IMS Health & Quintiles are now IQVIA™

We are IQVIA. And it's nice to meet you.

Emerging Tech and AI

Gary Shorter

IMS Health & Quintiles are now

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Possible when human science meets data science

Human Data Science

Worldwide clinical and real-world experience informed by deep scientific expertise across every major therapy area

Solutions to help clients drive healthcare forward

Leading healthcare “big data” and technologies fueled by commercial expertise to find unparalleled insights

IQVIA mobilizes unparalleled data, analytics, technology, and expertise through solutions connecting stakeholders to improve health

IQVIA CORE™

Domain Expertise

Institutional knowledge and domain expertise across diseases, geographies and scientific methods

Transformative Technology

Leading technologies to provide real-time access to operations-critical information

Unparalleled Data

One of the world's largest curated healthcare data sources with innovative privacy protections

Advanced Analytics

Faster, more precise decision-making generated by advanced analytics designed for healthcare

Advanced Analytics

The Link Between Data and Decisive Action

Our immense data source is only useful when it can be scanned and analyzed quickly, leading to precise decisions, diagnoses and courses of action.

CUTTING EDGE ANALYTICS

- Artificial intelligence
- Predictive analytics
- Natural language processing
- Machine learning
- Optimization
- Prescriptive analytics

EXAMPLE CLIENT APPLICATIONS

- Wearables integration
- Social media tracking
- Online promotions
- NextGen clinical development
- Multichannel marketing
- Precision market research
- Rare disease diagnostic tools

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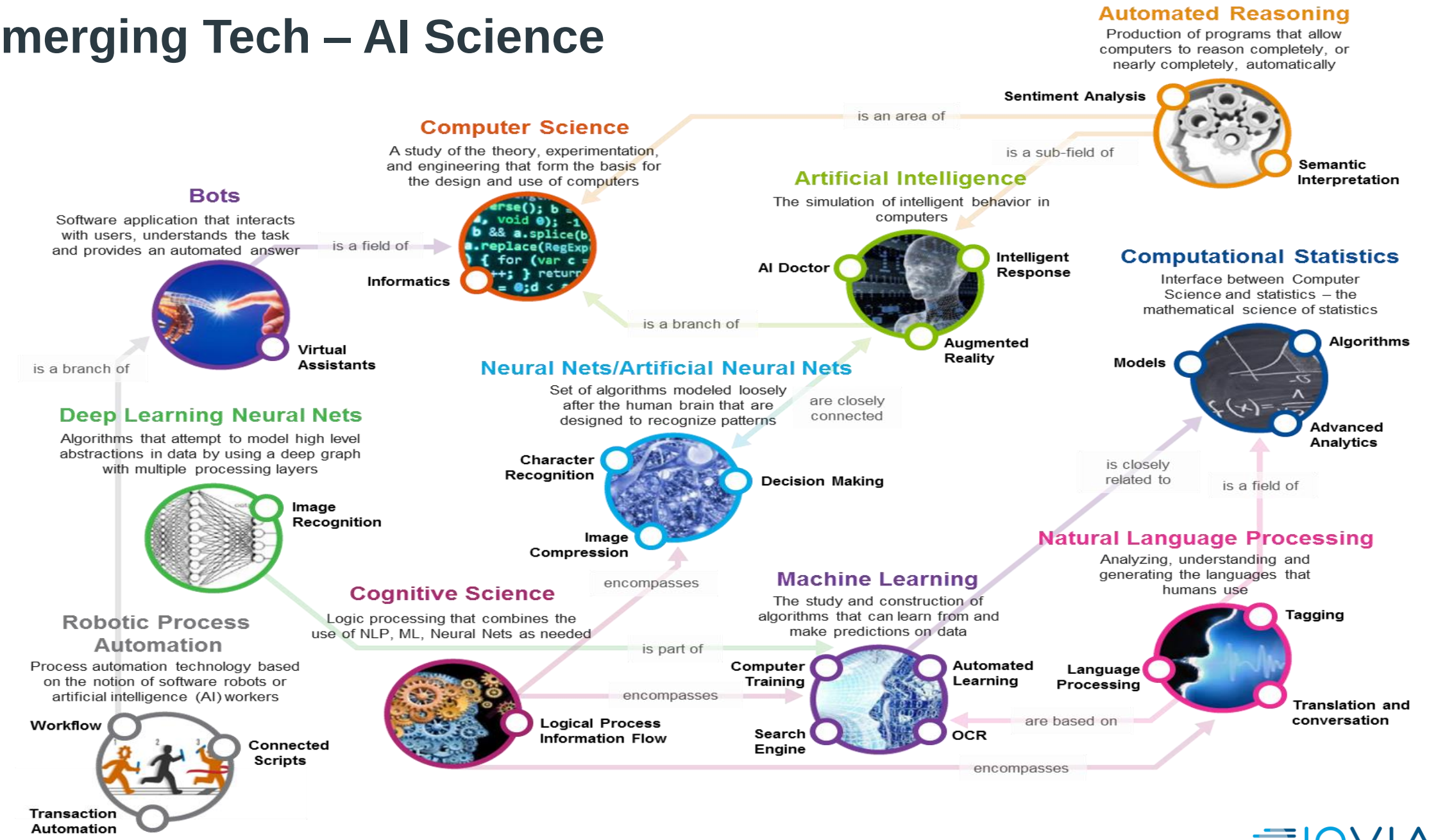
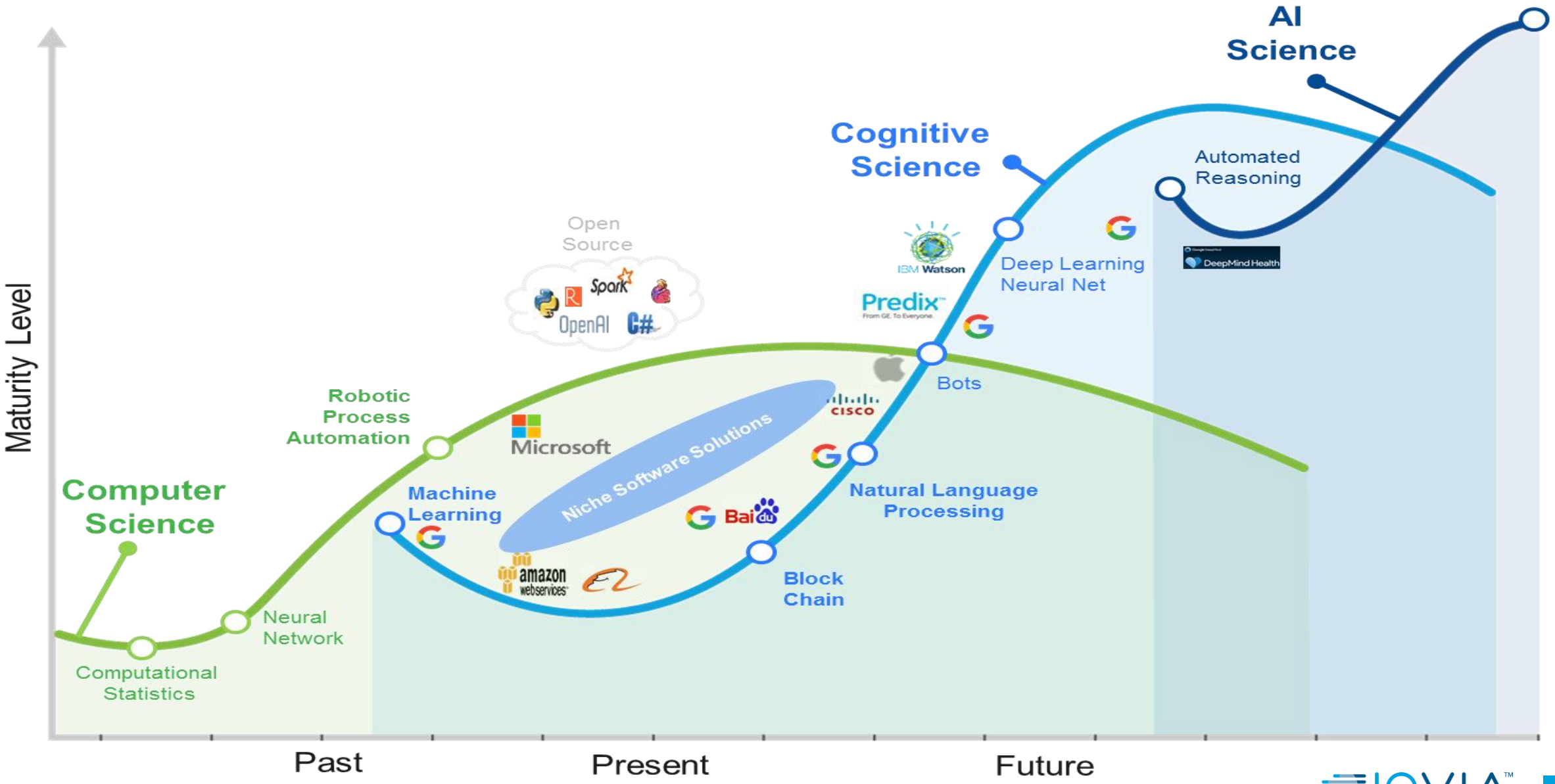
The Landscape of AI

Emerging Tech – AI Science

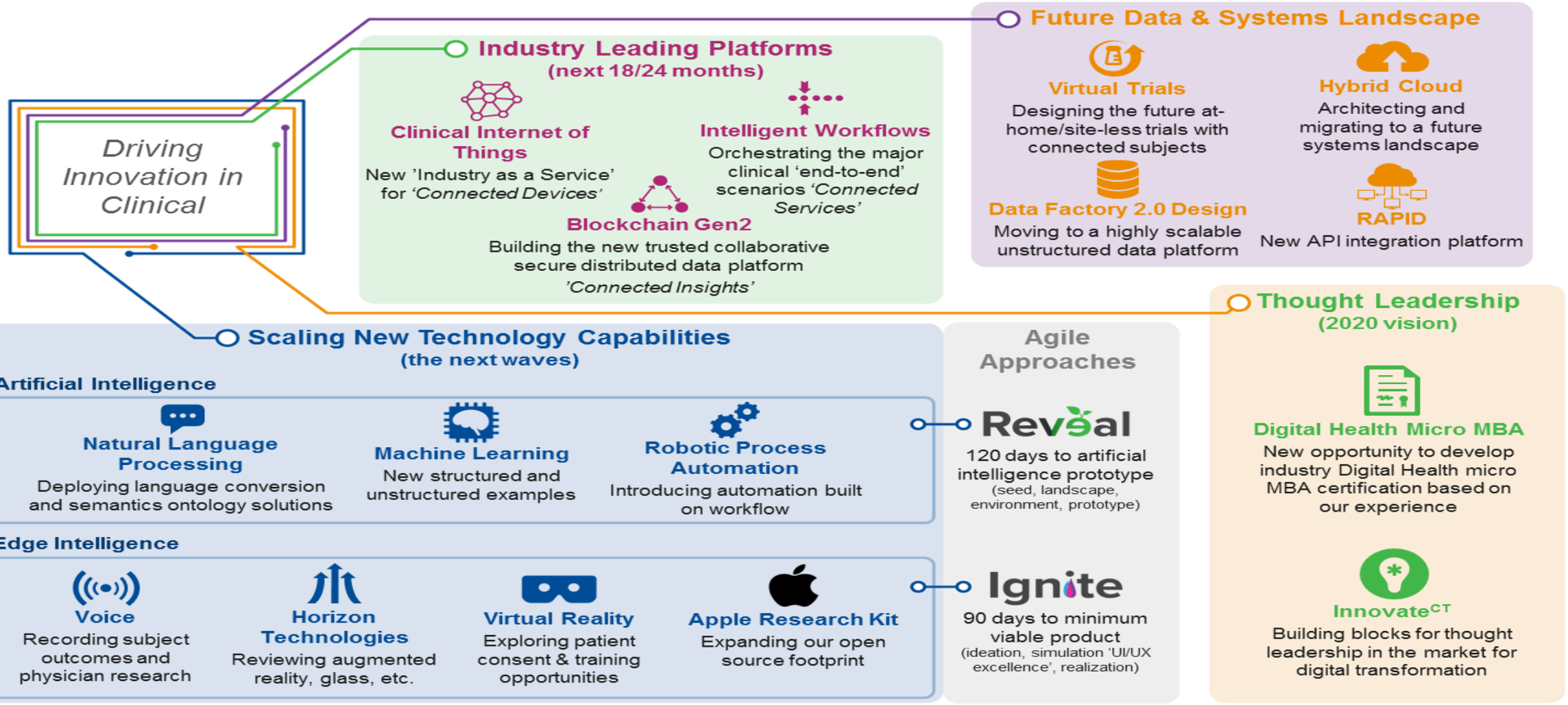


Emerging Tech – AI Maturity



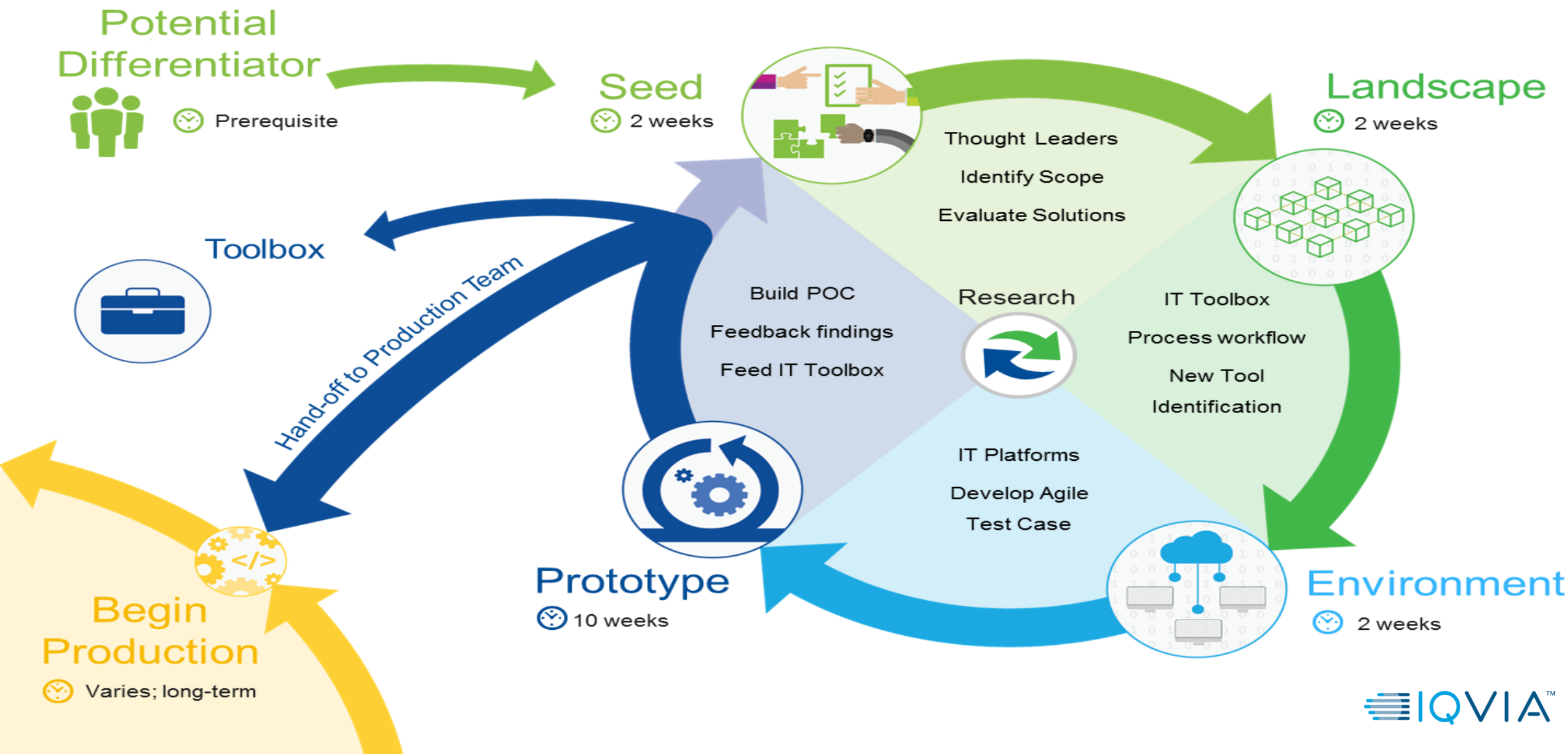
Innovation and Emerging Technologies

Keeping us one step ahead in the market



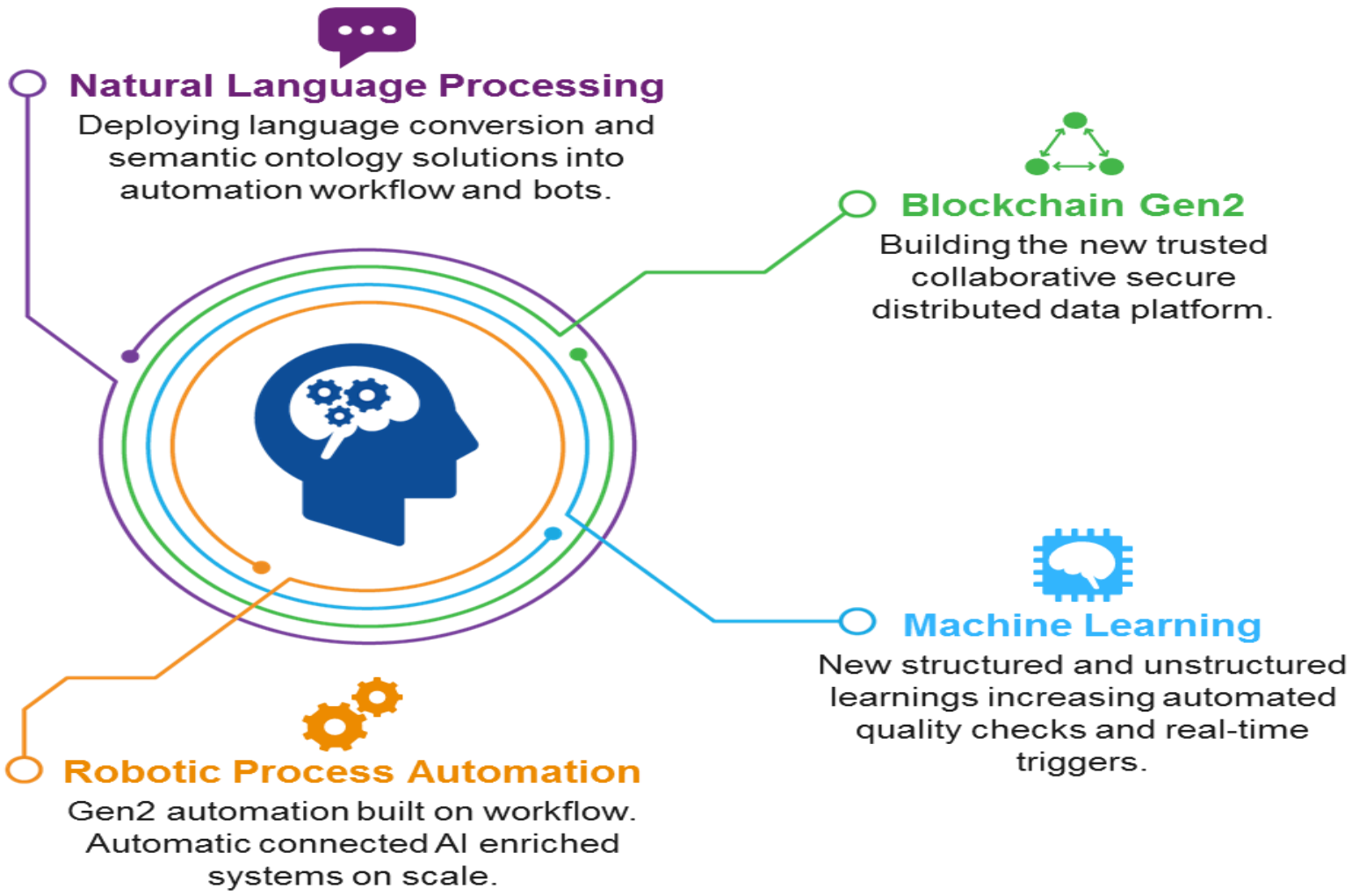
Reveal Accelerator Process for the Emerging Tech of AI

Growing intelligent automation with industry-specific expertise



Artificial Intelligence

Growing intelligent automation with industry-specific expertise



Digital Workflow integrated into document translation

130M+ words automatically translated annually

Deep Learning engine enhances document recognition and insight

2M+ documents digitized annually

What's Next

- Building re-usable AI solutions on scale across the organization through APIs
- Focusing AI Internal learning abilities resulting in a virtual business unit level expertise
- Semantic enterprise search across digitized information

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Quick Examples

- Big Data – 100k data suppliers unstructured NLP
- Models
  - Disease Detection
  - Line of Therapy
  - Non-Adherence
  - Treatment Response
- AI
  - Centralized/Medical Monitoring
  - eTMF
  - Translation
  - Safety

Leveraging Unstructured Physician Notes using NLP

Client Benefits

Enhanced the ability to characterize the progression of a chronic illness when faced with limited availability of structured variables

Customer Challenge

- To understand disease progression among patients diagnosed with Migraine Disorder (ICD-9 346.xx)
- Disease progression required understand of migraine frequencies
- There are no clinical tests or claims-based data signifying acute events over time

Our Solution

- We developed an iterative approach to mining and reviewing physician notes for identifying migraine frequencies:
  - Development of Clinical terms of interest (e.g. “migraine/month”)
  - Query physician notes for terms among patient and time period of interest
  - Review findings, and frequencies of matches and revise terms as appropriate

Results

- Identified over 2,300 patients with a migraine diagnosis with mention of quantity of migraines per month in physician notes
- Merged derived variable with existing analytic database

Pat ID	Record Date	Variable	Value
100002	1/7/2014	Monthly Migraines	14
100003	2/4/2014	Monthly Migraines	7
100003	1/21/2014	Monthly Migraines	1
100004	2/21/2014	Monthly Migraines	1

Four key applications for real world data with ML

Disease Detection

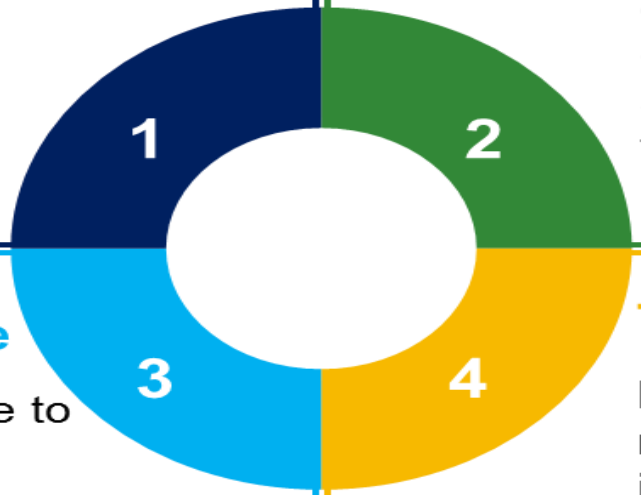
Identify un-diagnosed patients by analyzing medical utilization patterns, ultimately leading to the identification of new patients eligible for treatment in specific disease areas

e.g. finding undiagnosed patients, physician targeting

Trigger Alerts for line of therapy transition & disease progression

Proactively predict upcoming line of therapy transition and identify target populations for treatment

e.g. predict which patients are failing on their first line therapy and are about to transition to a second line treatment; generate a target list of HCPs



Predictions for non-adherence

Identify key drivers of non-adherence to guide targeted adherence strategy; identify patients who are most likely to prematurely discontinue therapy

e.g. adherence improvement strategy: Physician education, copay cards, mobile apps, patient support programs, HCP trigger alerts

Treatment response profiling

Proactively predict treatment response for individual patients and identify most effective therapies for treatment

e.g. identifying target patient groups with unmet needs, or identifying those patients who would most benefit from particular therapies or treatments

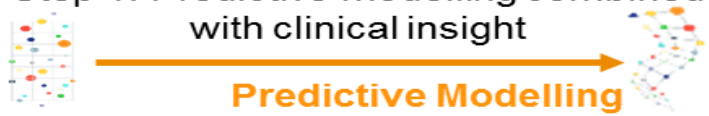
Example: Raising disease awareness in a targeted way

Situation

- Client has a drug for a rare disease – diverse range of symptoms, low HCP awareness resulting in frequent misdiagnoses, inappropriate treatments, high costs and negative patient outcomes
- Client was interested in identifying a target list of HCPs in a position to diagnose patients with this rare condition, with the ultimate goal of raising the disease awareness in a targeted way and speeding up the time to diagnosis

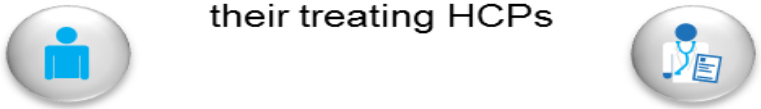
Approach

Step 1: Predictive modelling combined with clinical insight



- 100+ medical and demographic predictors included in a bagging random forest model
- Model used to score the universe of 100M patients to identify those highly likely to have the disease

Step 2: Finding undiagnosed patients and their treating HCPs

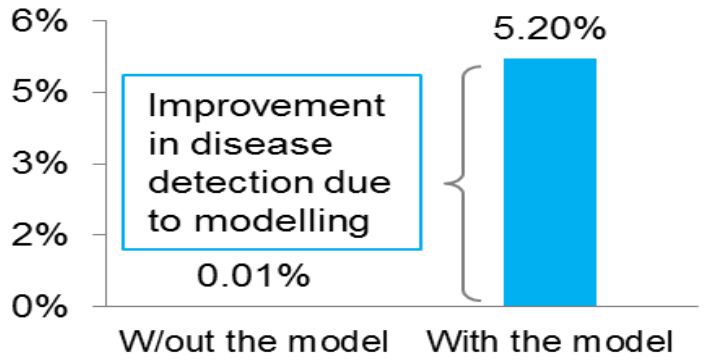


- Identified patients linked to relevant HCPs
- Target list of HCPs is generated for a disease awareness campaign

Result

- The algorithm could be deployed as a highly effective screening tool for finding high-risk undiagnosed patients

Disease Detection among High Risk patients*



*High Risk group was defined as top 5% of undiagnosed rare disease patients

1 Disease Detection

Cognitive and automation computing - Monitoring

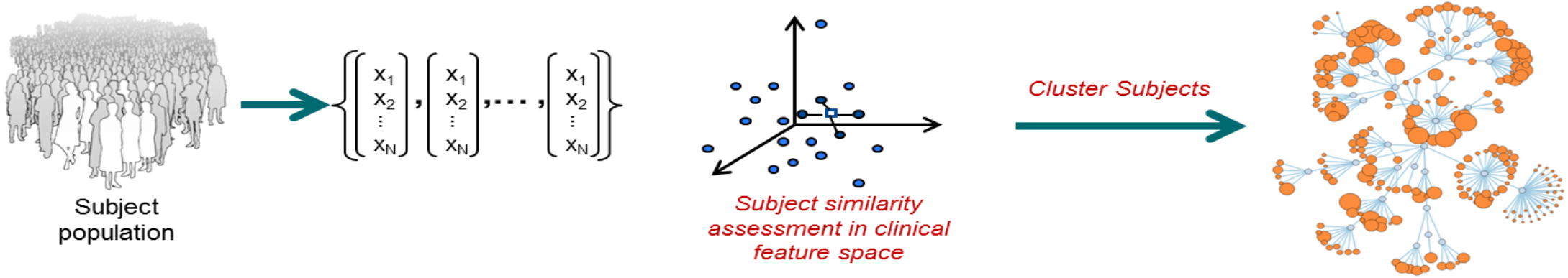
Moving subject event management from a manual to an automatic process through the use of advanced analytic models for automated/ targeted/ quality triggers.

QuintilesIMS Centralized Monitoring (PoC's)

10,008
Records, running time 37 sec. 1,230 duplicates found

>85%
Accuracy in identification of outliers (small sample), with scale we would expect ~ 95%

88.9%
Accuracy to detect the vital signs outliers effectively



Duplicate Subject Detection

Using machine learning to come up with the best rules to automatically find similar records in dataset

Laboratory Tests Outlier Detection

Propose a dissimilarity measure to quantify the differences between subject records for flagging as outliers

Vital Signs Outlier Detection

Identify subjects with large or small variations from baseline using Boxplot, Normal Distribution, and linear regression

Cognitive and automation computing - eTMF

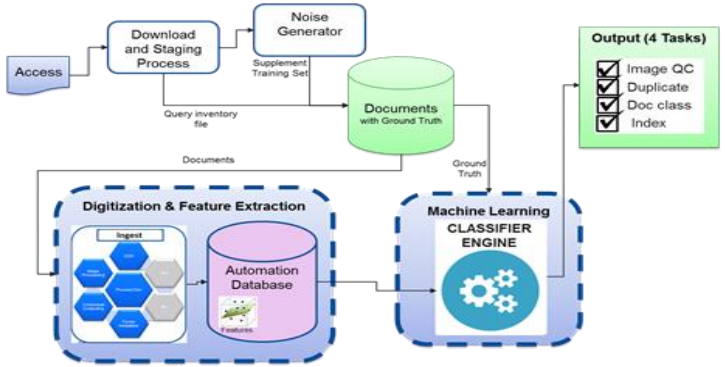
Mass scale centralization of document management with automation capabilities to identify the quality and integrity where duplications occur and checking, classifying and indexing into standard requirements.

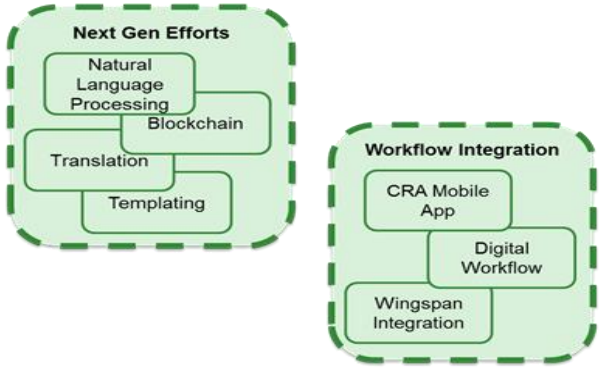
QuintilesIMS Electronic Trial Master File

2M+
Documents collected annually

800+
Document types able to run through Deep Learning

1000+
Trials run per year on average





Auto-Identify Document Type

Using optical character recognition identify, strip format, images etc and tag into structured definitions

Enhanced Document Recognition and insight

Deep Learning engine that recognizes the document, checks its validity, classifies quality and content and indexes accordingly

Augment Smart eTMF

Additional capabilities added into eTMF solution supporting added automation capabilities and connected devices

Cognitive and automation computing - Translation

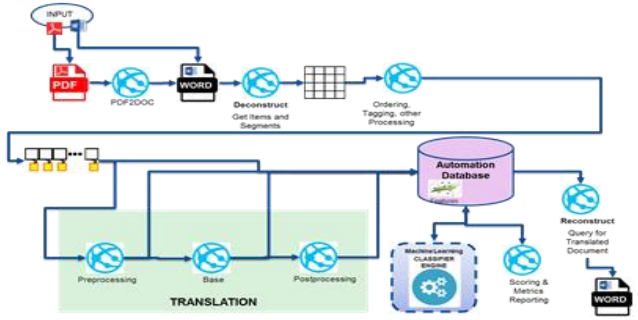
The global capability combined with historical specific clinical trial knowledge makes translation a strong candidate for smart machine learning capabilities that augments the human translator.

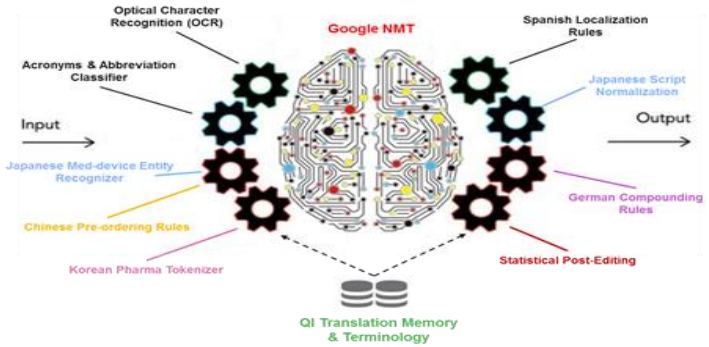
QuintilesIMS Translation Capabilities

130M+
Words translated annually

93,000+
Documents fed through Neural Machine Translation annually

50%
Global coverage through 11 language pairs





Auto-Identify Document Type

Using optical character recognition identify, strip format, images etc and tag into structured definitions

Enhanced Language Translation

Enrich the Translator with pre and post-processing specific clinical trial engines that augment translation requirements

Integrated Translation into Digital workflow

Collating segments back into formatted document and integrating into workflow management for follow-up

Cognitive and automation computing - Safety

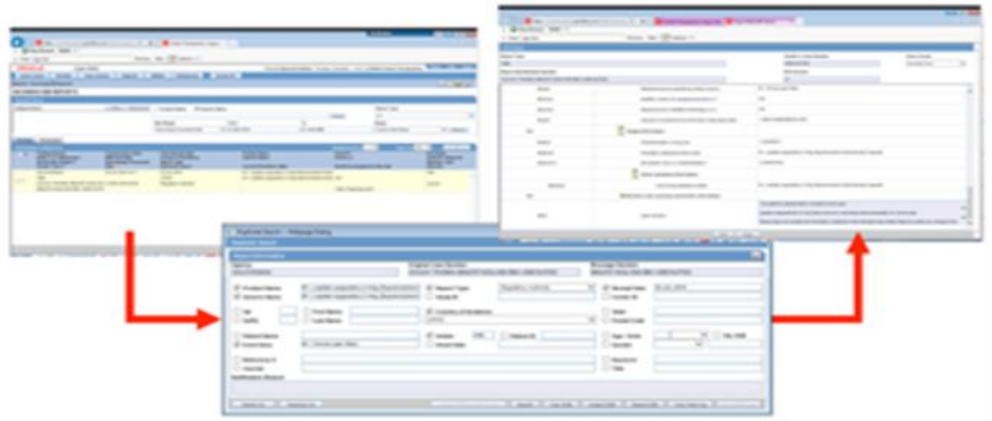
The high volume and repetitive processes make safety case reporting a good candidate to apply automation and smart machine learning capabilities to increase productivity.

QuintilesIMS Safety Case Processing

800,000+
cases processed annually

68,000+
Safety Regulatory Reports

1/3
Input data is structured or semi-structured



Auto ingest of Adverse Events

Using optical character recognition to convert AE e-mails/PDF's digitally and importing to Safety System

Enhanced Coding Descriptions

Enriching the safety information by adding 3rd party ontology information

Expert Narrative Production

Machine learning from huge amounts of previous cases allowing more accurate resulting narratives

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What's Next?

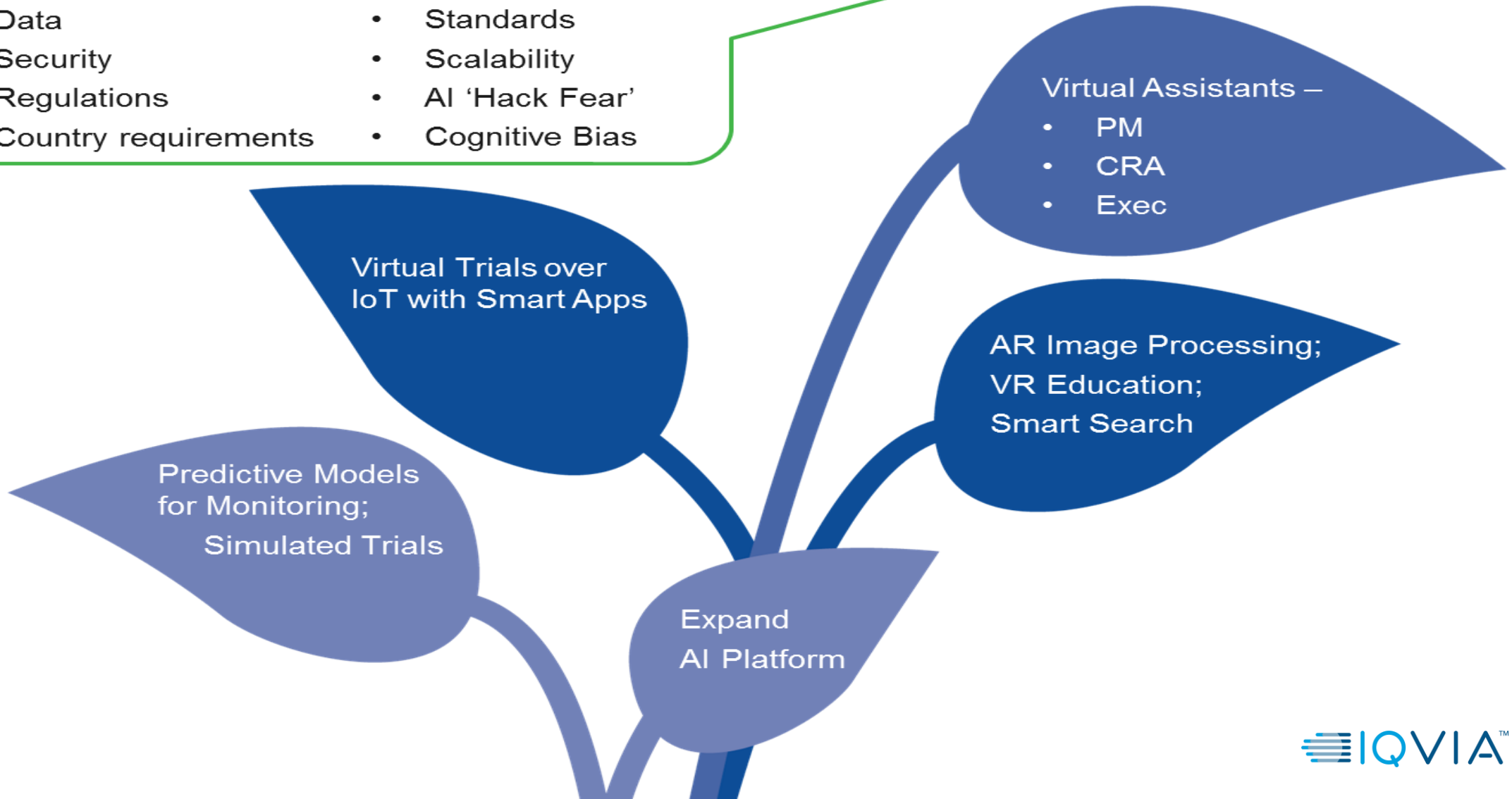
What's next for Artificial Intelligence

Growing intelligent automation with industry-specific expertise

Reveal

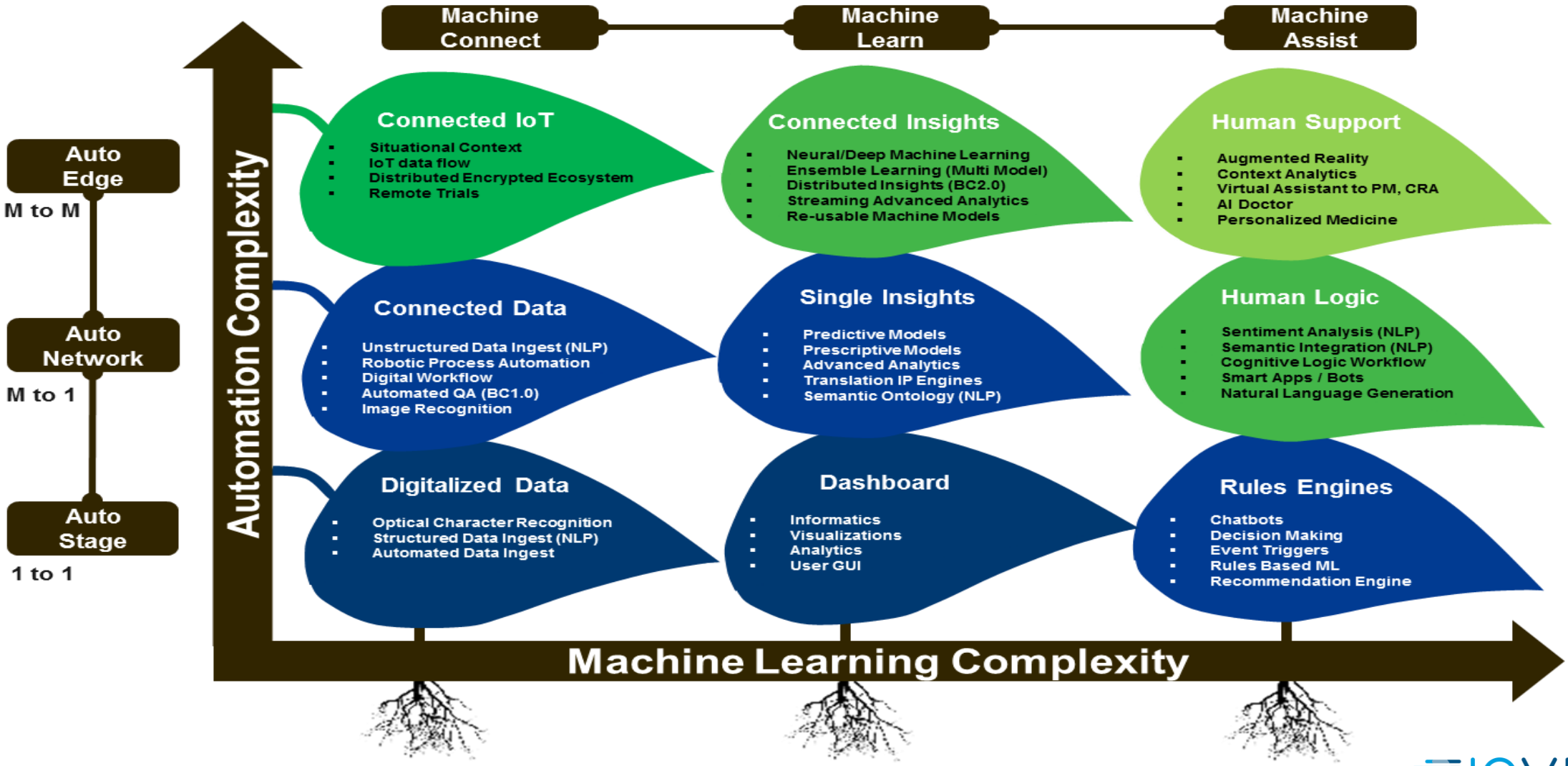
Challenge areas:

- Data
- Security
- Regulations
- Country requirements
- Standards
- Scalability
- AI 'Hack Fear'
- Cognitive Bias



What's next for Artificial Intelligence

Growing intelligent automation with industry-specific expertise



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Thank you

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