# Artificial intelligence and Machine Learning

Rich Brunner
CIO, V.P. of Products and Technology
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# Why must Humans do all the thinking?

# World's most concerning issues

1. Climate change / destruction of nature
2. Large scale conflict / wars

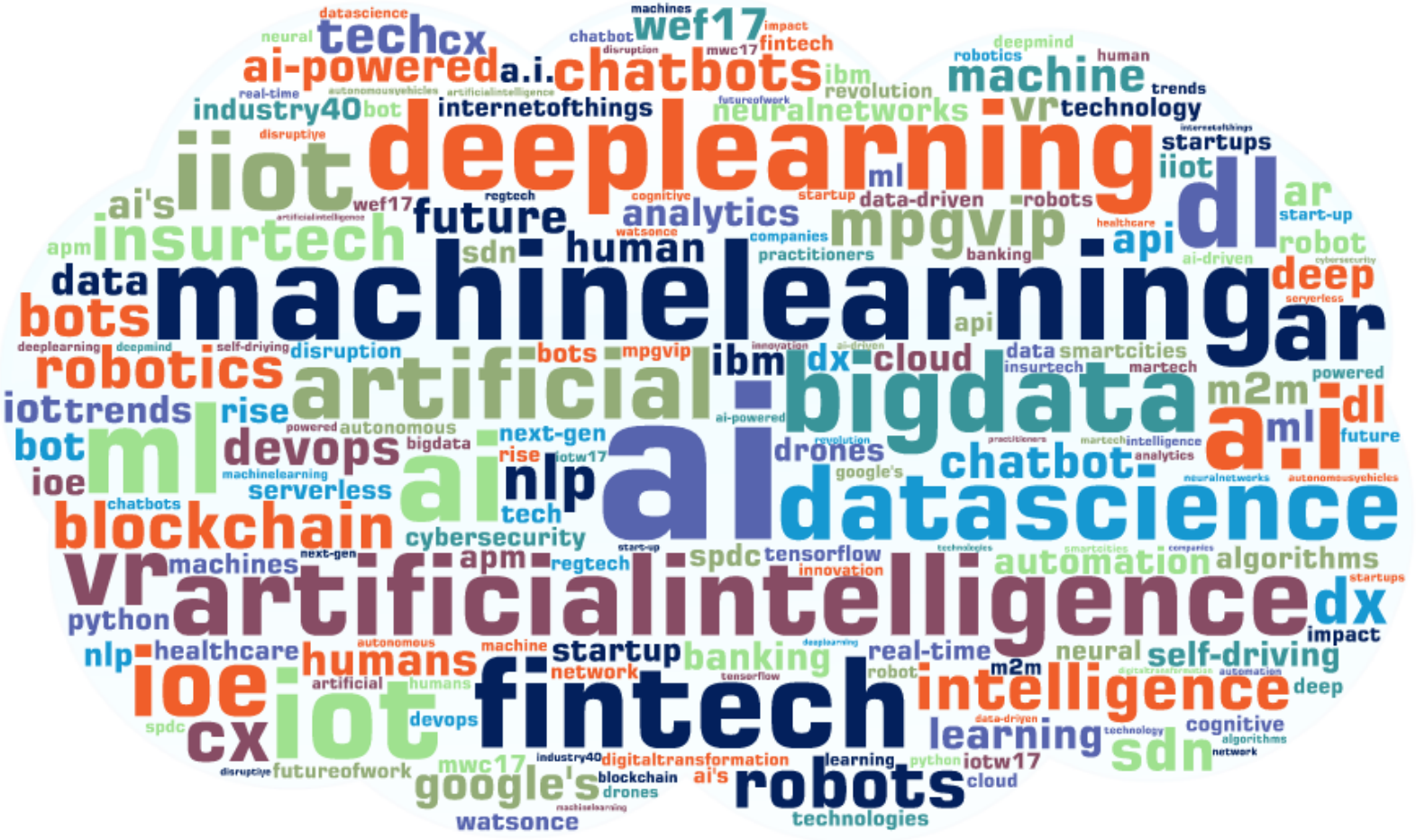
10. Lack of economic opportunity and employment

World Economic Forum, 2018

# The Human Brain

- 100,000,000,000 Neurons
- 10,000,000,000,000 Synapses
- The most complex machine known to man
- Studied by
  - Philosophers, Psychologists, Surgeons
  - Neuroscientists
  - Theoretical Neuroscentists
  - Neuromorphic Computing Researchers
  - Cognitive Neuroscientists
  - Molecular Neuroscientists

# Artificial Intelligence



# What is Artificial Intelligence

A system's ability to:

- correctly interpret external data,
- to learn from such data,
- and to use those learnings to achieve specific goals and tasks through flexible adaptation

# Why Pursue Artificial Intelligence?

- Acts as a multiplier of human ingenuity
- Makes our life better, as it does repetitive (drudgery-inducing) tasks way faster and more efficient than we could ever do so.
- Provides insights, options (and ultimately decisions) we otherwise wouldn't get ourselves

# Artificial General Intelligence

- Could successfully perform any intellectual task that a human being can.
- Not currently close, but at least 45 active R&D projects. Largest 3 being DeepMind (Google), The Human Brain Project (EU) and OpenAI (Musk)
- Achieving AGI has been labeled “The Singularity”.
- Experts generally agree this will happen this century.

*“The development of full artificial intelligence could spell the end of the human race….It would take off on its own, and re-design itself at an ever increasing rate. Humans, who are limited by slow biological evolution, couldn't compete, and would be superseded.”*

— Stephen Hawking

# Historical highlights if A.I.

- Started in 1957
- 1966 –Eliza –A machine that could respond to humans (in text)
- 1968 - HAL 9000 from *"2001 a Space Odyssey"*
- 1980 – XCON gives rise to Expert Systems
- 1991 – Birth of the Internet
- 1997 – Deep Blue beats Gary Kasparov in Chess
- 2011: Watson on Jeopardy, Siri
- 2014: Alexa

Critics: AI Winter is Coming!

# Examples of AI

- Fully automated vehicles
- Personalized medical treatment
- Robot-assisted surgery
- Deep Fake video persona hacking
- Predicting what music you'll want to hear
- Using Facebook to diagnose medical conditions
- When will my food delivery arrive?
- Optimizing soil health and crop yields

# Why Now?

- Market pressures
- Faster computers – GPUs and purpose-built chips
- Big data–oriented data management platforms
- Dramatically more data captured and available
- Democratization of the Cloud–Drives down costs, increases availability of storage and algorithmic capabilities
- Commercialization – Computer giants are “all-in”

# Explosive Growth in AI

- AI and machine learning have the potential to create an additional $2.6T in value by 2020 in Marketing and Sales, and up to $2T in manufacturing and supply chain planning.

  Source: McKinsey Global Institute

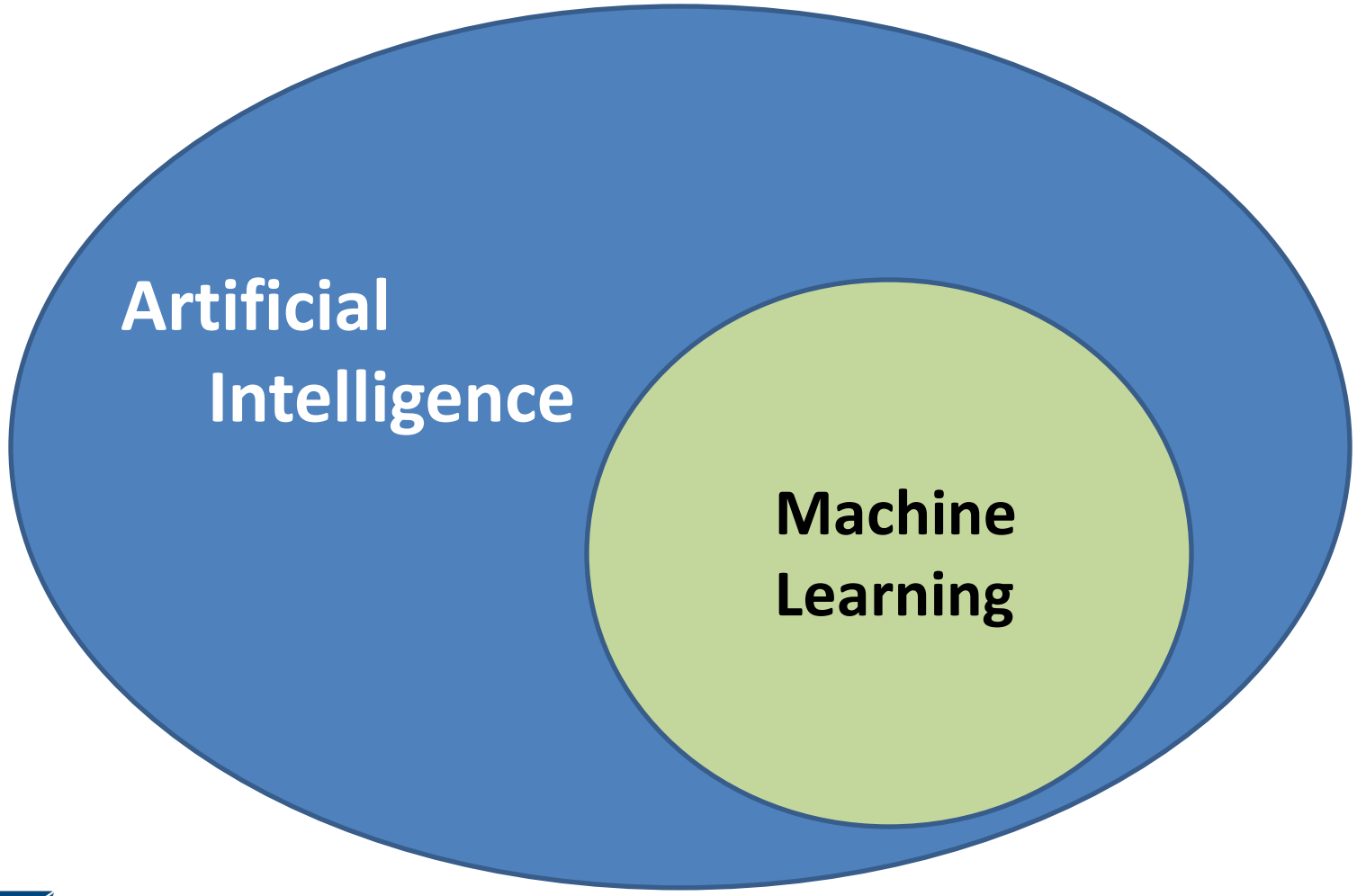
- The market for Cognitive and Artificial Intelligence systems will reach $77.6B in 2022, more than three times the $24.0B spent in 2018

  Source: IDC Worldwide

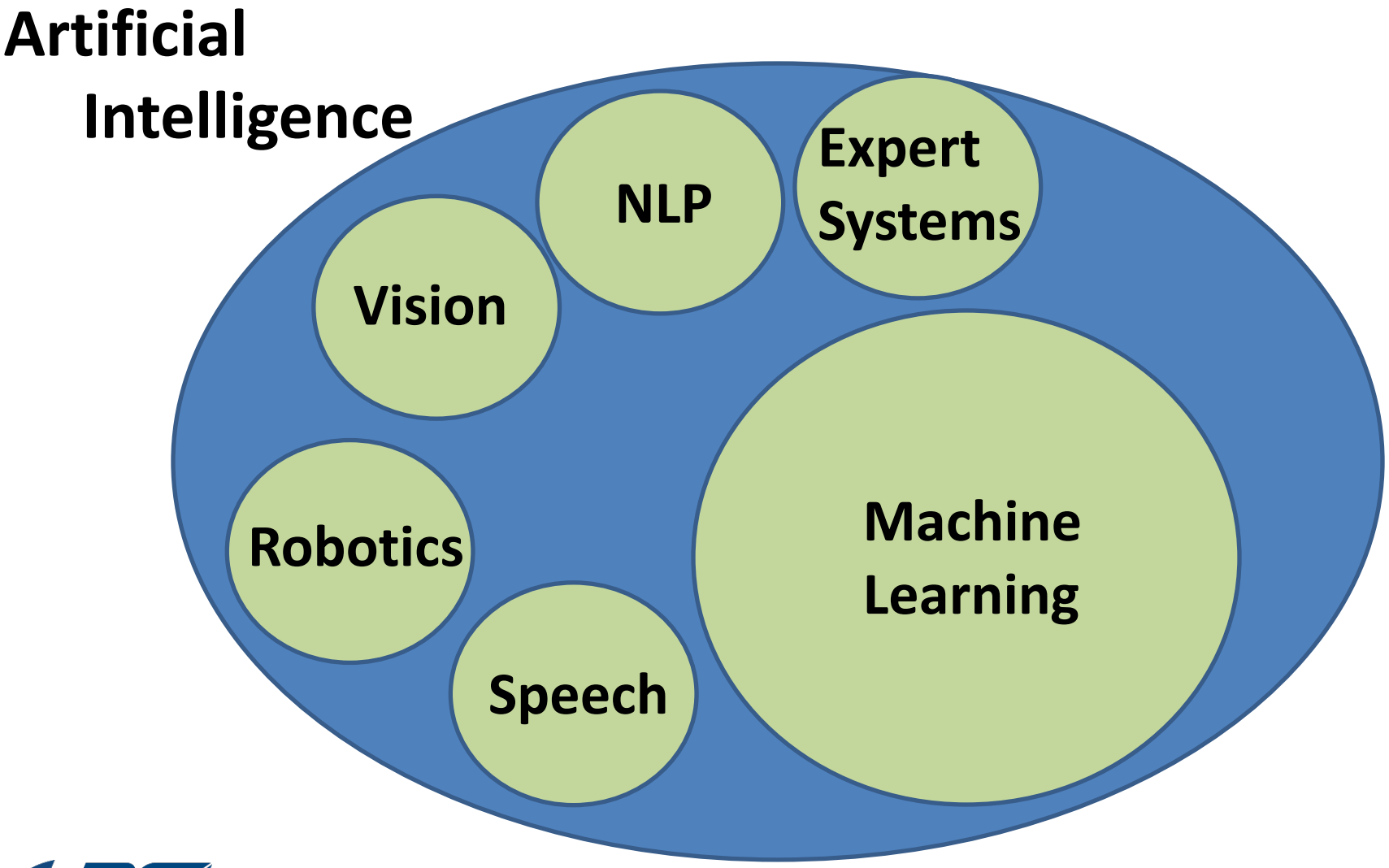
- 47% of organizations participating in a recent survey say they have either scaled up and industrialized machine learning or are moving projects into production.

  Source: HFS Research & KPMG

# Machine Learning vs AI

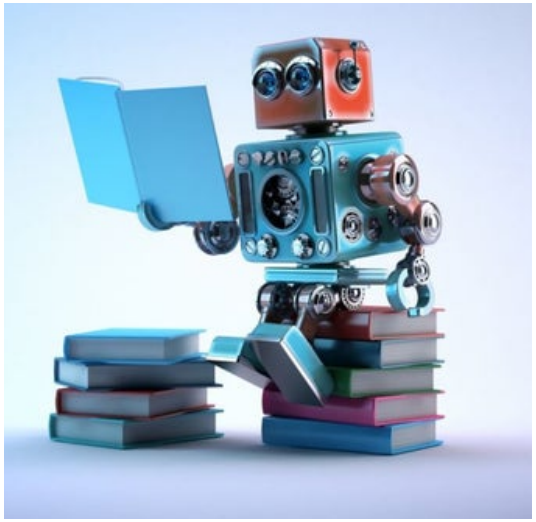


# Other Types of AI

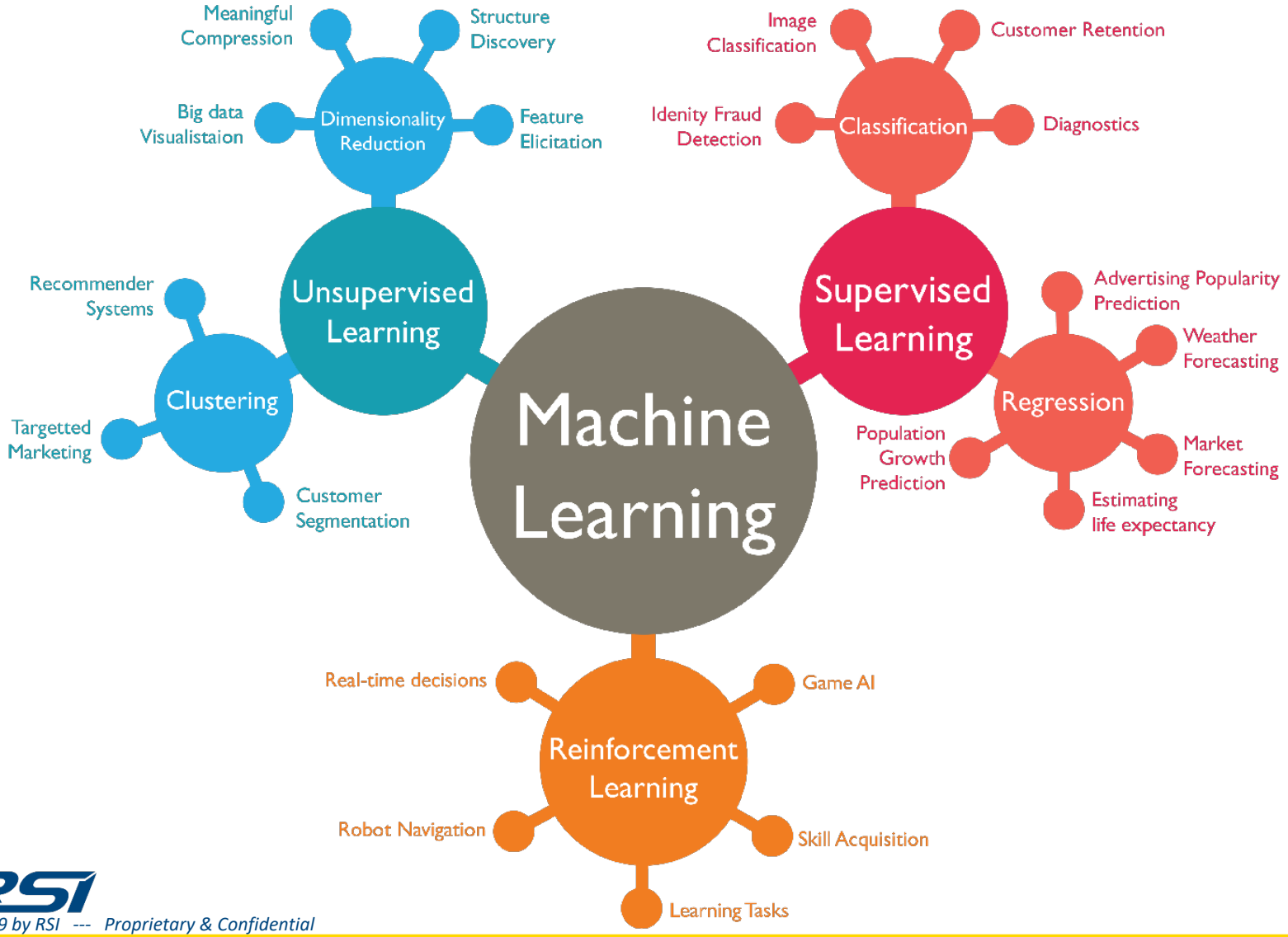


# Machine Learning vs AI

- We don’t feed the computer rules or instructions, we allow it to learn from examples and experience
- Give it examples – Thousands, or millions, and it will then extrapolate to how it should treat the next one,
- Dynamic – Can modify itself based on more data



# Differing Learning Approaches

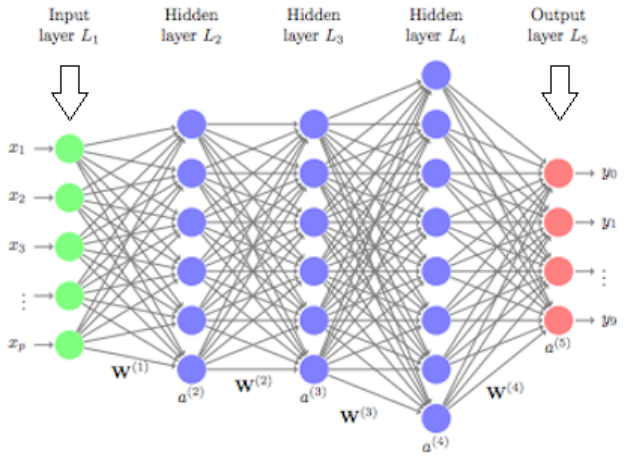


# Artificial Neural Network

- Can sort through complex and messy data and model it to make it useful
- Show me thousands of pictures of cats and tell me that they are cats (labeling) and I'll develop the ability to recognize a cat, without having any real information about what a cat "is"

# Deep Learning

- Multiple levels of neural networks, including potentially unstructured, unlabeled data, where each layer feeds the subsequent layer
- “I’m 95% sure these pictures are all of domesticated female cats that live indoors, while this group is all male dogs that are happy and living outdoors”



# Natural Language Processing

- Smart Virtual Assistants - Alexa, Siri, Google Assistant, etc.
- Chatbots
- Difficulties come in understanding context – “Steve Jobs ran Apple like an artist”
- Tremendous growth coming in “human-ness” of machine initiated speech (i.e., natural language generation)

# Sample uses for Machine Learning

- Identifying Refund Fraud
- Refunds held for approval – the machine can help
- Making decisions on Return exceptions
- Collections – Whom to go after first or…how to identify them well before they go to Collections
- Customer Service – I know why you're calling and here's your answer.  Text you with your answer before you call.

# Sample Uses for Other types of AI

- Identifying unhappy callers, or escalating call situations
- Chatbots – Fielding questions for you live or online
- Manual Collections – Conversing with your delinquent taxpayers
- Using social media sentiment analysis to identify likely non-filers and then using targeted nudge marketing to deter in advance

# Impacts on Your Business

- Drives costs down, but requires upfront investment
- Leverages your top people – Let the machines learn from your best!
- Need to build knowledge about AI and trust for results it delivers
- Legislative impact – e.g., can machines make decisions?
- Staffing – There'll be reskilling opportunities
- Need for Data Scientists

# What will drive continued growth

- Quantum computing will exponentially advance computing power
- Inter-relationships between techniques drives materially better results
- The Artificial Intelligence global arms-race

# Questions