

## Business Solutions Enabled by Artificial Intelligence

John Wheat  
AI Lead

David Hemingson  
Partner

ISG Higher Education and Academic Medical Centers Practice

# Objectives of Today's Session

- Demystify and describe current generation AI technologies
- Review the landscape of practical business solutions they are enabling
- Provide an action plan for exploiting these solutions

\* The focus will be on current business solutions and not on predictions about the future.

# Introduction: Why This Topic Now?



“Over the past five years, researchers have achieved key milestones in Artificial Intelligence (AI) technology significantly earlier than prior expert projections.”

*Artificial Intelligence and National Security* by Greg Allen and Taniel Chen, July 2017 – Page 7  
Belfer Center for Science and International Affairs | Harvard Kennedy School.

# Introduction: Why This Topic Now?

“There are four key drivers behind the rapid progress in AI technology:

1. Decades of exponential growth in computing performance
2. Increased availability of large datasets upon which to train machine learning systems
3. Advances in the implementation of machine learning techniques
4. Significant and rapidly increasing commercial investment”

*Artificial Intelligence and National Security* by Greg Allen and Taniel Chen, July 2017 – Page 7  
Belfer Center for Science and International Affairs | Harvard Kennedy School.

# Introduction: Why This Topic Now?

AI-driven technologies are already infused into products and solutions in widespread use today.

Personal Agents	Intelligent Devices (e.g., Thermostats)	Personalized Search	Voice Menus and Assistants
Recommendation Systems	Language Translators	Prediction Systems	Fraud Detection
Medical Diagnostics	Ridesharing Apps	Plagiarism Checkers	Personalized Marketing
Dictation Apps	Chatbots	Financial Analytics	Spam Filters

And, the rate of growth is approaching exponential...

# Agenda

1. Demystifying AI: Context, Definitions and Trends
2. Current Generation AI-driven Solutions
3. AI Trends in Business: ISG Insights 2017 Automation and AI Survey
4. Exploiting AI Opportunities: Outline of an Action Plan



# Part 1 - Demystifying AI

Context, Definitions and Trends



“There is no single definition of AI that is universally accepted by practitioners.”

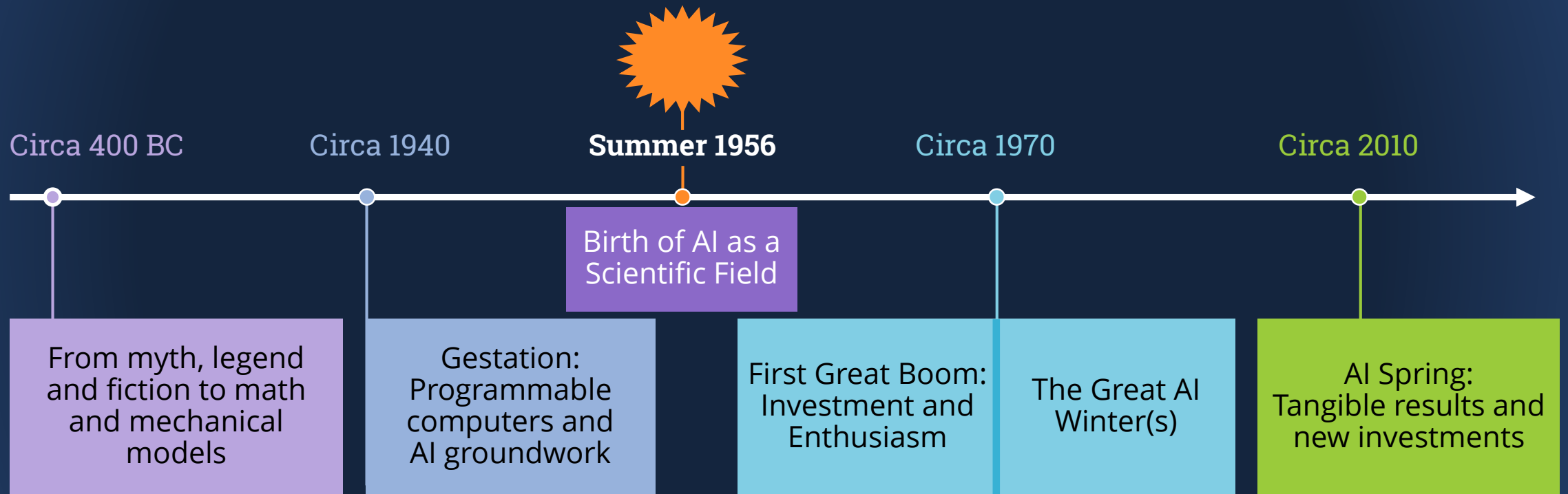
Preparing for the Future of Artificial Intelligence - US National Science and Technology Council Committee on Technology, October 2016



Artificial Intelligence (AI) is the science of creating software and machines which can:

- learn autonomously from data and sensory information
- create new knowledge and insights
- communicate with humans and with other machines
- take action

# The History of AI: A Timeline



# Two main branches of AI pursuit

## General AI

- Definition: AI which has broad, at least human-like cognitive capabilities across many categories and is able to analogize, learn, reason and communicate like humans.
- Does not exist yet and probably will not for many decades
- Also known as:
  - Strong AI
  - Artificial General Intelligence (AGI)

## Narrow AI

- Definition: Specific-purpose AI technologies which are used to bring some aspects of intelligence to automation of specialized tasks. Cannot generalize to other tasks.
- In widespread use today in an ever-growing number of applications
- Also known as:
  - Weak AI
  - Specialized AI

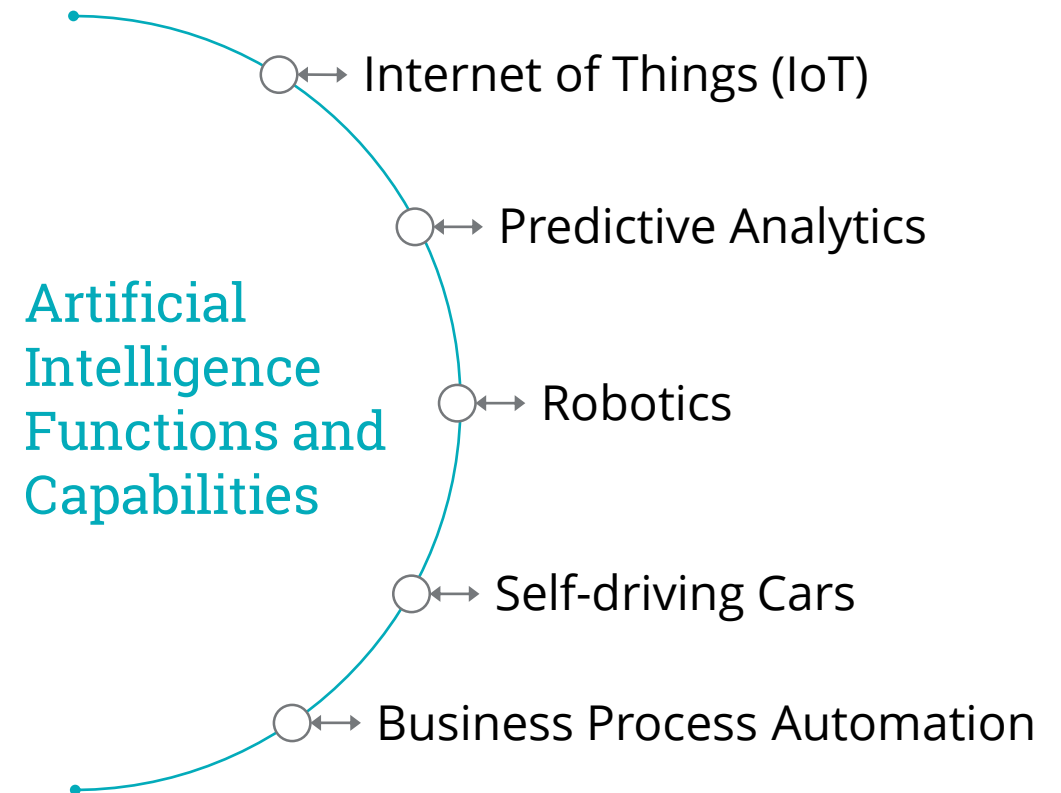
# AI Sub-fields as Building Blocks

- Can be used alone or in tandem for endless possible products/services
- Specialized or “narrow” intelligence
- NOT artificial general intelligence (AGI)



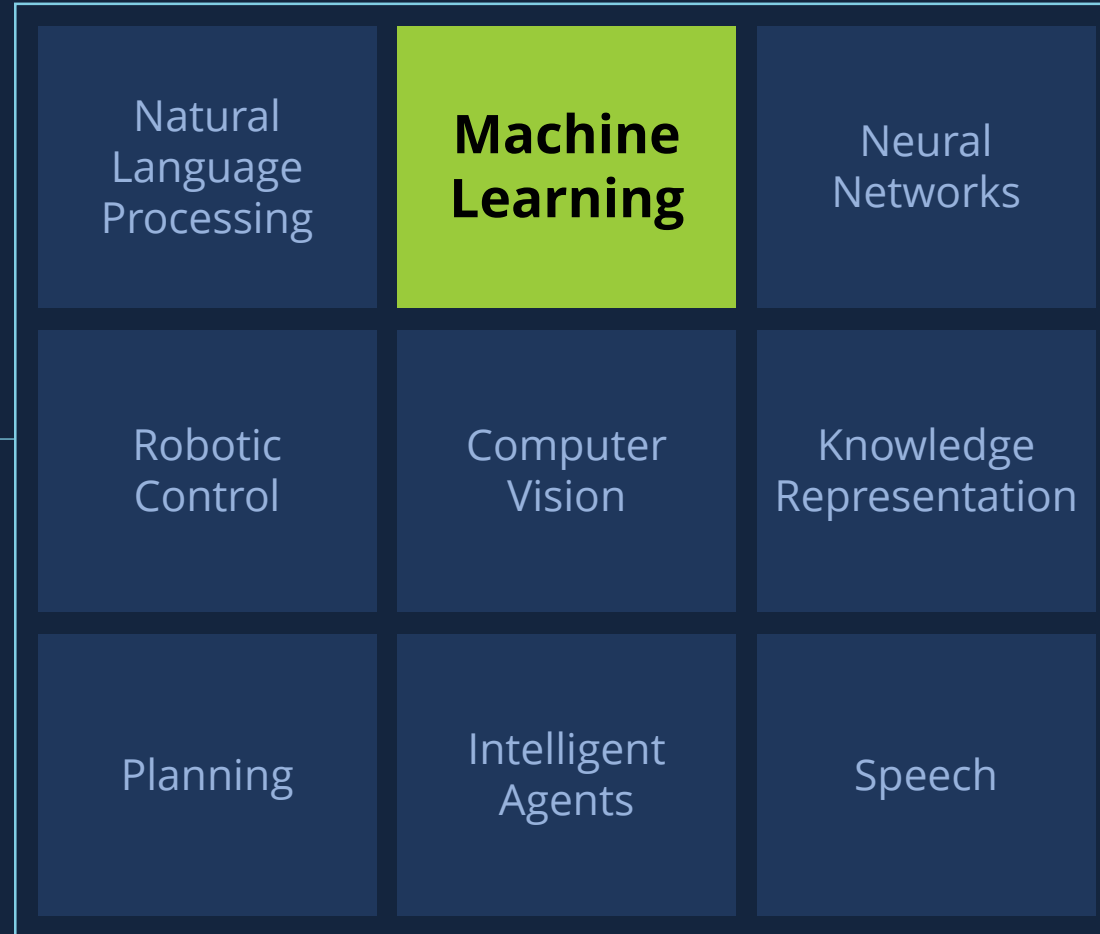
# AI Technologies are Rapidly Being Integrated into Every Form of Automation

- Combined with conventional technologies, AI can create new or more intelligent products, services and capabilities
- These are greater than the sum of their parts
- Can control, learn from, integrate and/or extend the capability of conventional technologies



# Focus on Machine Learning (ML)

AI Sub-Field  
Technologies



# What does machine learning do?

Basically:

1. Sophisticated computational **pattern recognition**
2. Compound patterns to identify broader characteristics and trends; and then...
3. **Predict** behaviors, future actions and trends

Which can be used as the basis for an endless variety of services & products:

Face  
Recognition

Self-driving  
Cars

Market  
Analysis

Recommendation  
Systems

Personal  
Assistants

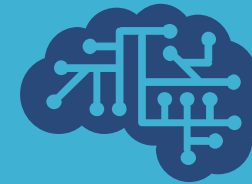
Language  
Translators

Medical  
Diagnostics

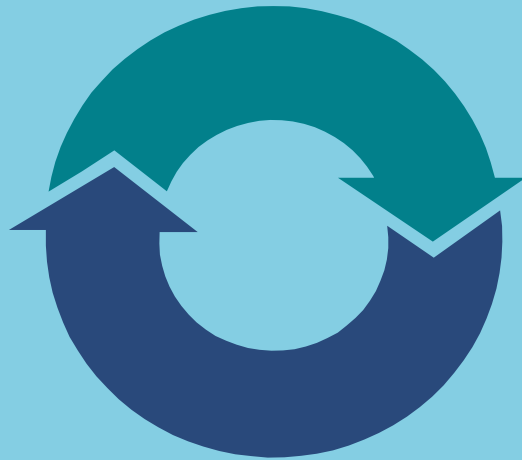
Intelligent  
Search

Research  
Discoveries

# Artificial Intelligence



## Machine Learning



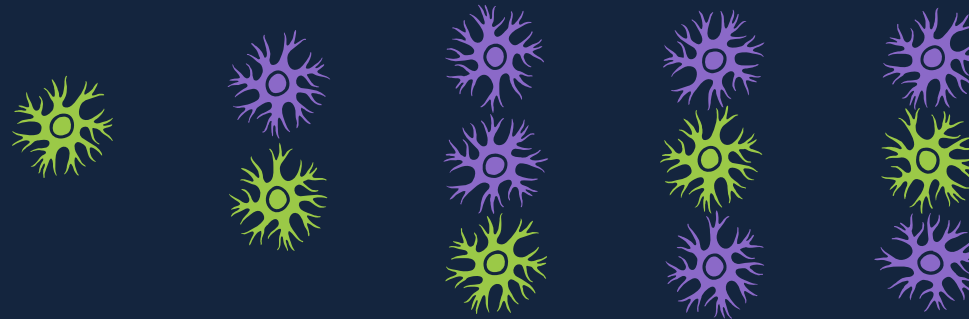
### Deep Learning



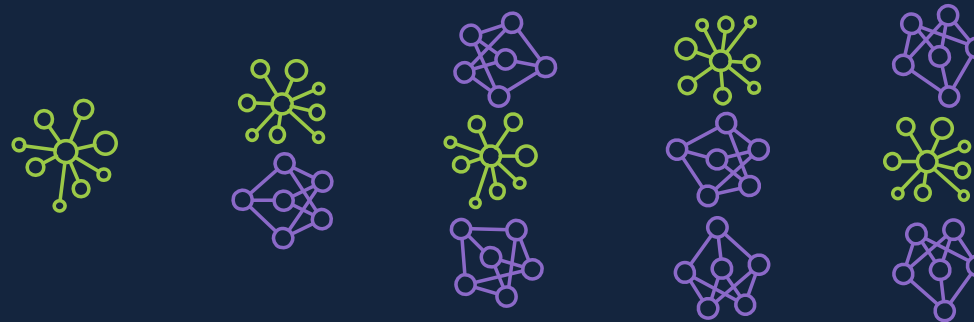


# Biological Model for Deep Learning

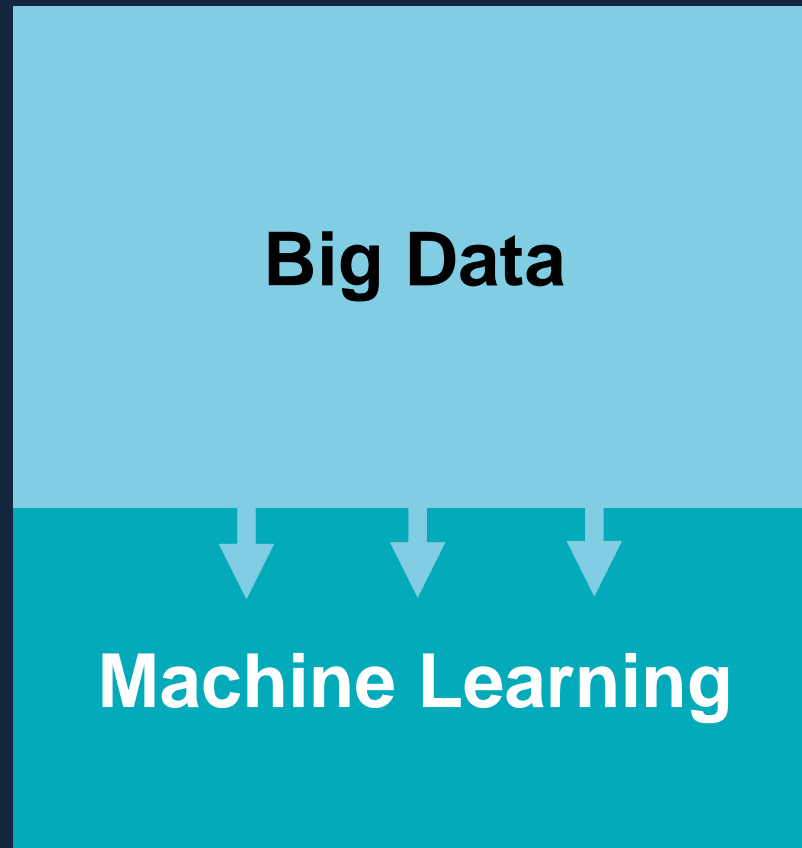
Biological Learning  
Learning by reinforcing  
**neural pathways**



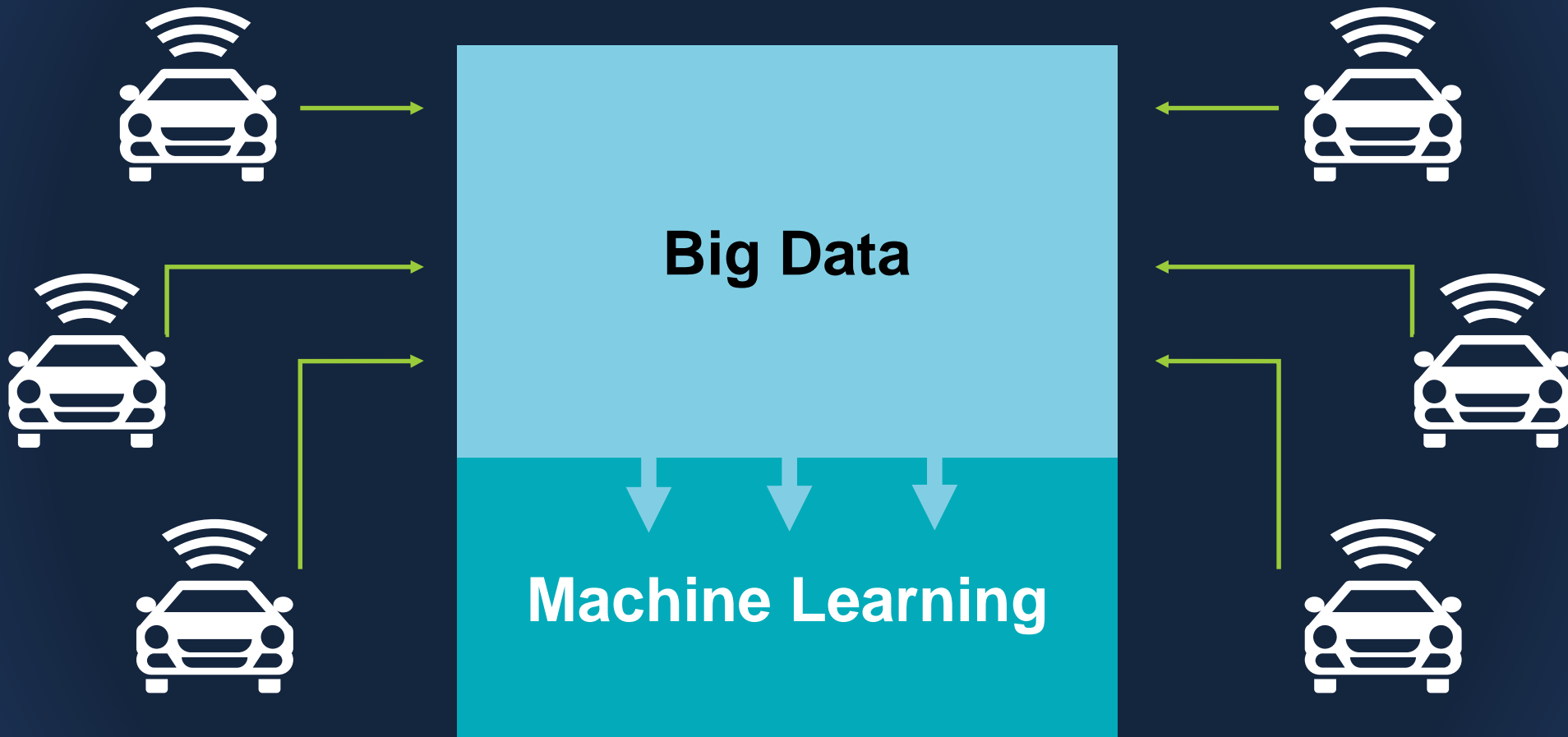
“Deep”  
Neural Net  
Learning by using  
**computational statistics**



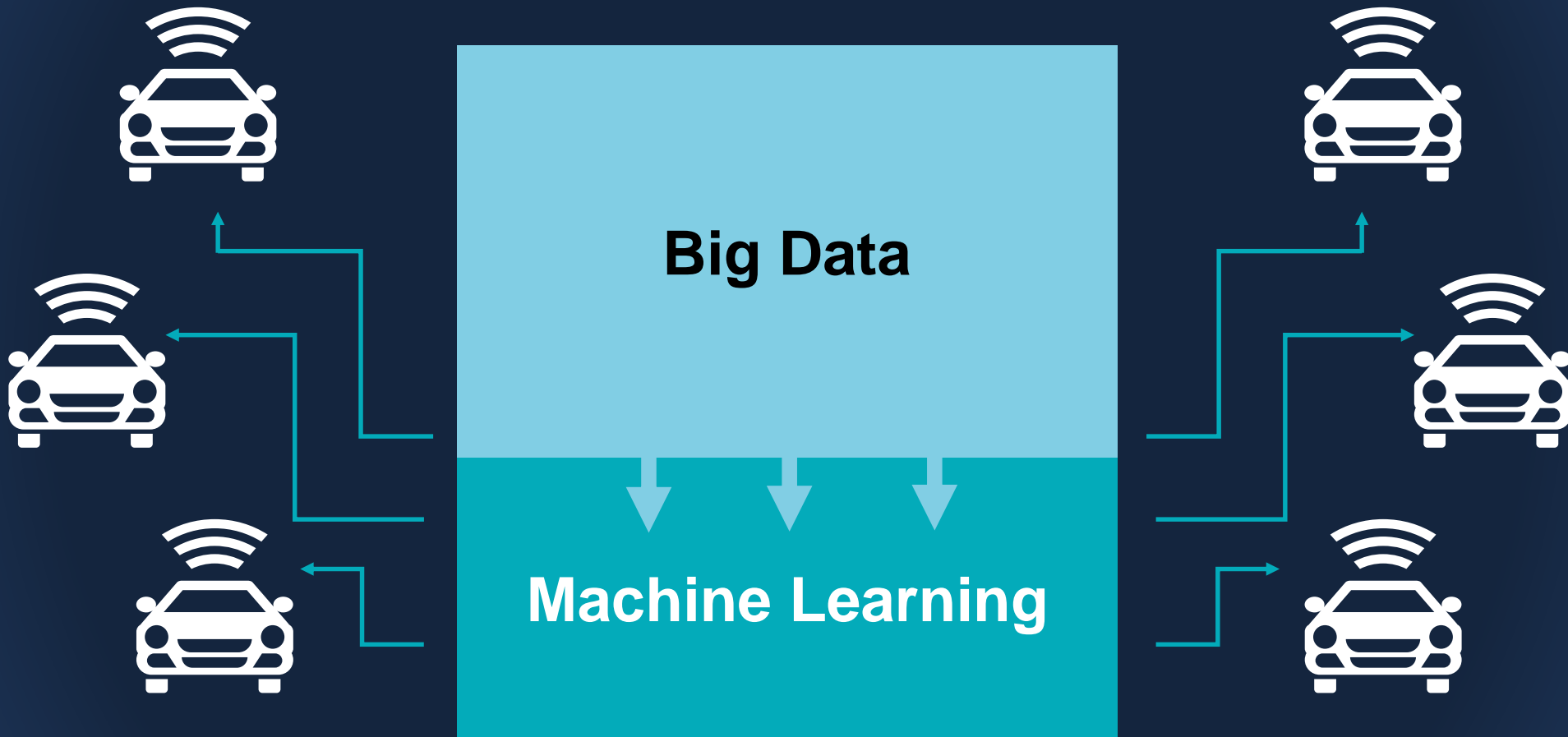
# The “Deep” Relationship between Machine Learning and Big Data



# Self-driving Car “Fleet” Learning



# Self-driving Car "Fleet" Learning



# Deep Learning has strengths and limits

## Strengths

- Very broad application to a wide range of automation problems
- Ability to identify subtle/intricate patterns humans miss
- Ability to assimilate huge amounts of data quickly
- Excellent pattern recognition and matching capability
- Excellent predictive capabilities under best data conditions
- No loss of attention during long-term tasks
- Can operate at very large scale with low incremental costs

# Deep Learning has strengths and limits

## Weaknesses

- No "common sense": does not understand context of situation
- Very limited ability to work outside of narrow area of specialization
- Doesn't work well from small amounts of data
- Weak ability to adapt to new situations
- Black box: we cannot see and modify its decisions
- Little to no creativity

# Part 1 Key Points

- The sixty year old field of AI has begun to produce impressive results in the last decade
- The goal of a general purpose intelligence is still probably many decades away
- Breakthroughs in AI sub-fields, especially machine learning, are producing impressive systems which perform sophisticated but “narrow” functions better than humans
- The private sector is now making unprecedented investments to create both new products and new open AI development tools
- This level of investment plus the “learning” capability of the new AI technologies is resulting in a progressively increasing pace of progress and new breakthroughs in intelligent automation
- AI technologies are rapidly being integrated into a ever increasing range of conventional automation solutions thereby adding a degree of intelligence to them

A row of classical stone columns with a dark blue overlay containing text.

# Part 2 - Current Generation AI-driven Solutions



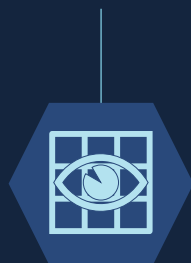
# AI Technologies as Automation Solutions

## Robotic Process Automation



Utilizes GUI of client systems to automate high volume, structured and repetitive processes

## Image Recognition



The process of identifying & detecting an object or feature in image/video files

## Natural Language Processing



Applying computational techniques to the analysis and synthesis of natural language and speech.

## Cognitive Reasoning



Ability to make and provide rationale for complex choices based on prior knowledge absorption

## Conversational AI



The evolution of NLP that powers a virtual agents' ability to hold structured conversations

## Data Extraction



Data analyzed for it's most relevant information (i.e., a contract)

## Natural Language Generation

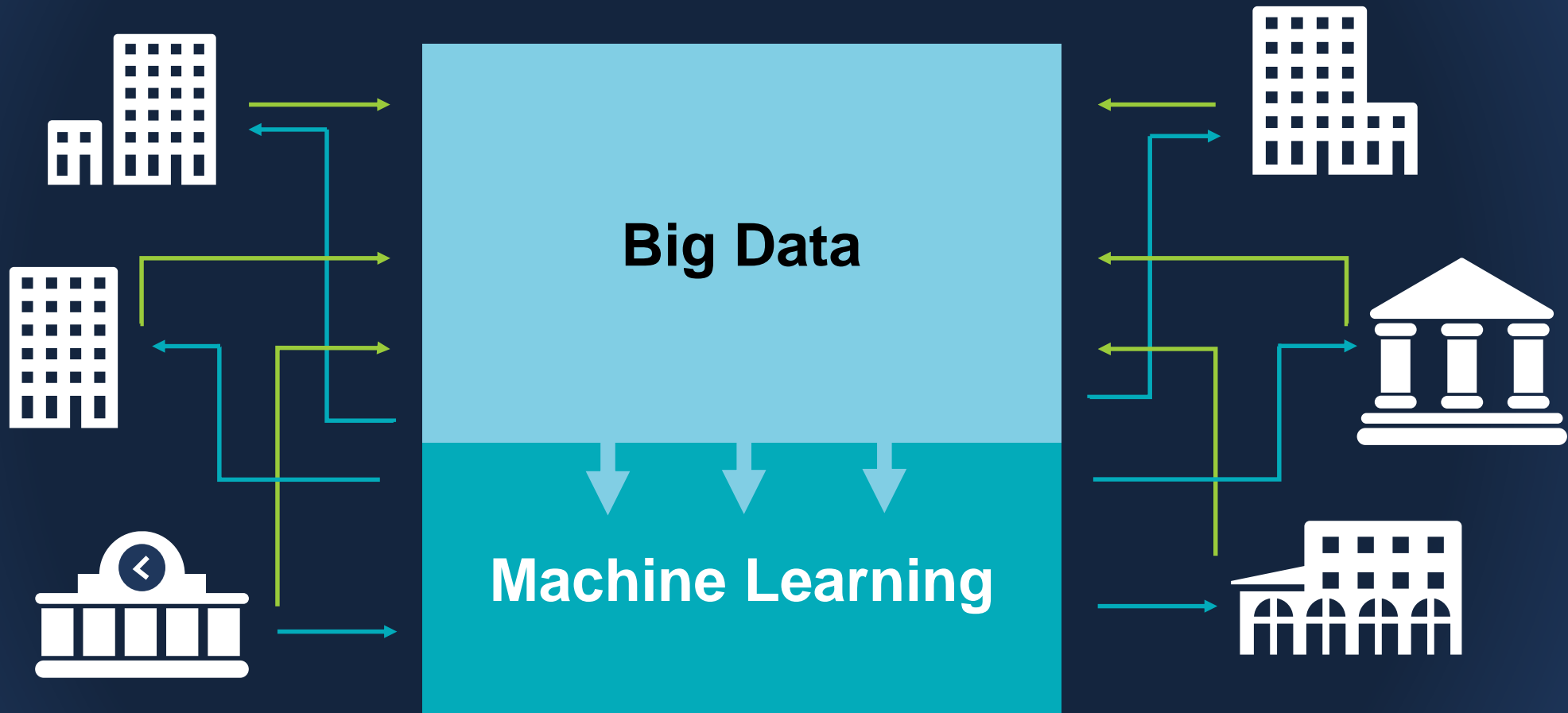


The NLP task of generating natural language from a machine representation system

# Examples of AI Solution Categories

Categories	Technologies	Capabilities	Impacts
Large-Scale Advanced Analytics	ML, analytics tools, institutional/BI databases, external benchmarks databases	Automated support for existing and expanded analytics functions	Faster, more effective response to efficiency opportunities; enhanced, optimized planning functions
Automated/Optimized Operations	ML, IoT, ERP, Facilities Management Systems, other operational support systems	Detailed pattern and trend analysis of operational systems; automated controls	Reduced operational costs, e.g., reduced facilities energy consumption
Digital Labor	ML, NLP, Speech, Intelligent Agents, ERP, other administrative systems	Automation of tasks previously requiring human labor	Reduced labor costs; enhance speed & accuracy; enable people to be re-deployed to advanced tasks

# IoT/AI Autonomous Utilities Optimization



# Evolution of Digital Labor Drives Toward Cognitive

A virtualized human workforce — working faster, with better quality, for less cost.



## Level 1

Automating repeatable processes

- Structured data
- Key Technology: RPA
- Rule-based process – like F&A, HR, and operations



## Level 2

Workforce is designed for variations

- Semi-structured data
- Key Technology: Expert System
- Data changes quickly, and this requires a decision by a human



## Level 3

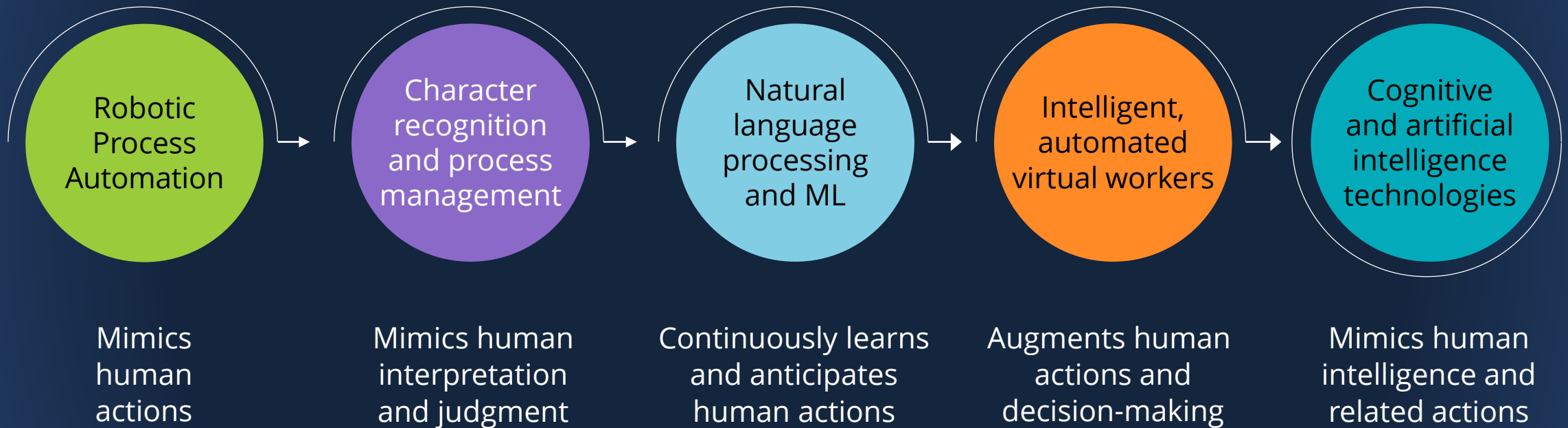
Machine learning improves problem solving

- Unstructured data
- Key technology: Machine learning
- Starting to see POC's emerge

# Digital Labor Examples

	Robotic Process Automation (RPA)	Autonomics	Cognitive
Business Goals	Automation of routine processes to reduce cost and enhance speed & accuracy	Automation of routine processes to reduce cost and enhance speed & accuracy	Automation of non-standard processes to reduce cost, up speed & develop insights
Automation Targets	Business processes that use structured data and business rules (e.g., F&A, HR & Supply Chain)	IT processes that use structured and unstructured data and business rules (e.g., user support)	Business processes that require voice interaction, image recognition and/or involve unstructured data
Value Proposition	Automate any process without the need to change the process or the systems	Automate high volume, "commodity" IT processes	Automate human interaction
Relative Cost	Low	Medium	High

# The Digital Labor Continuum

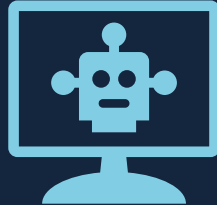


# What is RPA?

“Training” software robots (AKA bots) to execute processes, using same steps, business rules and systems that a person does today.

## Characteristics

- Any process
- No change to process
- No change to systems
- Faster and lower cost to deploy and maintain
- Works 24x7
- Enterprise-ready



## Requirements

- Structured digital
- Business rules



# Functions and Process Areas for RPA

Record to Report	Procure to Pay	Order to Cash	Supply Chain	Human Resources
Gen. Acct. / Close	Vendor Master	Customer Master	CRM & Customer Service	Recruiting
Management Reporting	Sourcing / Contract	Credit / Contract	Demand Management	Comp & Benefits
External Reporting	PO Process	Order Process	Materials Management	Performance Management
Treasury	Goods Receipt	Logistics / Delivery	Capacity Flow Management	Training & Development
Tax	Invoice Process	Billing / Disp. Res.	Transport & Logistics	Payroll





# Part 3 - Automation Trends: Today and Near-Term Future

ISG Insights 2017 Automation and AI Survey: Excerpts and Insights

# Research Approach

## Background and Demographics

In April 2017, ISG Insights™ conducted a global survey of IT and business leaders to assess the state of adoption of automation and AI in their enterprises.

### Company Size:

>25,000 employees:	38%
10 – 25,000 employees:	13%
5 to 10,000 employees:	27%
1 to 5,000 employees:	22%

### Functional Distribution:

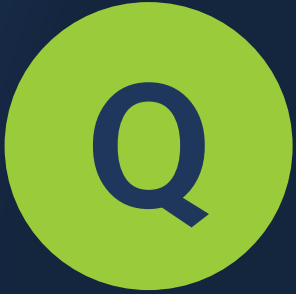
IT:	42%
Finance & HR:	34%
Business ops:	34%

### Region Distribution:

United States:	50%
United Kingdom:	20%
Germany:	15%
France:	15%

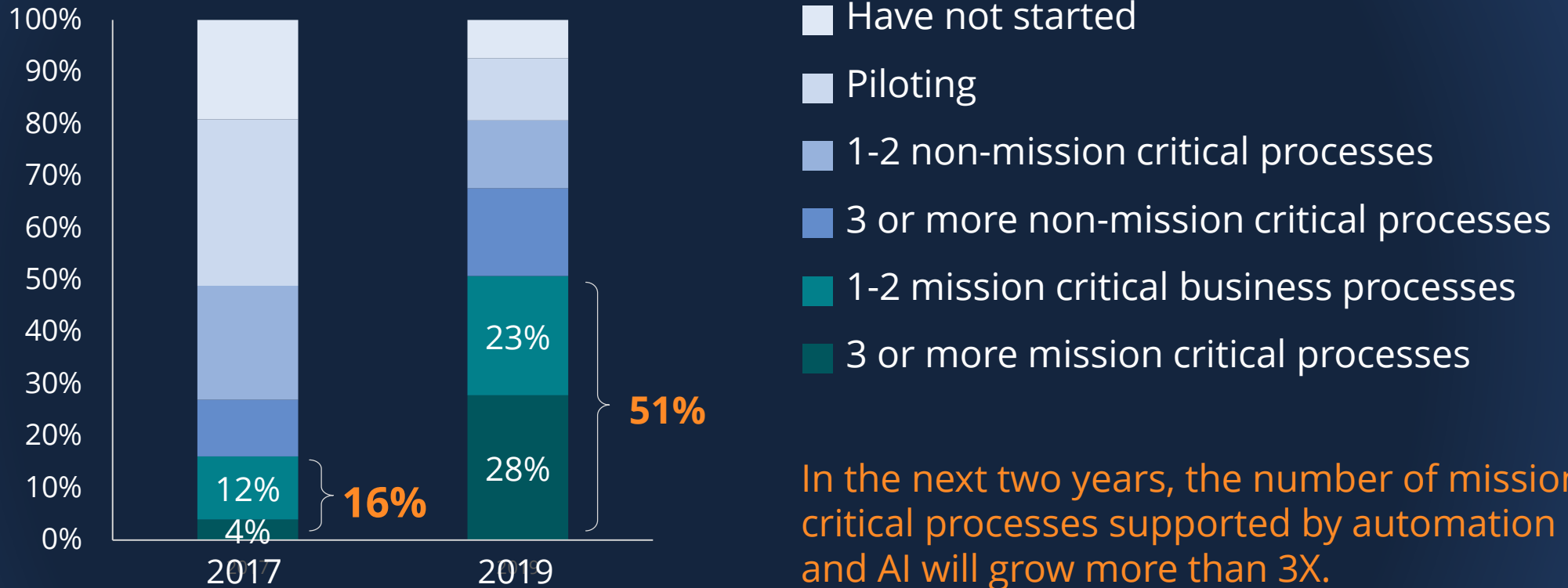
### Title Distribution:

C-level:	13%
SVP+:	10%
VP / GM:	18%
Director:	26%
Manager:	32%



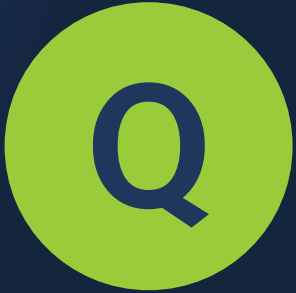
Describe your current state of adoption of automation and AI today, and how you believe it will change by 2019.

# Adoption Today vs. 2019



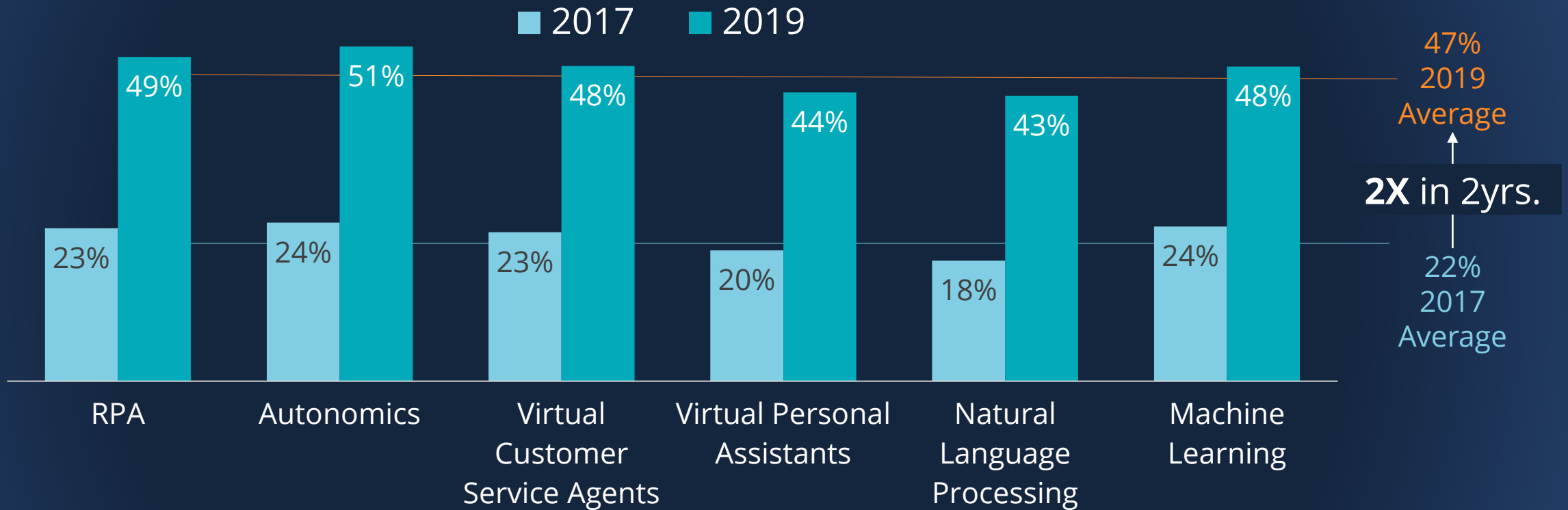
In the next two years, the number of mission-critical processes supported by automation and AI will grow more than 3X.

Source: ISG Insights 2017 Automation and AI Survey, n=532

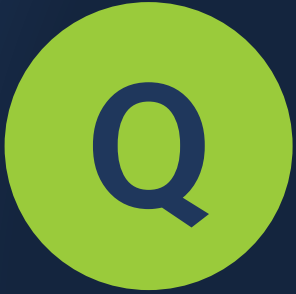


For the following list of technologies, please indicate your current state of adoption, and what you believe it will be by 2019.

# Which Technologies?



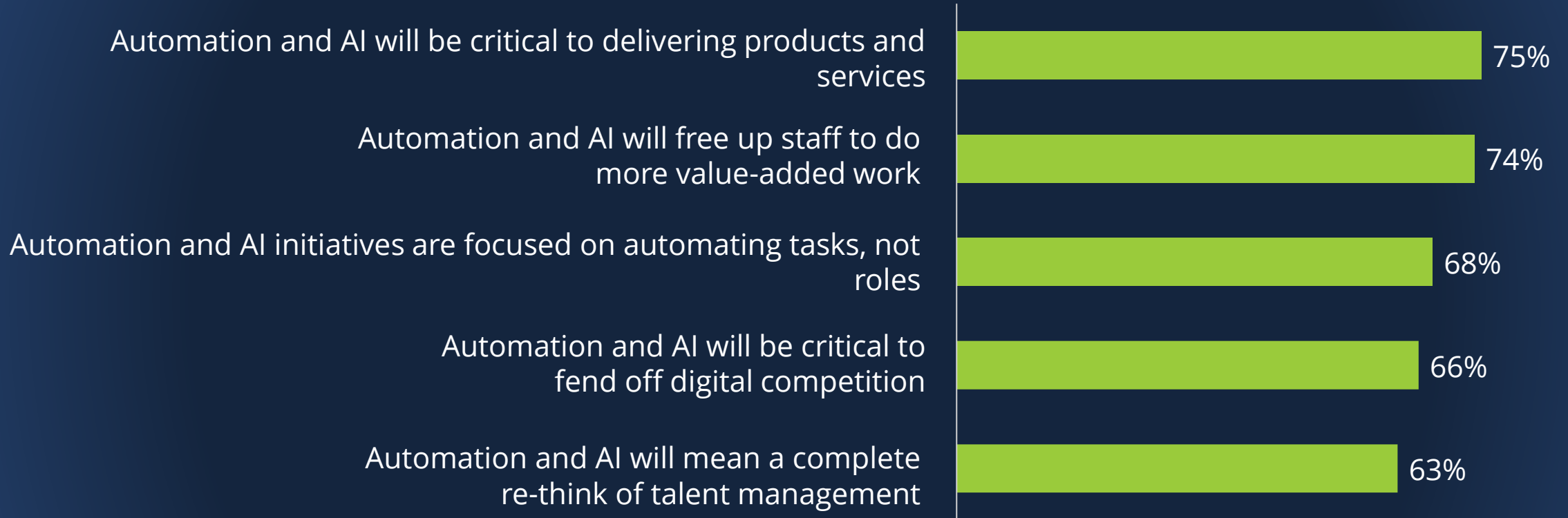
Source: ISG Insights 2017 Automation and AI Survey, n=532



Indicate your level of agreement with the following automation and AI statements.

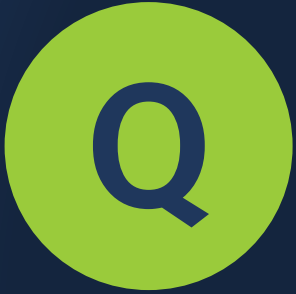
*Note: Agree + Strongly Agree responses shown.*

# Why and How?



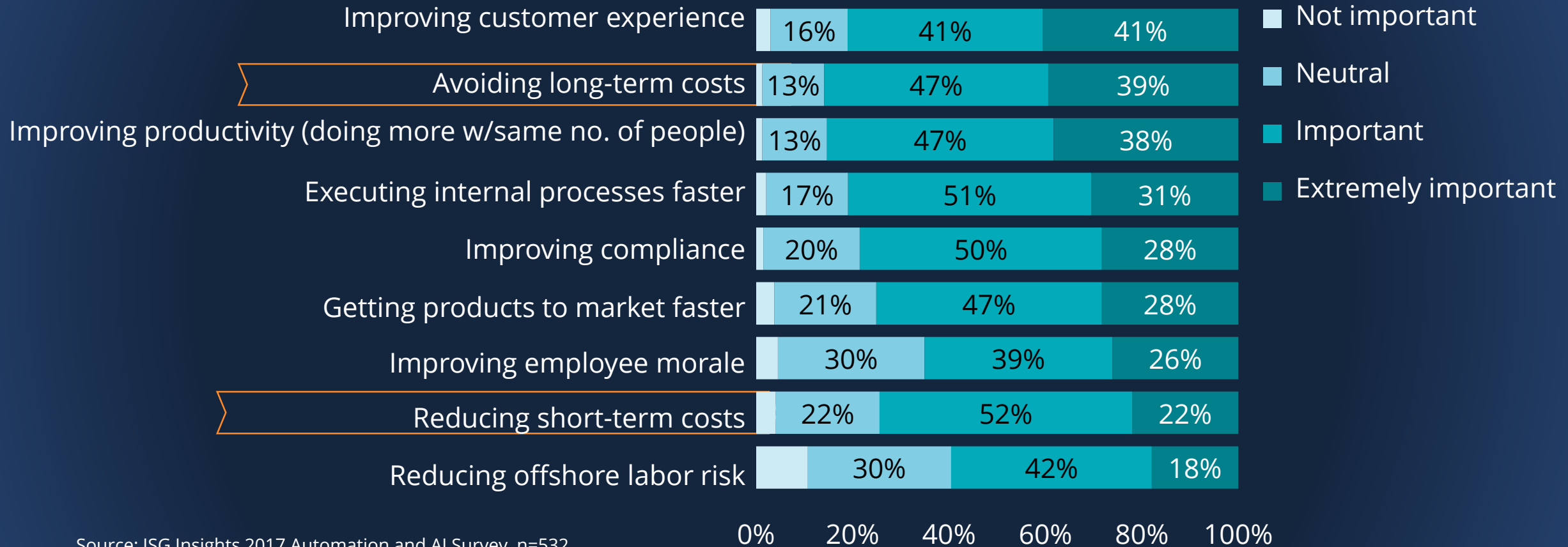
Source: ISG Insights 2017 Automation and AI Survey, n=532

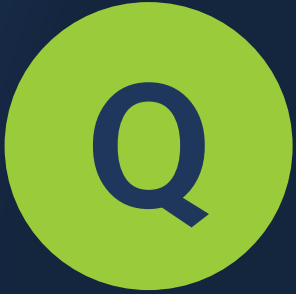




From the following list of potential outcomes of automation and AI, indicate how important each one is to your company.

# Outcomes: Importance

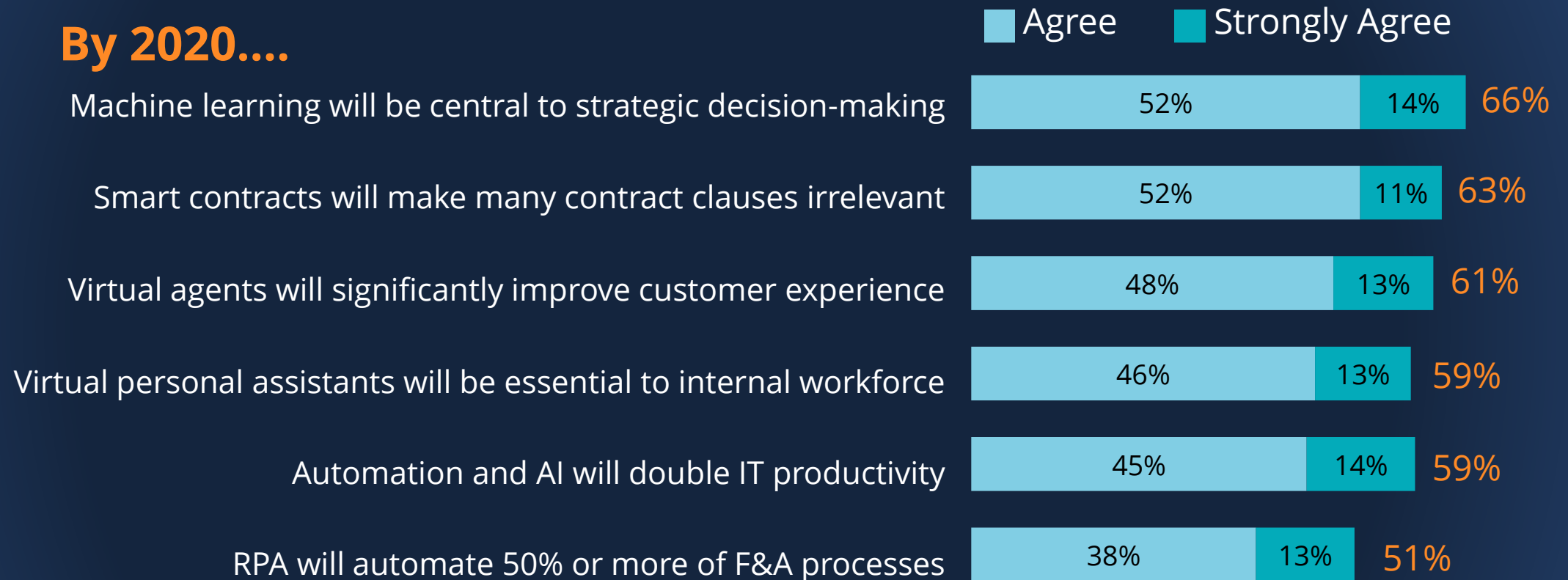




Indicate your level of agreement with the following statements about automation and AI technology adoption over the next three years.

# Strategic Planning Positions

## By 2020....



Source: ISG Insights 2017 Automation and AI Survey, n=532

# Part 3 – Key Points

- Automation and AI are top of mind for business executives and service providers alike
- Deployments expected to double over the next two years, even in mission-critical business processes
- Automation and AI will be disrupting entire economic segments by using far fewer people and much smarter software
- The value proposition of human labor is changing



# Part 4 - Exploiting AI Opportunities

Outline of an Action Plan

# A simple three-part action plan is a great way to begin

- ✓ Educate yourself in more detail on AI generally and AI solutions
- ✓ Position your operation and encourage your institution to exploit new AI solutions
- ✓ Investigate whether proven digital labor solutions could be cost-effective today

# Educate yourself in more detail on AI generally and AI solutions

**The suggested follow-up reading list for today's presentation includes the following resources and many others:**

*AI: The Disruptive Technology Engine of the 21st Century;* ISG Insights – September 2017

*ISG Automation Index and AI Survey 2017;* ISG Insights – June 2017

*Artificial Intelligence and Life in 2030;* Stanford University – August 2016

*Artificial Intelligence and National Security;* Harvard Kennedy School – July 2017

*Machine Learning and the Rise of Systems of Intelligence;* ISG Insights – April 2017

*ISG Automation Index™ Report;* ISG Insights – April 2017

*Preparing for the Future of Artificial Intelligence;* National Science & Technology Council – October 2016

*The Relentless Pace of Automation;* MIT Technology Review – February 2017

Reading list available at: [www.isg-one.com/SACUBO17-AI-Solutions-Readings](http://www.isg-one.com/SACUBO17-AI-Solutions-Readings)



# Position your operation and institution to exploit new AI solutions

- A strong **data** infrastructure and capabilities in **predictive analytics** are critical foundational elements for gaining maximum benefit from current and future machine learning solutions
- Machine learning is completely dependent on the availability of plentiful, relevant, accurate data in order to function
- The pattern recognition capabilities of machine learning can amplify and expand the effectiveness of many predictive analytics functions

# Building Institutional Data Mastery is Key for Universities to Thrive in the AI Age

**Ask the question:** How well does your institution **identify, collect, manage, and govern** its data?

All Types of Data Across All Missions

Teaching & Learning

Research

Business & Administration

Public Service

# Tactical “low hanging fruit” steps present early opportunities to begin

- ✓ Establish partnerships with **current student analytics** programs
- ✓ Explore **big data capture and analysis capabilities** for business processes
- ✓ Consider adding **machine learning and data** clauses to cloud vendor negotiations/contracts
- ✓ Increase priority and add resources to **existing business analytics initiatives**
- ✓ Look for **existing data opportunities** to apply analytics and ML to facilities optimization - including: space utilization, power consumption, access management, etc.
- ✓ Look for data opportunities in **supply chain & vendor management**

# First steps toward an AI-aware long-term strategy & action capability

- ✓ Add **data science & analytics expertise** at the institutional level
- ✓ Add or modify institutional data **governance structure** to be “AI-aware”
- ✓ Review and **modify institutional data plan** in light of AI opportunities - Look for integration opportunities across mission & unit boundaries
- ✓ Look especially to **other industries and professions** for leading practices
- ✓ Create institutional AI education plan to **ensure broad buy-in and contributions**

# Investigate whether proven digital labor solutions could be cost-effective today

Robotic Process Automation (RPA) has been in use by industry for many years and is a proven, cost-effective digital labor solution. RPA is a logical first step in a longer term strategy for transitioning to more advanced digital labor solutions.

## See readings:

*Applying Digital Labor and Digital Intelligence to the Business;*  
ISG Insights – April 2017

*IT Leaders Underestimating Rapid Rise of RPA;*  
ISG Insights – October 2016

*10 RPA Implementation Best Practices;*  
ISG Insights – October 2016

*Maximize RPA Value and Minimize Risk with an Automation Governance Board;*  
ISG Insights – October 2016

Reading list available at: [www.isg-one.com/SACUBO17-AI-Solutions-Readings](http://www.isg-one.com/SACUBO17-AI-Solutions-Readings)

# Looking forward to what is next for AI....

## Exponential Growth?

Looking backward from today, growth appears fairly gradual.



Looking forward, current trends extrapolate to near exponential advancement.

# Thank you!

## Business Solutions Enabled by Artificial Intelligence

John Wheat  
AI Lead, ISG  
Email: [John.Wheat@isg-one.com](mailto:John.Wheat@isg-one.com)  
Phone: 512-797-6907

David Hemingson  
Partner, ISG  
Email: [David.Hemingson@isg-one.com](mailto:David.Hemingson@isg-one.com)  
Phone: 703-296-9200

Presentation Resources: <http://www.isg-one.com/SACUBO17-AI-Solutions-Readings>



ISG (Information Services Group) (NASDAQ: III) is a leading global technology research and advisory firm. A trusted business partner to more than 700 clients, including 75 of the top 100 enterprises in the world, ISG is committed to helping corporations, public sector organizations, and service and technology providers achieve operational excellence and faster growth. The firm specializes in digital transformation services, including automation, cloud and data analytics; sourcing advisory; managed governance and risk services; network carrier services; technology strategy and operations design; change management; market intelligence and technology research and analysis. Founded in 2006, and based in Stamford, Conn., ISG employs more than 1,300 professionals operating in more than 20 countries—a global team known for its innovative thinking, market influence, deep industry and technology expertise, and world-class research and analytical capabilities based on the industry's most comprehensive marketplace data.

[isg-one.com](https://www.isg-one.com)