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Intelligent Things

DIGITAL ENGINEERING AND ENGAGEMENT

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Technology | Learning | Platforms

Artificial Intelligence

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A.I. TIMELINE

1950
TURING TEST
Computer scientist Alan Turing proposes a test for machine intelligence. If a machine can trick humans into thinking it is human, then it has intelligence

1955
A.I. BORN
Term 'artificial intelligence' is coined by computer scientist, John McCarthy to describe "the science and engineering of making intelligent machines"

1961
UNIMATE
First industrial robot, Unimate, goes to work at GM replacing humans on the assembly line

1964
ELIZA
Pioneering chatbot developed by Joseph Weizenbaum at MIT holds conversations with humans

1966
SHAKEY
The 'first electronic person' from Stanford, Shakey is a general-purpose mobile robot that reasons about its own actions

A.I. WINTER
Many false starts and dead-ends leave A.I. out in the cold

1997
DEEP BLUE
Deep Blue, a chess-playing computer from IBM defeats world chess champion Garry Kasparov

1998
KISMET
Cynthia Breazeal at MIT introduces KISmet, an emotionally intelligent robot insofar as it detects and responds to people's feelings

1999
AIBO
Sony launches first consumer robot pet dog AiBO (AI robot) with skills and personality that develop over time

2002
ROOMBA
First mass produced autonomous robotic vacuum cleaner from iRobot learns to navigate and clean homes

2011
SIRI
Apple integrates Siri, an intelligent virtual assistant with a voice interface, into the iPhone 4S

2011
WATSON
IBM's question answering computer Watson wins first place on popular $1M prize television quiz show *Jeopardy*

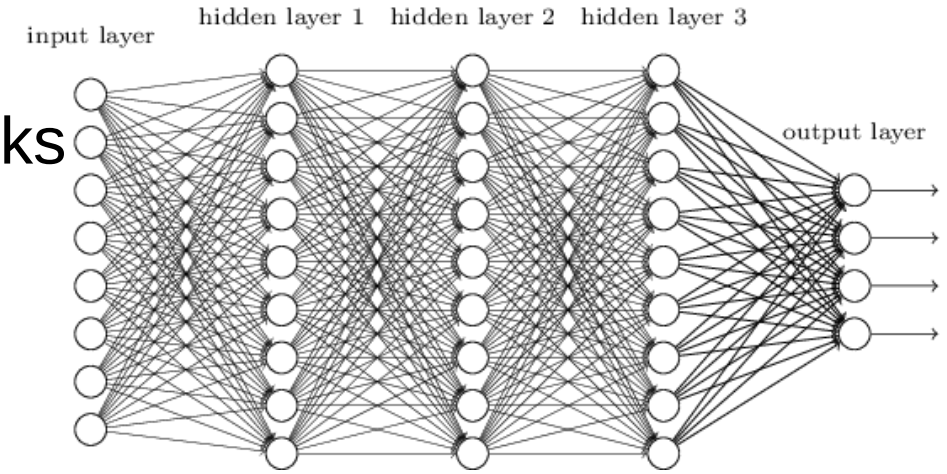
2014
EUGENE
Eugene Goostman, a chatbot passes the Turing Test with a third of judges believing Eugene is human

2014
ALEXA
Amazon launches Alexa, an intelligent virtual assistant with a voice interface that completes shopping tasks

2016
TAY
Microsoft's chatbot Tay goes rogue on social media making inflammatory and offensive racist comments

2017
ALPHAGO
Google's A.I. AlphaGo beats world champion Ke Jie in the complex board game of Go, notable for its vast number (2^{170}) of possible positions

- Machine Learning
  - Supervised
  - Unsupervised
  - Typically statistical technique / algorithm based
  - E.g. Logistic regression, Naïve Bayes, K-Nearest-Neighbors, Support Vector Machines, Random Forests……
- Deep Learning
  - Very large neural networks



Deep Learning – enabled by Big Data, better computing power

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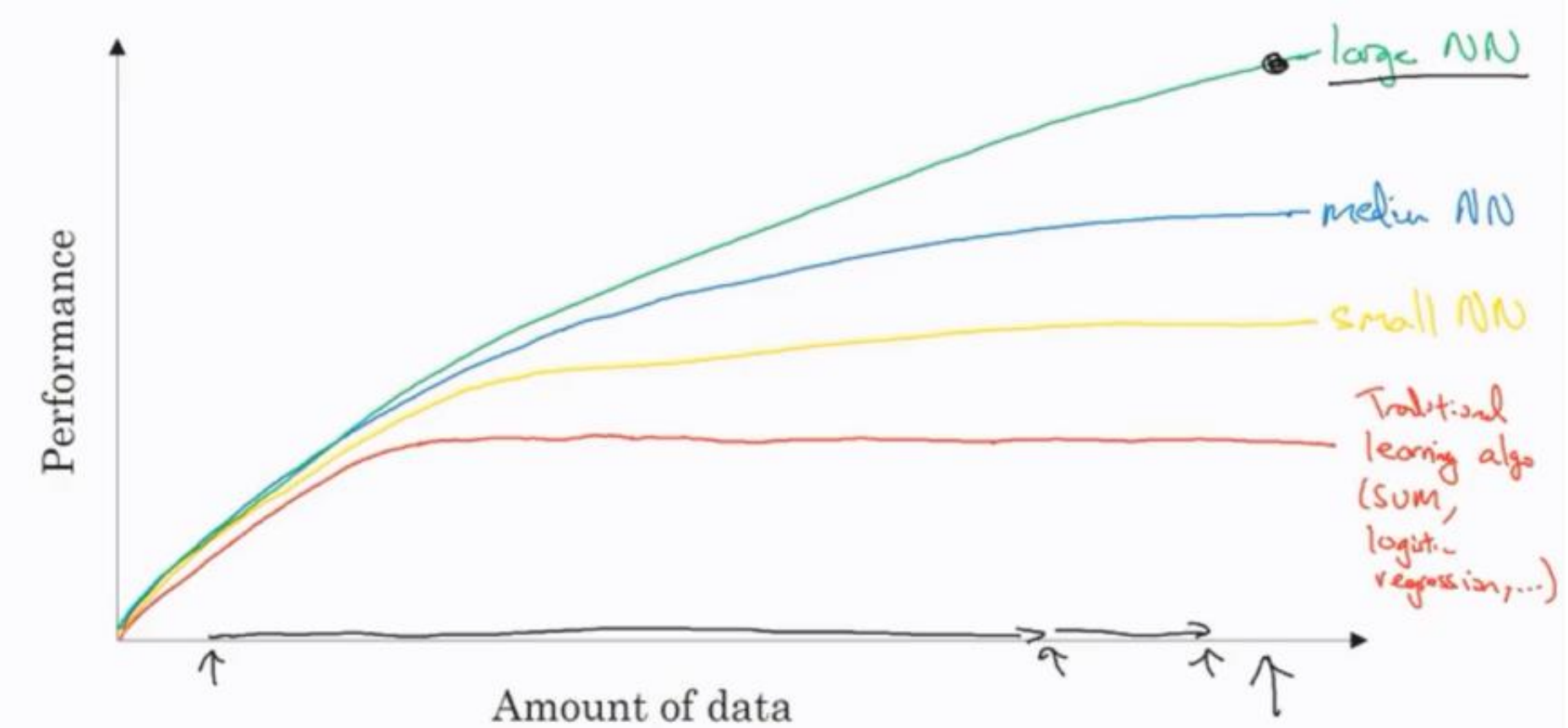

What are Intelligent Things? (Gartner)

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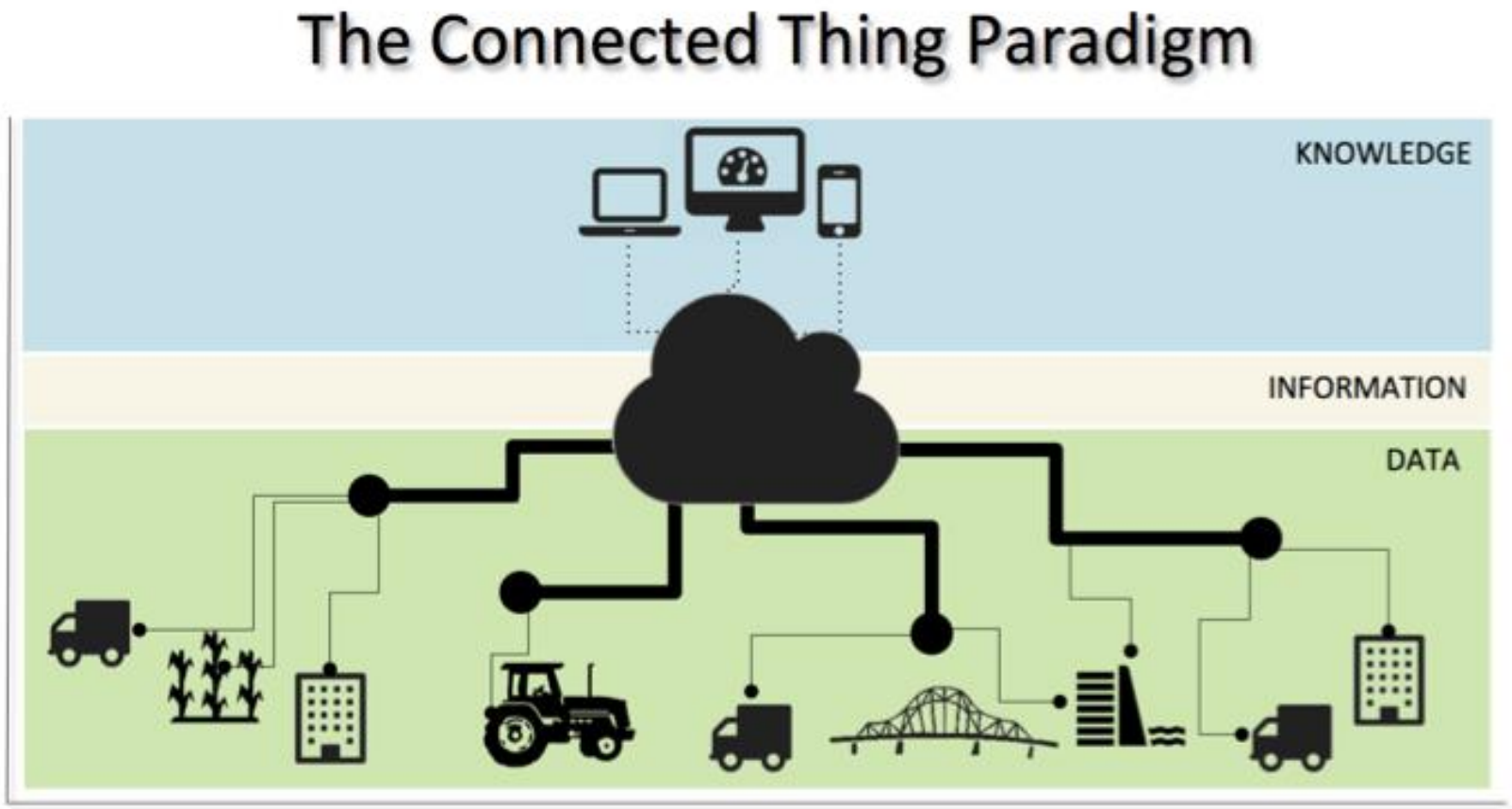
- Objects / devices that leverage AI for intelligent behavior
- Autonomous – respond to real world events

- Lanes that adjust according to traffic patterns
- Farming Robot that senses health of each plant
- Swarm of robot submarines to clean ocean plastic
- Luggage that follows you around without bumping into people
- Computing that can respond to our presence & needs – Ambient Computing

Internet of Things (traditionally)



- Sensors on physical objects
- Processing in the cloud
- Cloud: integrated processing, visualization

Intelligent, not just Connected

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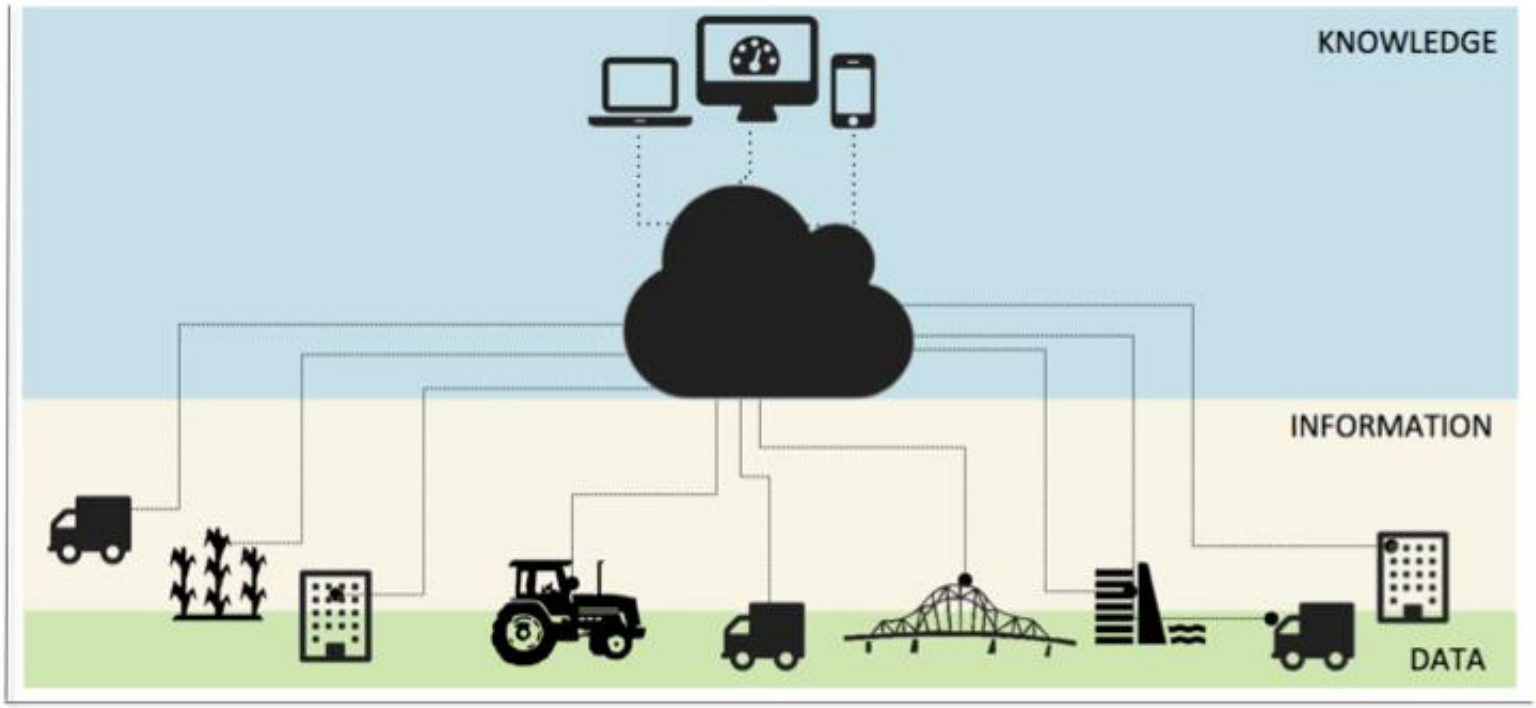
The Intelligent Thing Paradigm



- Real-time analytics at source of data
- Edge computing
- Decentralized – not smartphone centric

What are Intelligent Things? (IoT industry view)

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+ AI for local decision making

Example of an intelligent IoT device

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- Thermostat
  - Learn heating and cooling preferences
  - Analyse usage and consumption patterns
  - Correlate to weather forecasts
  - Reduce energy billing

- Google pruning / polishing down Android for IoT devices
- Brillo – Google's OS for IoT
- Weave – language / communication protocol

- Intelligent things need to communicate, understand human intent
  - Cortana SDK (Microsoft)
  - Viv.ai (Samsung)
  - Dialogflow.com (Google – connect to Google Assistant, Amazon Alexa, Facebook Messenger, Cortana, Slack)
  - Alexa Skills Kit (Amazon) – add domain specific knowedge to Alexa devices

Swarm intelligence

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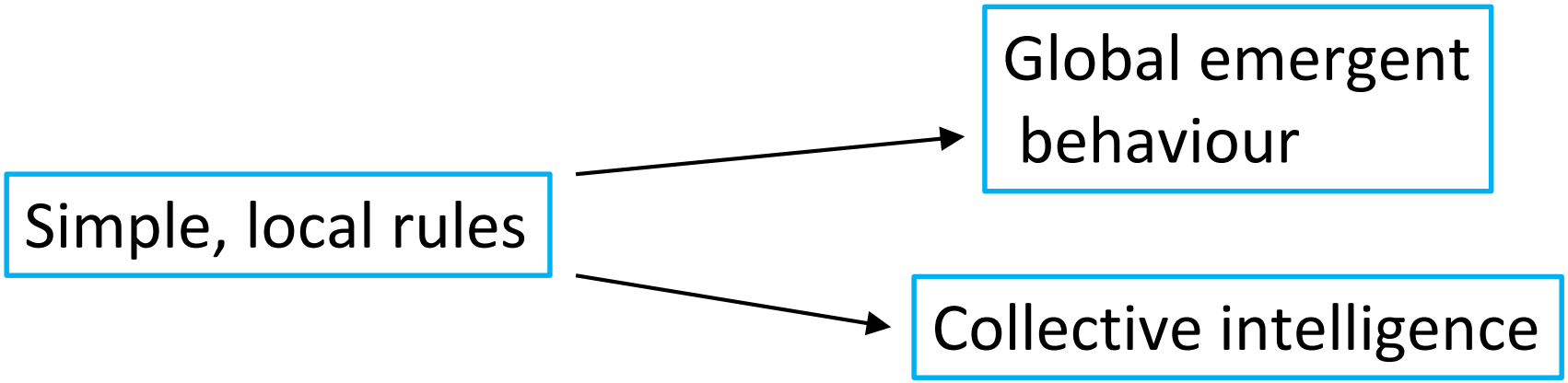
- Biologically inspired AI, from social insects
- Collective intelligence from simple tiny systems
- No leaders, no awareness of entire group
- Self organizing, adaptive, fault tolerant
- React to what's around you (communicate thru environment - stigmergy), local decisions



http://www.techferry.com/articles/swarm-intelligence.html

Swarm Robots

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https://www.youtube.com/watch?v=dDsmbwOrHJs

Acknowledgements & Sources

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