & Audio

Time series data
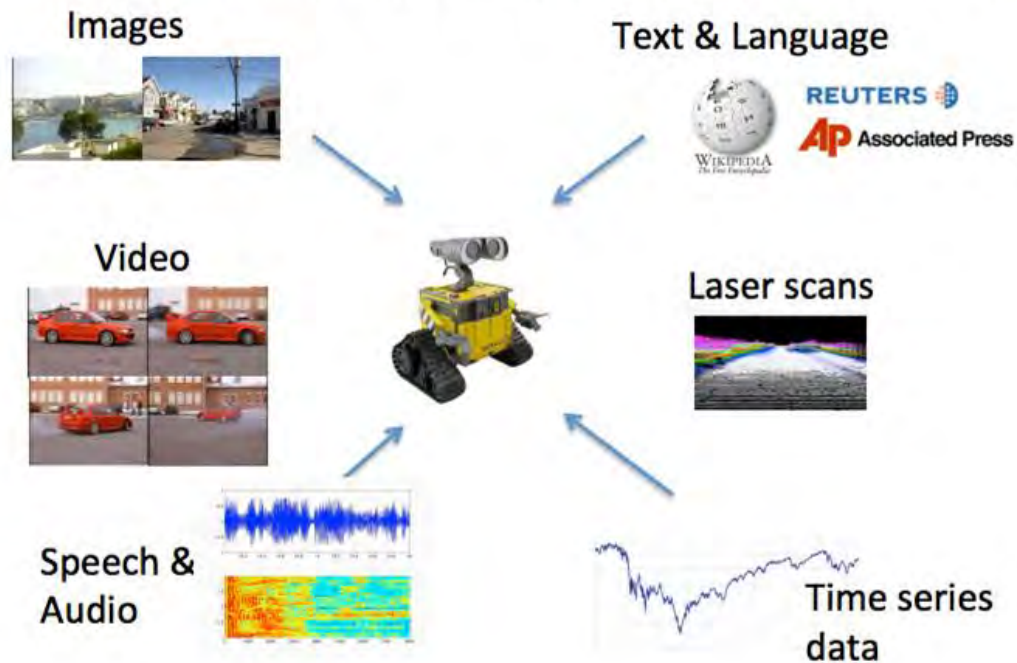
Develop learning systems that come
closer to displaying human like intelligence.

Gesture and Pose Recognition

(a)   (b)   (c)   (d)
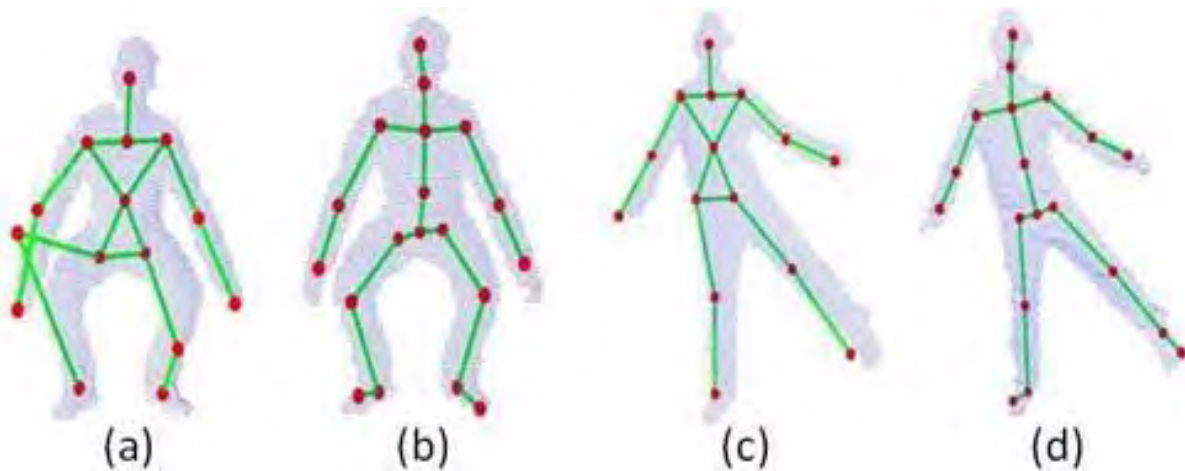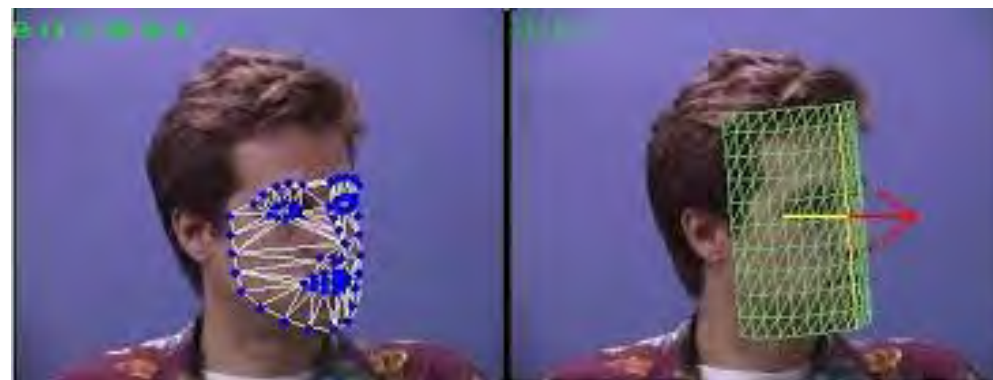
Vision
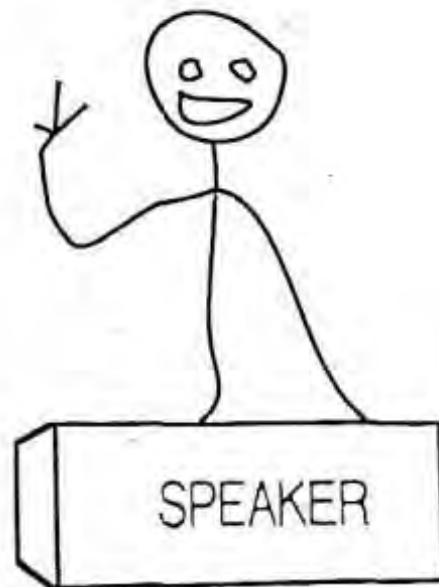
Machine Perception
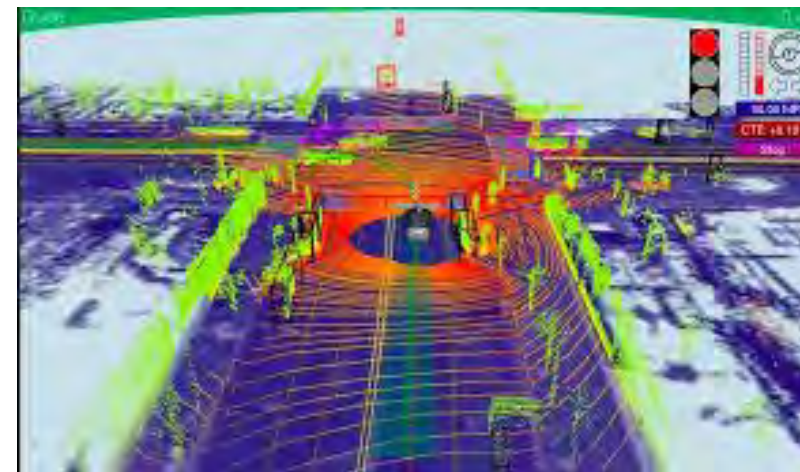
ALVINN
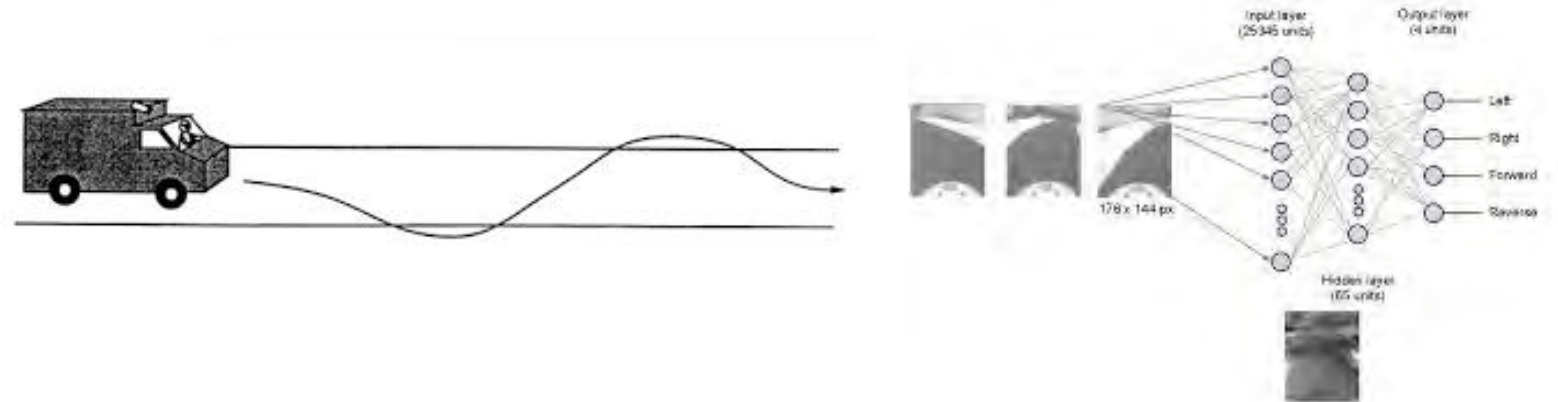
2 Problems Too Difficult to Program by Hand

☐ **Autonomous Land Vehicle in a Neural Network (ALVINN) drives 70 mph on highways**

- Perception system which learns to control the NAVLAB vehicles by watching a person drive
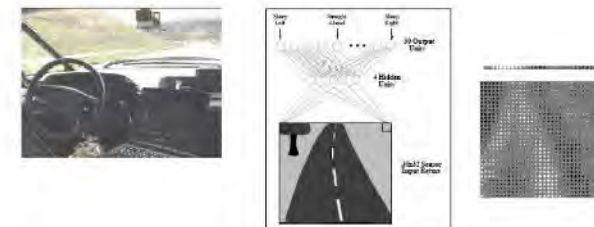
Human Activity Recognition From RGBD &   Abnormal Event Detection

http://pr.cs.cornell.edu/humanactivities/
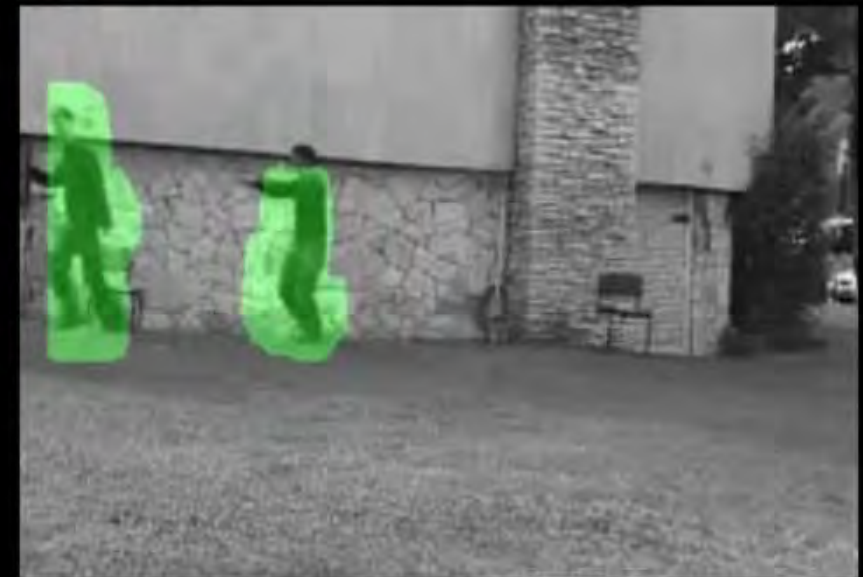
Three major trends are converging
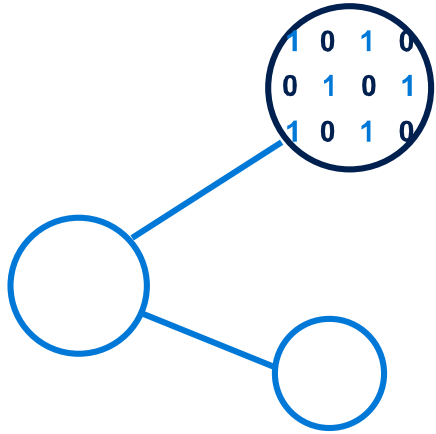
Big Data & IoT
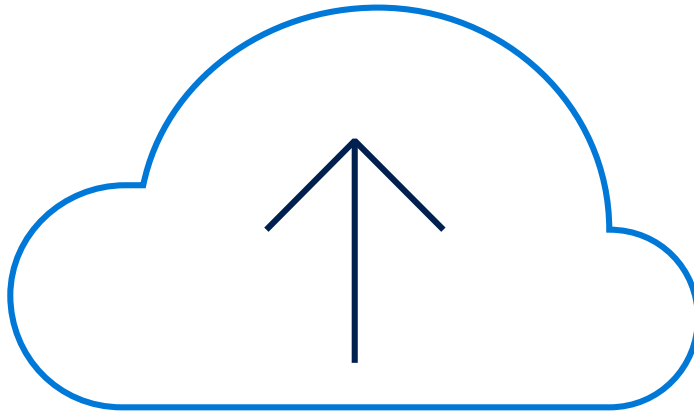
Cloud

Artificial Intelligence

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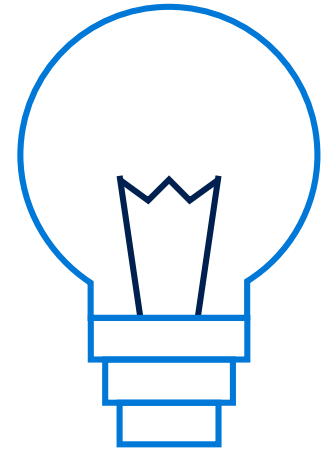
Data is a key strategic asset

10%

Percent of organizations expected to have a highly profitable business unit specifically for productizing and commercializing their data by 2020

Source: Gartner, 2016

$100M

The most digitally transformed enterprises generate on average $100 million in additional operating income each year

Source: Keystone Strategy 2016

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The cloud offers limitless computing power
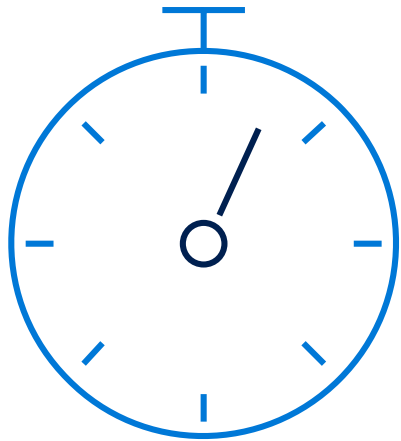
Speed

Scale

Economics

Here is how successful companies are staying ahead

Improving visibility and making accurate predictions with remote monitoring

Getting the right products to the right places with inventory management

Offering customers exactly what they want, when they want it, with personalization

Fixing problems proactively before they start with predictive maintenance
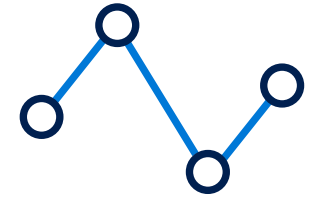
Exploring new business opportunities with data-driven services

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Opportunities exist across functional areas

EXAMPLE SOLUTIONS

Marketing	Sales	Service	Finance	Operations	Workforce
Customer Insight	Customer Acquisition	Service Analytics	Financial Analytics	Demand Forecasting	Employee Insight
Customer Feedback Analytics	Cross sell & Upsell	Contact Center Analytics	Financial Forecasting	Inventory Optimization	HR Insight
Churn Analytics	Lead Generation & Opportunity Scoring		Fraud Management	IT Operations Insight	Pay for Performance
Product Innovation			Risk Management	Operational Efficiency	
Personalization				Procurement Insight	
Product Recommendation				Spend Insight	
Marketing Optimization				Supplier Insight	

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> "*We wanted to go beyond the industry standard of preventative maintenance, to offer predictive and even preemptive maintenance.*"

Andreas Schierenbeck
CEO, ThyssenKrupp Elevator

Machine Learning in action

Competitive differentiation through accessibility

"At Pier 1 Imports, we've embraced the cloud. It helps us operationalize technology quickly and react to our ever-evolving business needs"

Andrew Laudato
Pier 1 Imports

Personalized offers

Retailer Pier 1 Imports wanted to offer a connected, personal experience both online and in store

Improve visibility and make accurate predictions

Dartmouth-Hitchcock revolutionizes personalized healthcare

Scenario   Static treatment plans | Outdated, generic data

Solution   ImagineCare collects and analyzes real-time and historical data from across devices and records, then surfaces metrics in clinical dashboards and mobile apps for a consumer-focused, personalized treatment plan.

Result
- Empowered, healthier patients with personalized, evidence-based treatment plans
- The ability to identify issues like heart attacks before they happen
- Millions of dollars saved in readmission costs, unnecessary ER and doctor visits, and less missed work
- Improved quality of life with 360° views of patient health
- More effective population health management

Dartmouth-Hitchcock

"This system is really transforming how we can deliver health and wellness to the population. Despite all of the technology involved, ImagineCare does not lose that human touch, which is so important."

Nathan Larson,
Director of Remote Medical Sensing

Microsoft

Get the right products to the right places

JJ Food Service optimizes their supply chain

Scenario
Outdated legacy systems | Manual processes | Lack of supply chain visibility

Solution
Dynamic AX end-to-end with Azure Machine Learning analyzing real-time and historical customer data to create predictive shopping lists and provide product recommendations based on cart contents

Result
- Accurate predictions of customers' needs
- IoT-enabled cab sensors
- Arrival of foods in peak condition
- Increase in basket value through upsell with decreased checkout times

"With Azure Machine Learning, the wow factor is huge. Customers are amazed that we can predict so accurately what they need."

Mushtaque Ahmed,
COO, JJ Food Service

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Next Gen Machine Learning

GPGPU
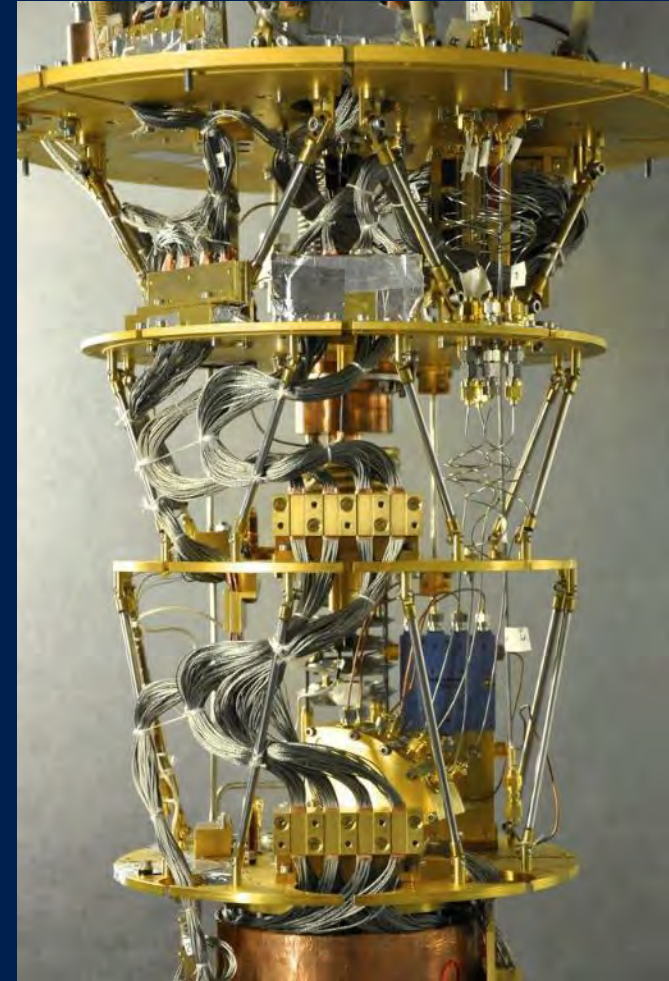FPGA
ASIC
Memristors
Stochastic
Processors
D-Wave Annealing
Quantum

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