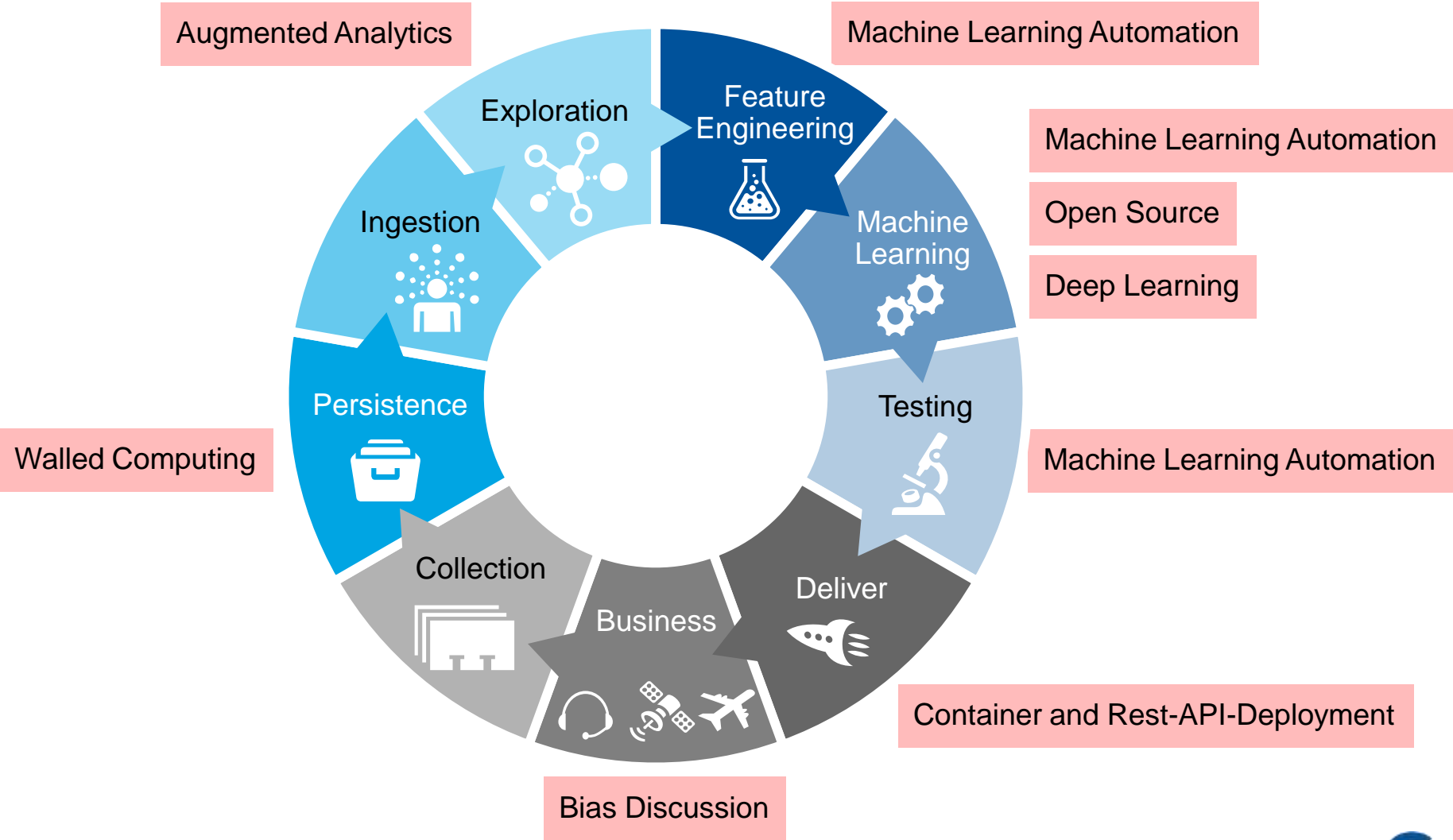


# Advancing in Machine Learning: Deep Learning and Beyond

Erick Brethenoux

# Cool Trends



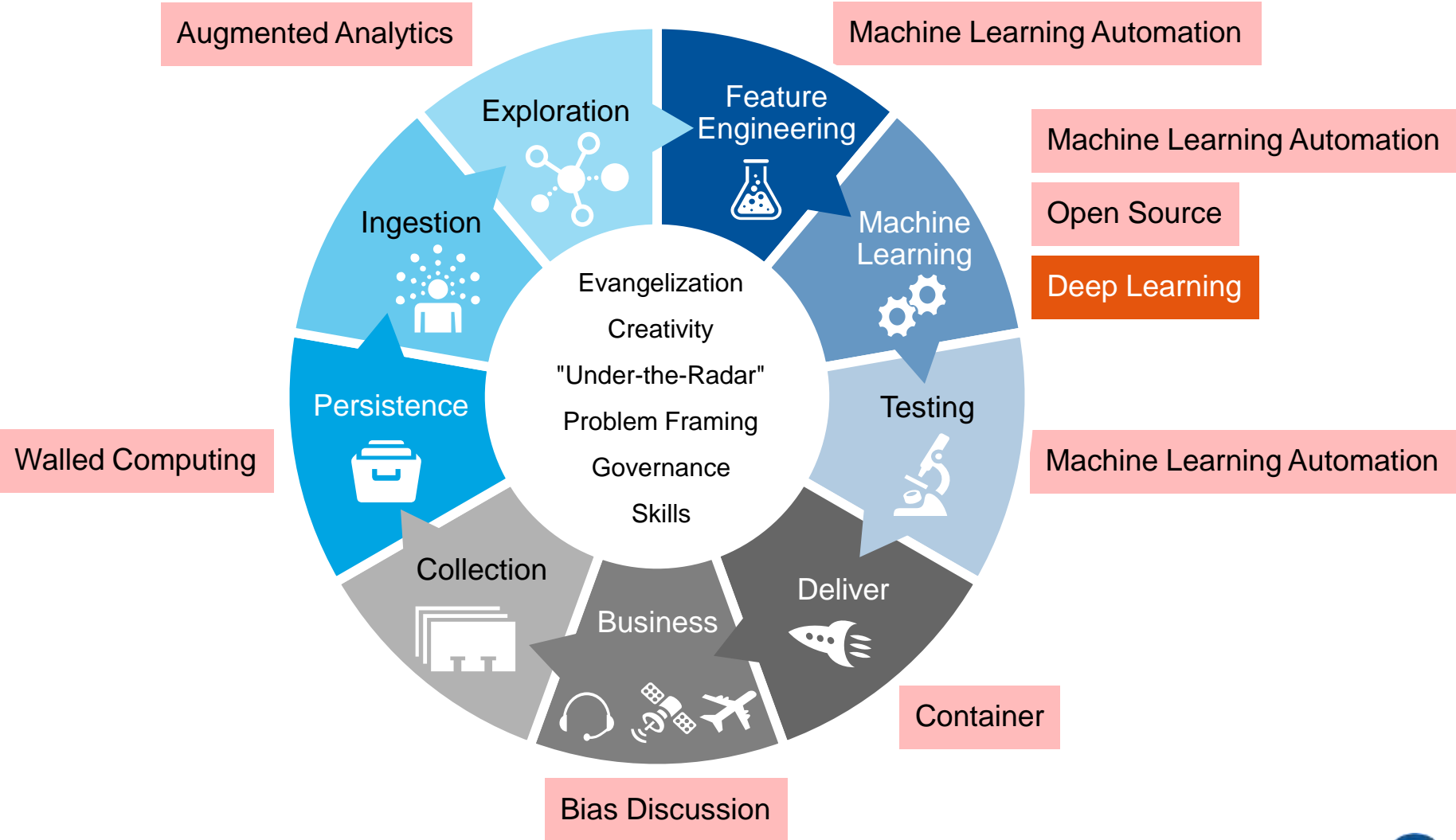
# Key Issues

1. What are the latest advances?
2. What new technologies and vendors are out there?
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# Key Issues

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# Cooler Trends



# Deep Learning





# A mostly complete chart of Neural Networks

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-  Backfed Input Cell
-  Input Cell
-  Noisy Input Cell
-  Hidden Cell
-  Probablistic Hidden Cell
-  Spiking Hidden Cell
-  Output Cell
-  Match Input Output Cell
-  Recurrent Cell
-  Memory Cell
-  Different Memory Cell
-  Kernel
-  Convolution or Pool

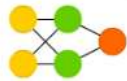
Perceptron (P)



Feed Forward (FF)



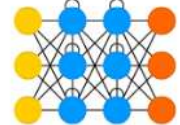
Radial Basis Network (RBF)



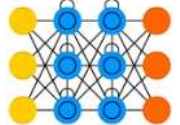
Deep Feed Forward (DFF)



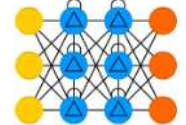
Recurrent Neural Network (RNN)



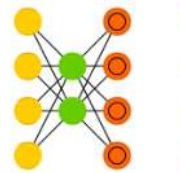
Long / Short Term Memory (LSTM)



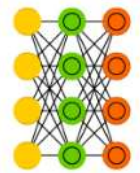
Gated Recurrent Unit (GRU)



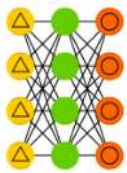
Auto Encoder (AE)



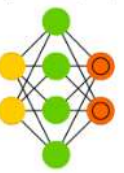
Variational AE (VAE)



Denosing AE (DAE)



Sparse AE (SAE)



Markov Chain (MC)



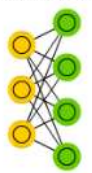
Hopfield Network (HN)



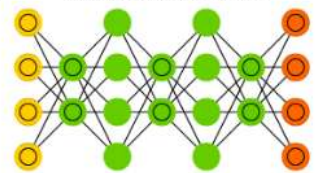
Boltzmann Machine (BM)



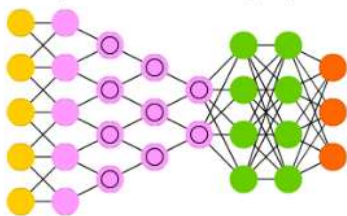
Restricted BM (RBM)



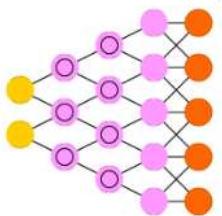
Deep Belief Network (DBN)



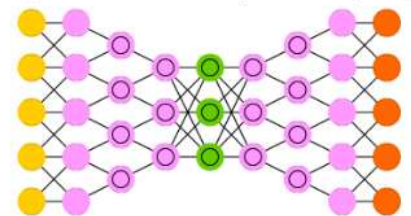
Deep Convolutional Network (DCN)



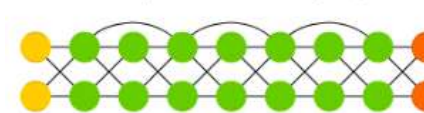
Deconvolutional Network (DN)



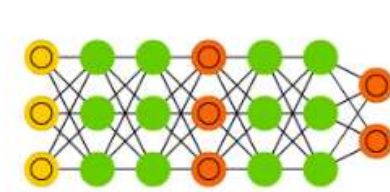
Deep Convolutional Inverse Graphics Network (DCIGN)



Deep Residual Network (DRN)



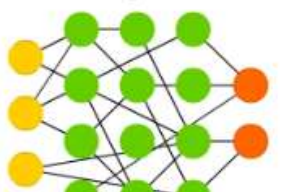
Generative Adversarial Network (GAN)



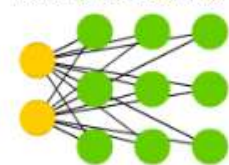
Liquid State Machine (LSM)



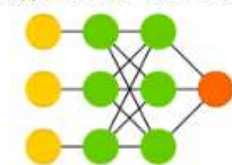
Extreme Learning Machine (ELM)



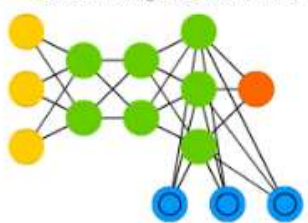
Kohonen Network (KN)



Support Vector Machine (SVM)



Neural Turing Machine (NTM)

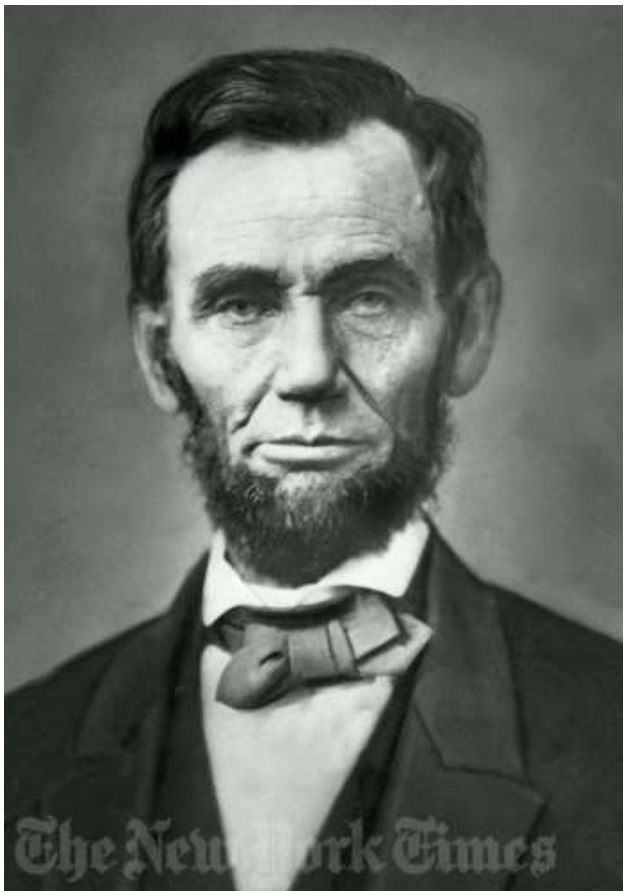


# Content Processing Matrix

O U T P U T S	Video					
	Image		Image Search		Synthetic Video Animation	
					Visual Search	Image Filtering
	Audio	Image Generation			Super Resolution	
			Voice Synthesis	Real-Time Translation	Visual Q&A	Lip Reading
	Text		Speech Imitation			
		Text Creation			Image Captioning	
I N P U T S	Tabular/ Structured	NLG	Machine Translation	Speech Recognition	OCR, ICR	
		Chatbots Speak	Proofreading			
		Classical Data Science	Chatbots Listen	Speech UI	Image Recognition	Surveillance
		Business Analytics	Information Extraction		Visual Search	Surveillance
			POS Tagging		Medical Diagnosis	Scene Classification
					Video Analytics	Compression
		Tabular	Text	Audio	Image	Video
						Diverse



# Real Magic

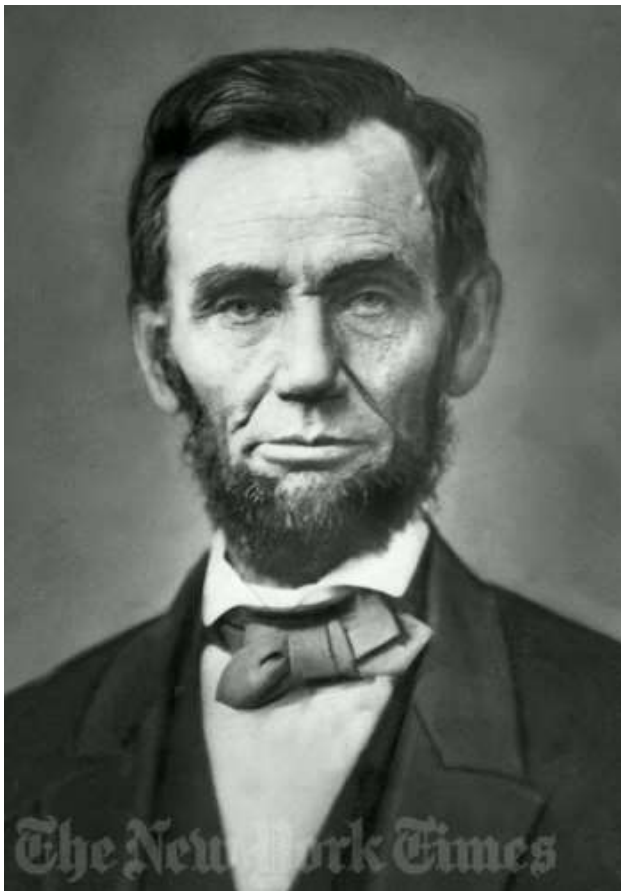


Bringing Portraits to Life

Hadar Averbuch-Elior	Daniel Cohen-El	Johnatan Kopf	Michael F. Cohen
Tel-Aviv University	Tel-Aviv University	Facebook	Facebook

With kind permission from

# Real Magic

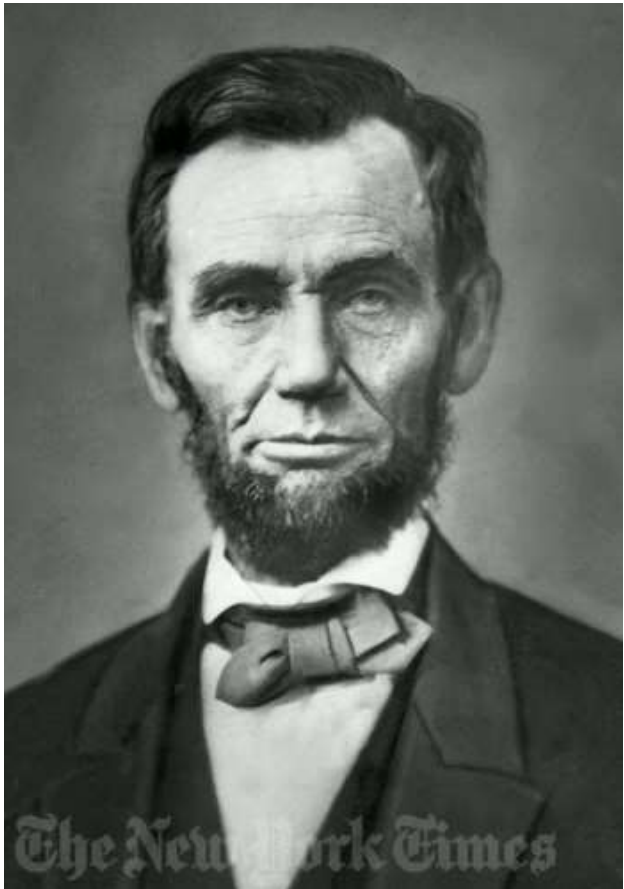


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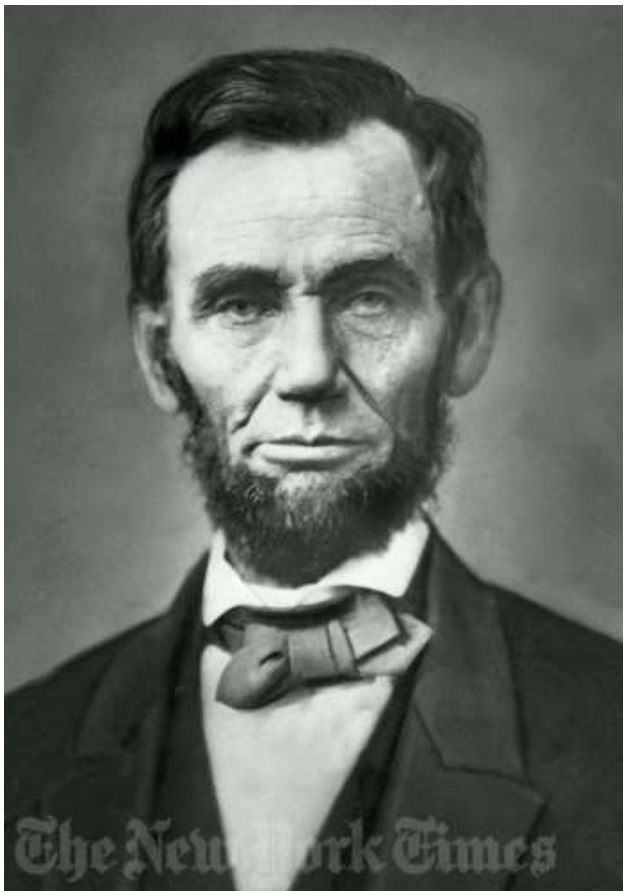
**Bringing Portraits to Life**

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With kind permission from



# Real Magic



Bringing Portraits to Life

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With kind permission from

# Real Magic

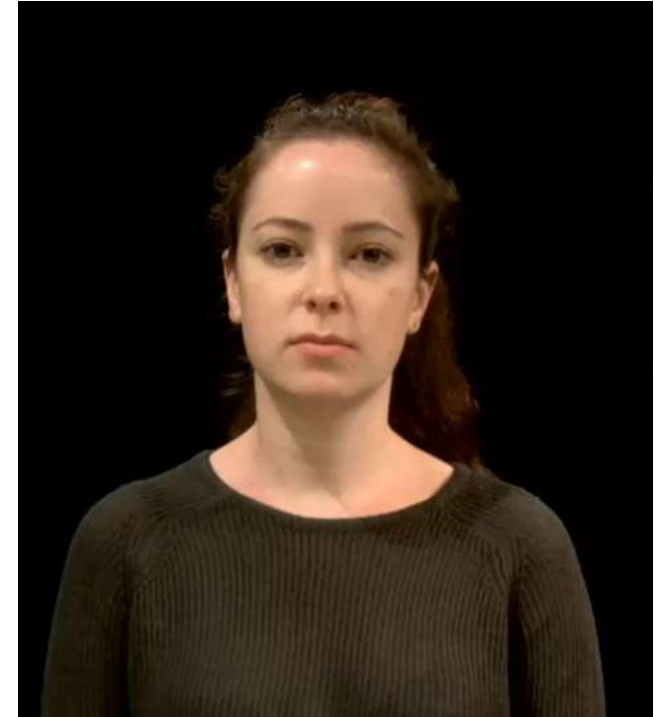
We only have that still picture



This here is the driving video



This is the resulting video

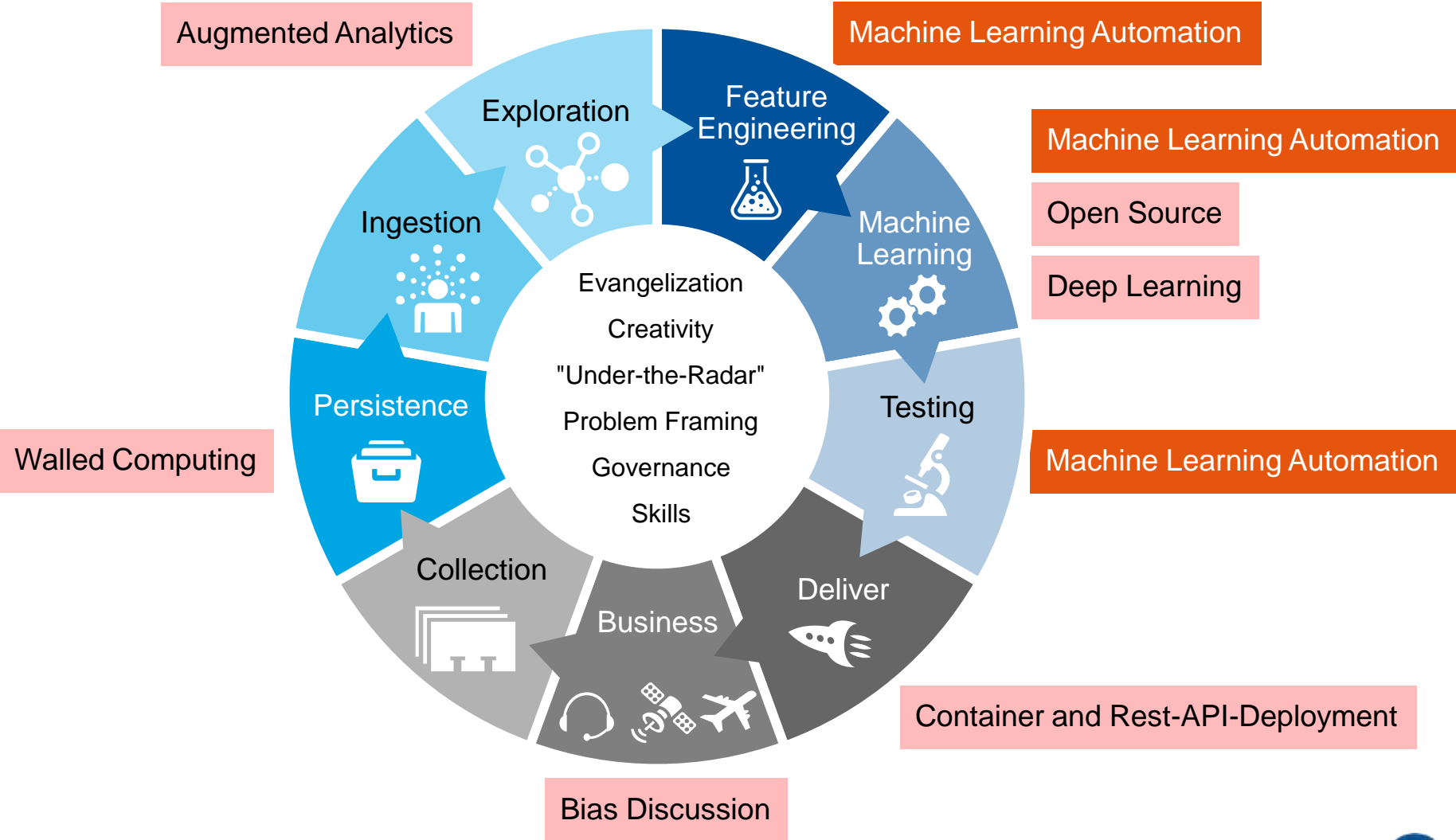


# Content Processing Matrix

		Content Processing Matrix					
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	Chatbots Speak	Proofreading					
Tabular/ Structured	Classical Data Science	Chatbots Listen	Speech UI	Image Recognition	Surveillance	Robotics	
		Information Extraction		Visual Search	Surveillance	Self-Driving Cars	
	Business Analytics	POS Tagging		Medical Diagnosis	Scene Classification		
				Video Analytics		Compression	
		Tabular	Text	Audio	Image	Video	Diverse
		I N P U T S					



# Cooler Trends



# Machine Learning Automation



# Augmented Data Science = Machine Learning Automation

## Try different features

- Greedy forward/backward selection
- Feature stacking

## Try model candidates

## Do a hyper parameter search

- Grid search
- Genetic algorithms

TPOT

auto-sklearn

Auto-WEKA

machineJS

DataRobot

H2O.ai (Driverless AI)

Auto-Sklearn

*AutoWeka*

DataRobot

H<sub>2</sub>O.ai

# #AutoML

**Gartner**

# Key Issues

1. What are the latest advances?
2. What new technologies and vendors are out there?
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# Several Angles of Market Segmentation

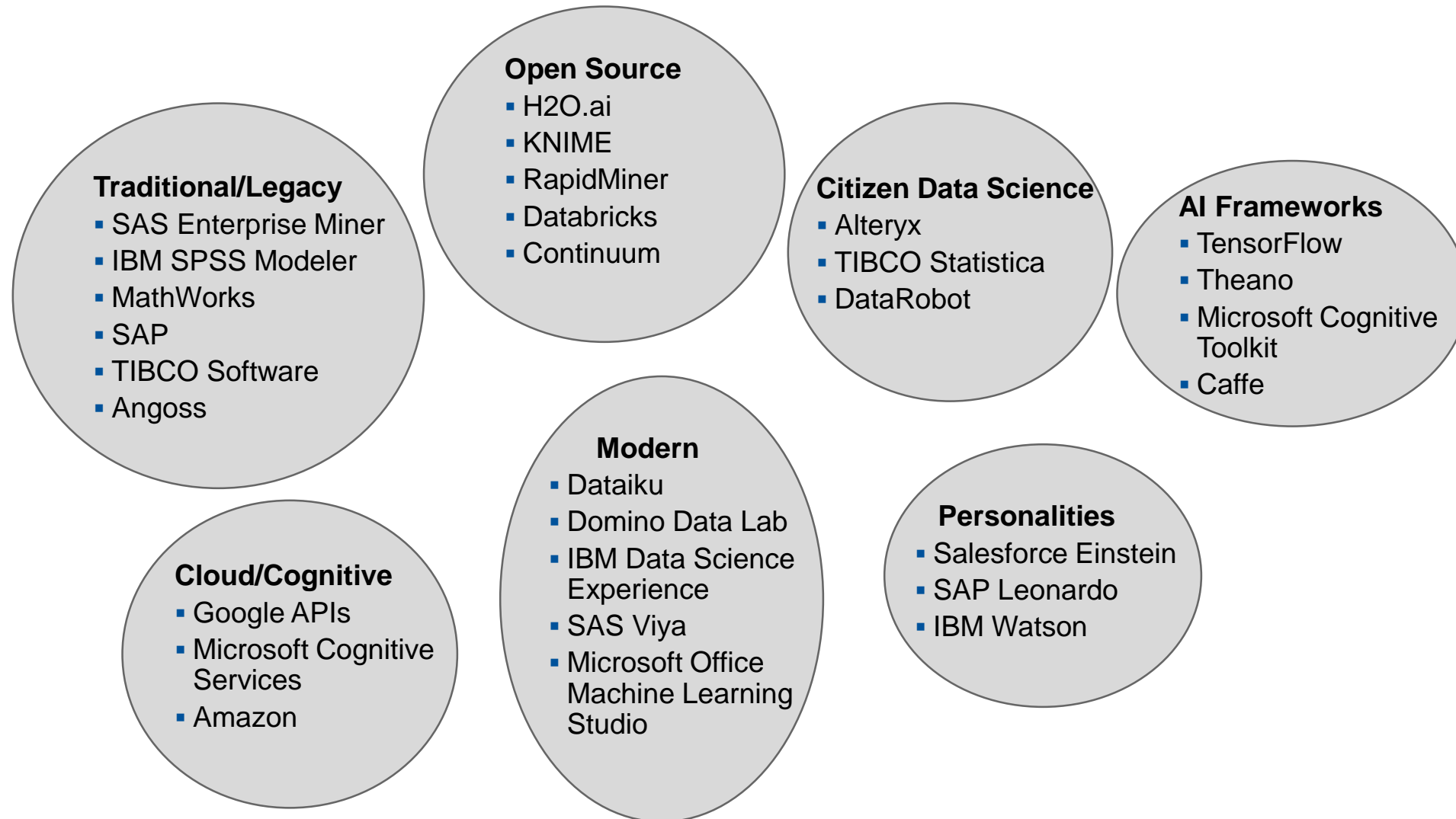
	2009	2009/2010
Sep	\$137,612	\$120,860
Oct	\$30,896	\$120,779
Nov	\$215,801	\$102,463
Dec	\$199,143	\$187,111
Jan	\$114,833	\$133,399
Feb	\$107,069	\$102,558
Mar	\$166,498	\$115,965
Apr	\$211,171	\$131,507
May	\$20,748	\$125,150
Jun	\$135,211	\$134,000
Jul	\$130,860	\$129,564



## STRATEGY

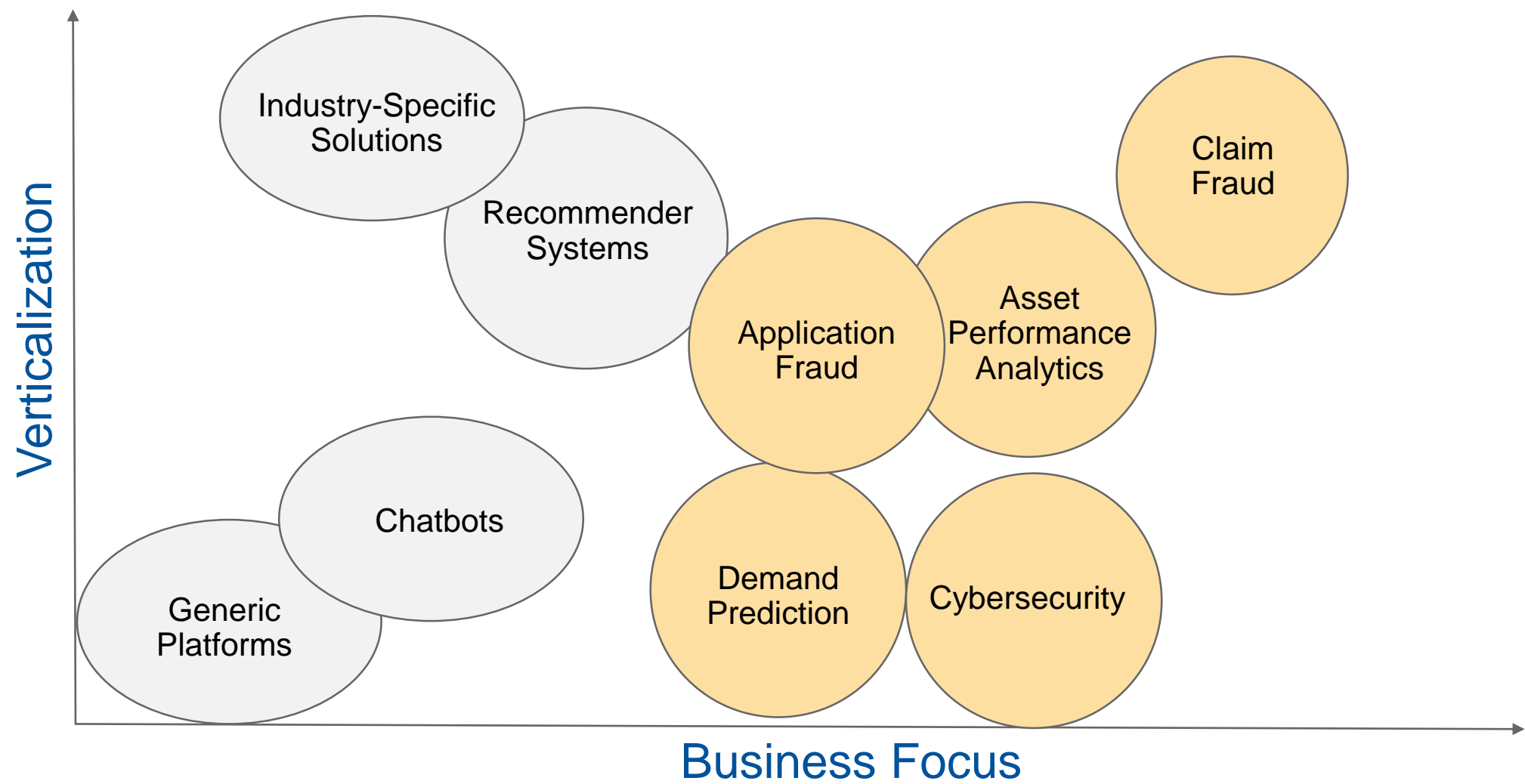


# Data Science and Machine Learning Platform Clusters

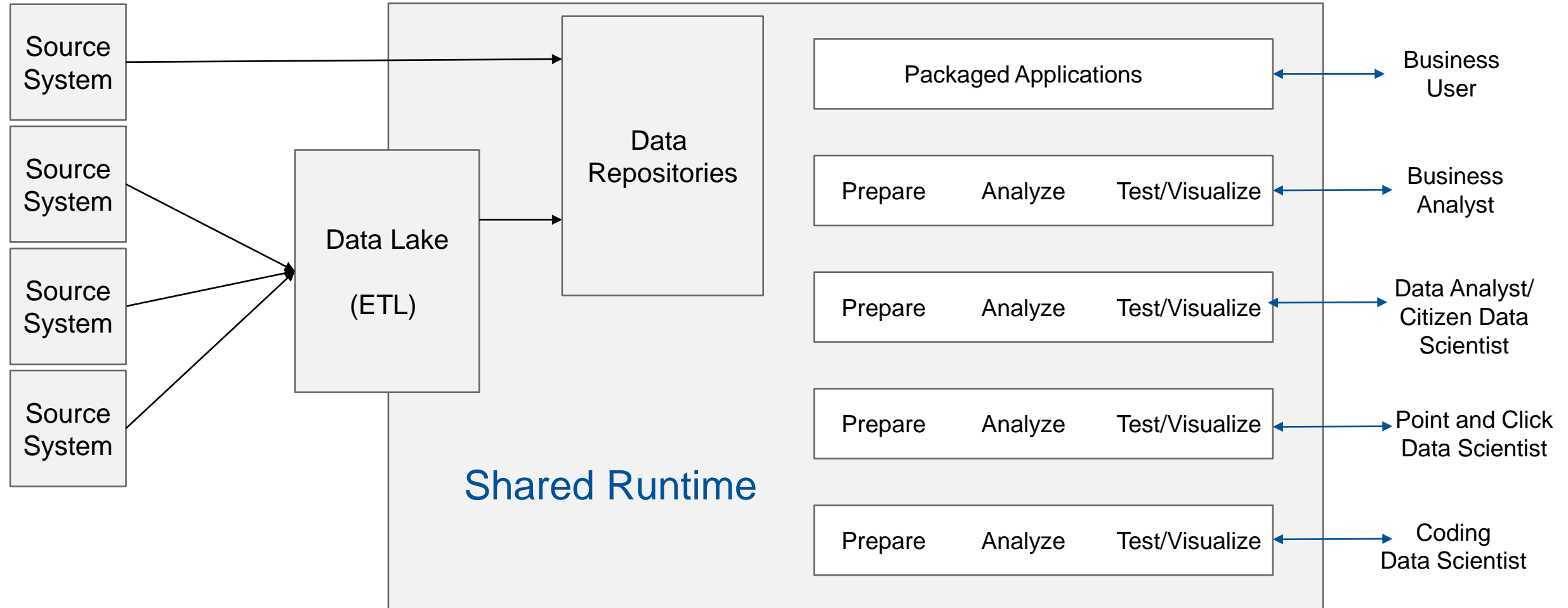




# DS/ML Software Space



# The Ideal Data Science Platform: Multiple Endpoints — Shared Runtime

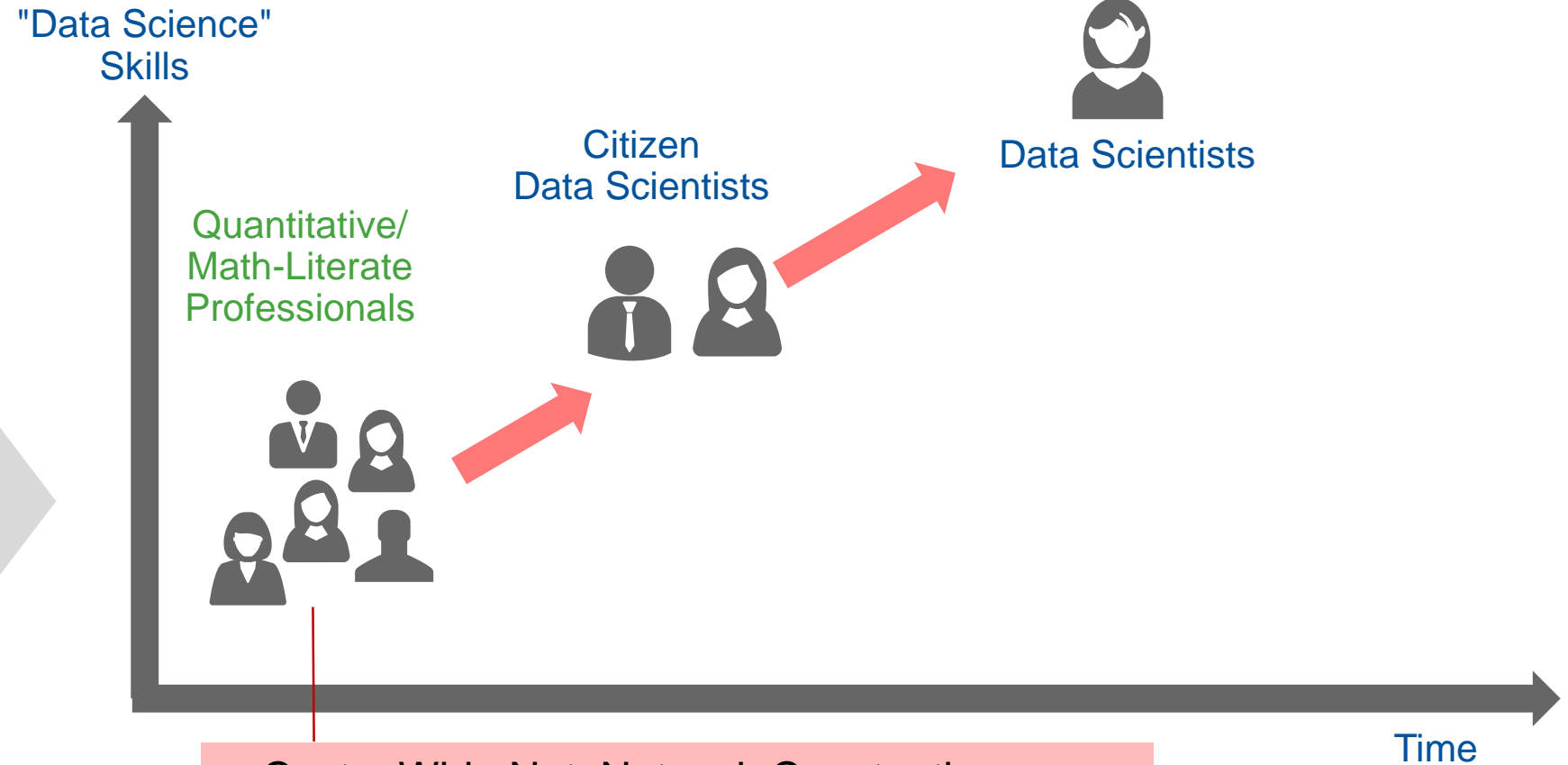


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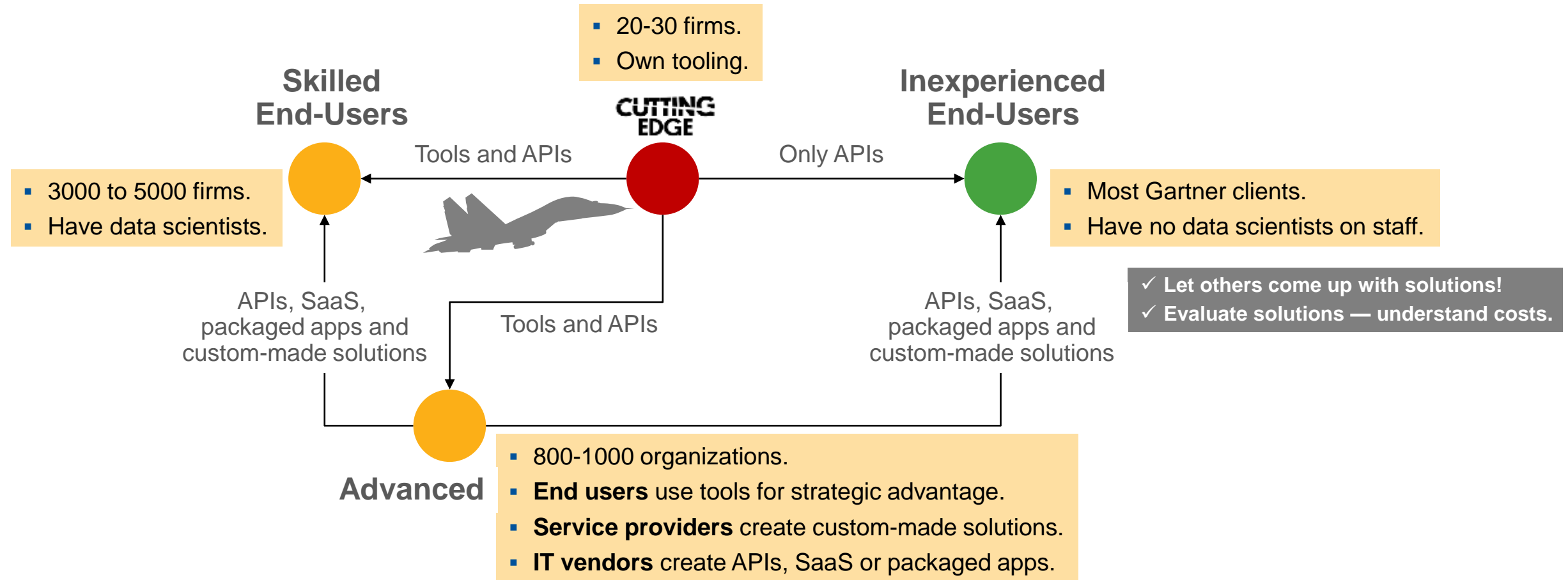
# Upskilling

- Physicists
- Chemists
- Biologists
- Engineering Disciplines
- Social Scientists
- Computer Scientists
- Statisticians
- Operations Researchers
- Mathematicians
- Industrial Engineers
- MBAs
- Astronomers
- Data Analysts
- Actuaries
- Risk Managers
- Control Engineers
- Financial Accountants
- Quality Specialists (Six Sigma)



- Cast a Wide Net, Network Constantly
- Identify Candidates
- Allow Time for Training Promising Candidates

# Deep-Learning/AI Adoption Patterns



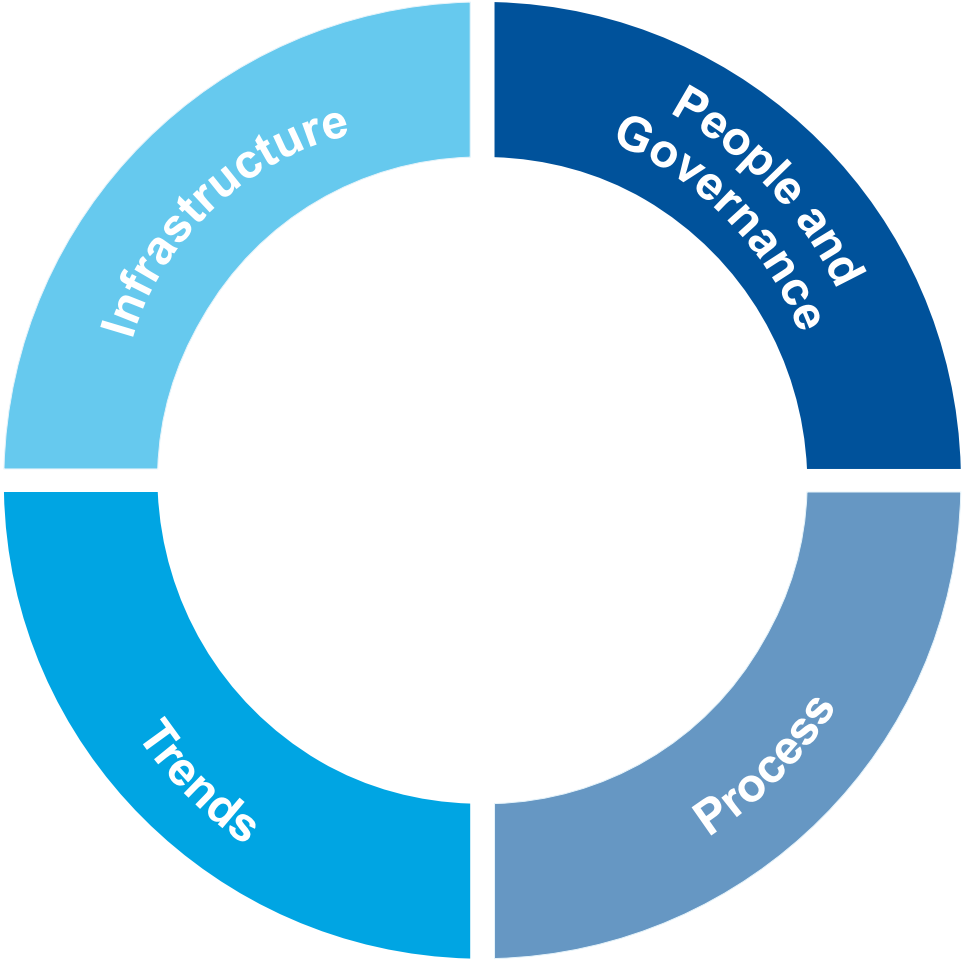
# Four Classes of Enterprise Problems

04

How to focus onto the most relevant data parts?

03

How to know what is relevant even in 2-3 years?



01

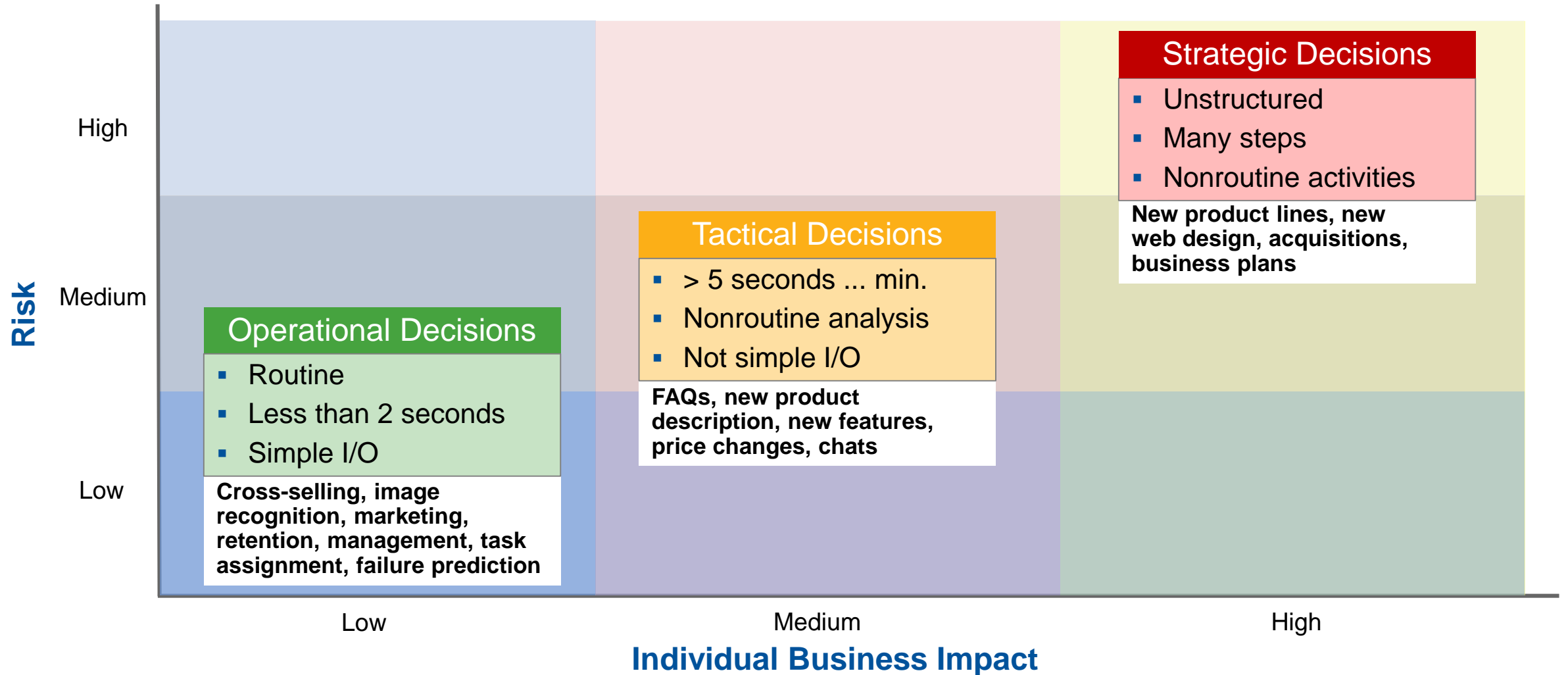
Which personas to hire?  
How to make them work together?  
How to become more effective in ML/AI?

02

How to create repeatable workflows?



# Toward Decision Modeling



# Other Recommendations on How to Start ...

- ✓ Engage the business:
  - Identify at least three separate business initiatives that can benefit from exploiting amazing innovation (AI) technologies in 2018 to 2019
- ✓ Use the three-phase approach:
  - Scope initiatives for quick time to value
  - Identify the right skills
  - Experiment and learn
- ✓ Respect the impact on people:
  - The impact of software and robots on employment, work and careers of people will be profound

# Recommended Gartner Research

- ▶ [Magic Quadrant for Data Science and machine learning Platforms](#)  
Carlie J. Idoine, Peter Krensky and Others (G00326456)
- ▶ [Hype Cycle for Data Science and Machine Learning, 2017](#)  
Peter Krensky and Jim Hare (G00325005)
- ▶ [Machine Learning: FAQ From Clients](#)  
Shubhangi Vashisth, Alexander Linden and Others (G00327948)
- ▶ [Deep Learning Enables a Quantum Leap in Content Processing](#)  
Alexander Linden (G00327965)
- ▶ [Innovation Insight for Deep Learning](#)  
Alexander Linden, Tom Austin and Svetlana Sicular (G00319191)