Convegno Annuale AISIS

eHealth 2020

Machine Learning:
Introduzione generale e possibili applicazioni nel settore Sanità.

Claudio Alfieri
Associate Partner – *Machine Learning Reply*

Cagliari, 13 e 14 ottobre 2016
THotel

Agenda 📅

- **Reply Group**
- **Machine Learning**
- **Applications**
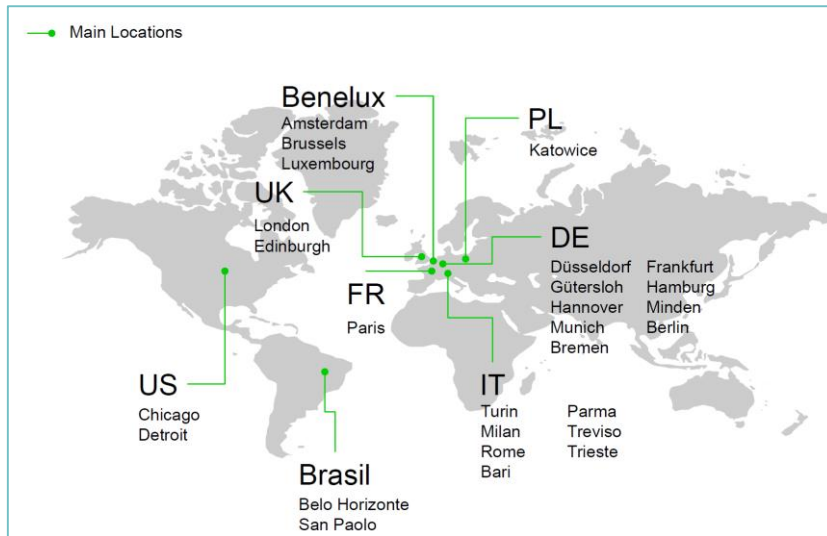- **Healthcare**

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Agenda 📅

- **Reply Group**
- Machine Learning
- Applications
- Healthcare

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Reply **GROUP**

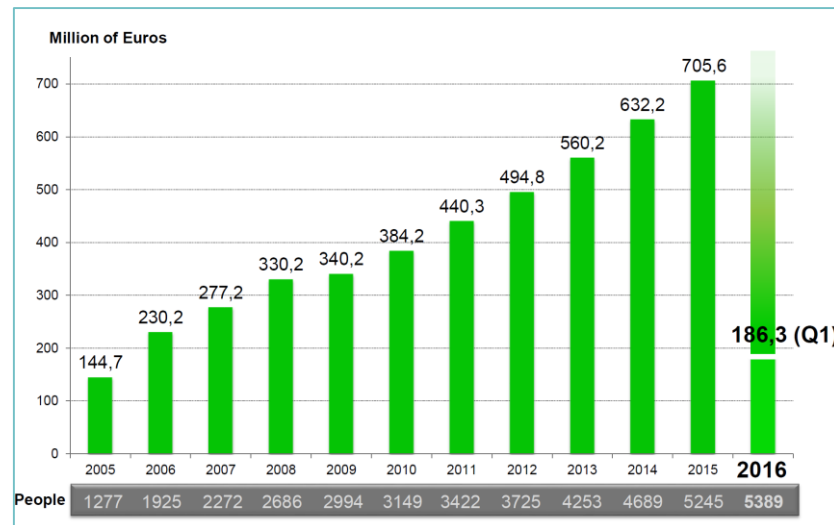To excel in helping our customers exploiting relevant innovation brought about by economic changes and driven by internet technologies

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Associazione Italiana Sistemi Informativi in Sanità
eHealth 2020

Reply
machine learning

ASSOCIAZIONE ITALIANA
SISTEMI INFORMATIVI IN SANITÀ

Main Locations

Benelux
Amsterdam
Brussels
Luxembourg

PL
Katowice

UK
London
Edinburgh

FR
Paris

DE
Düsseldorf   Frankfurt
Gütersloh   Hamburg
Hannover   Minden
Munich   Berlin
Bremen

US
Chicago
Detroit

IT
Turin   Parma
Milan   Treviso
Rome   Trieste
Bari

Brasil
Belo Horizonte
San Paolo

Reply Group

Million of Euros

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Revenue	144,7	230,2	277,2	330,2	340,2	384,2	440,3	494,8	560,2	632,2	705,6	186,3 (Q1)
People	1277	1925	2272	2686	2994	3149	3422	3725	4253	4689	5245	**5389**

KEY FACTS

- Founded in 1996 to achieve excellence within the internet consulting market, **Reply** is today a **leading IT Services Company**.

- Impressive track record: from **€18.6m** in **1999** to **€705.6m** revenue in **2015**. The revenue in **Q1 2016** was **€186.3m**, **+10.1% compared with Q1 2015**.

- Constant **two digit Ebit** growth.

- More than **5.300 employees** distributed across a network of specialized companies.

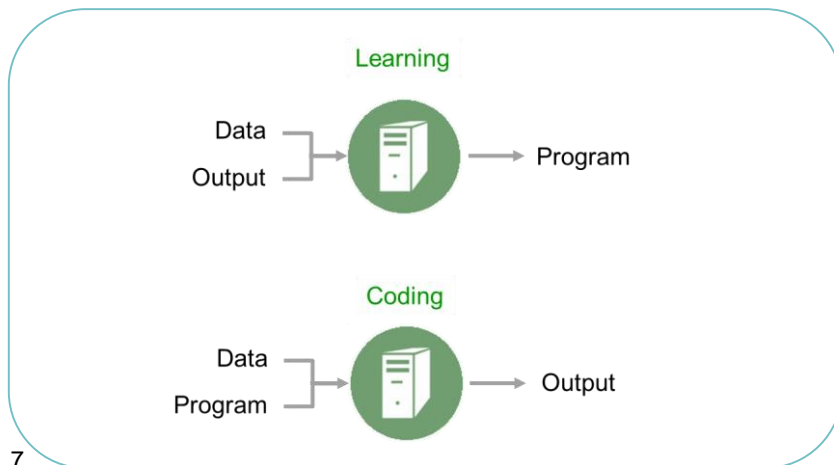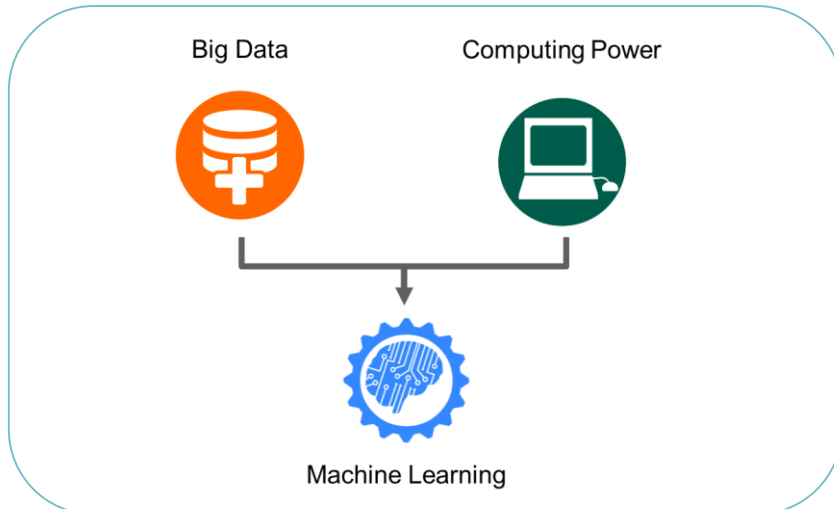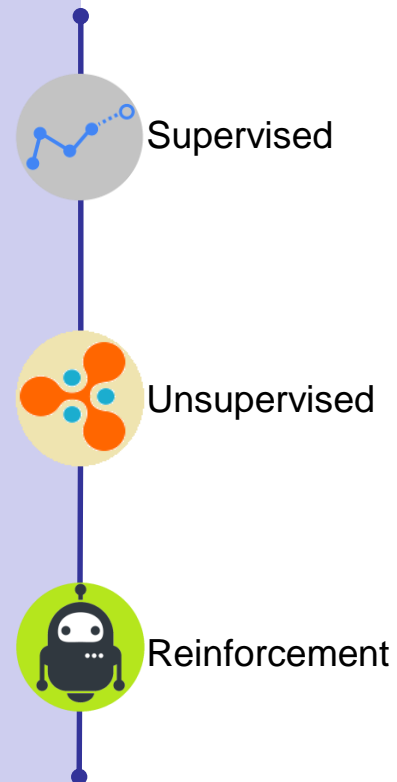- **Large customers**, with a very **high customer retention**.

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What is **MACHINE LEARNING** ?

Big Data — Computing Power → Machine Learning

Learning: Data, Output → Program
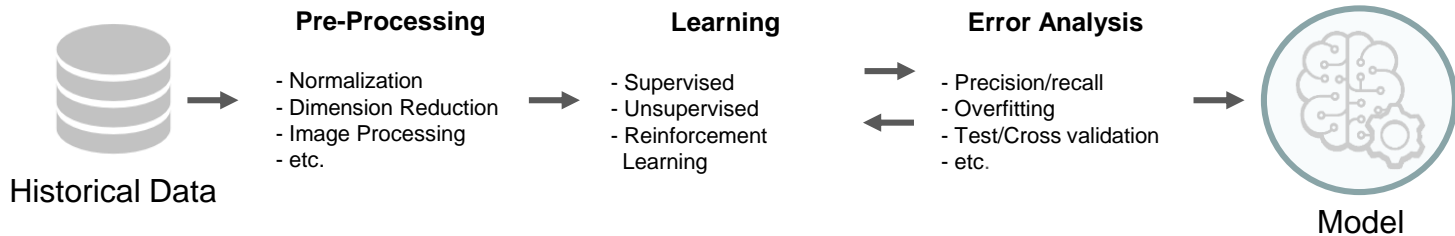
Coding: Data, Program → Output

Machine Learning is a scientific discipline that deals with the construction and study of algorithms that can **learn from data**.

Such algorithms operate by **building a model** based on inputs and using that to **make predictions or decisions**, rather than following only explicitly programmed instructions.
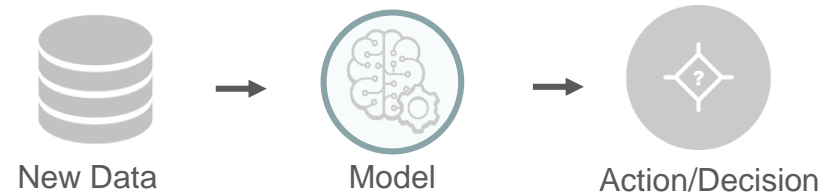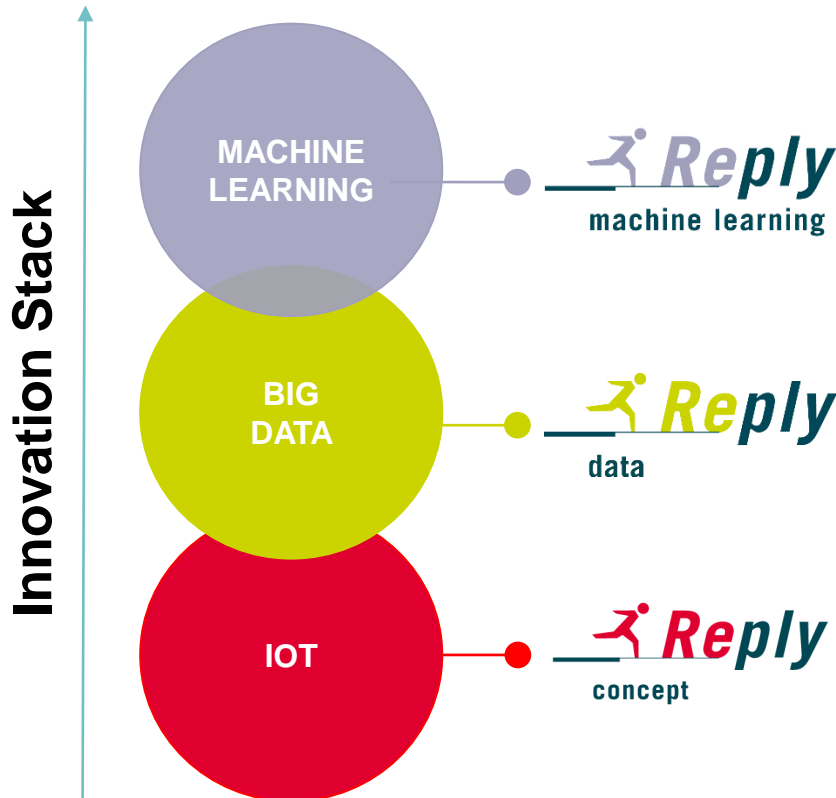
Supervised

Unsupervised

Reinforcement

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How **IT WORKS**

LEARNING

Pre-Processing
- Normalization
- Dimension Reduction
- Image Processing
- etc.

Historical Data

Learning
- Supervised
- Unsupervised
- Reinforcement
  Learning

Error Analysis
- Precision/recall
- Overfitting
- Test/Cross validation
- etc.

Model

PREDICTION

New Data → Model → Action/Decision

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Agenda 📅

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Machine Learning **REPLY**

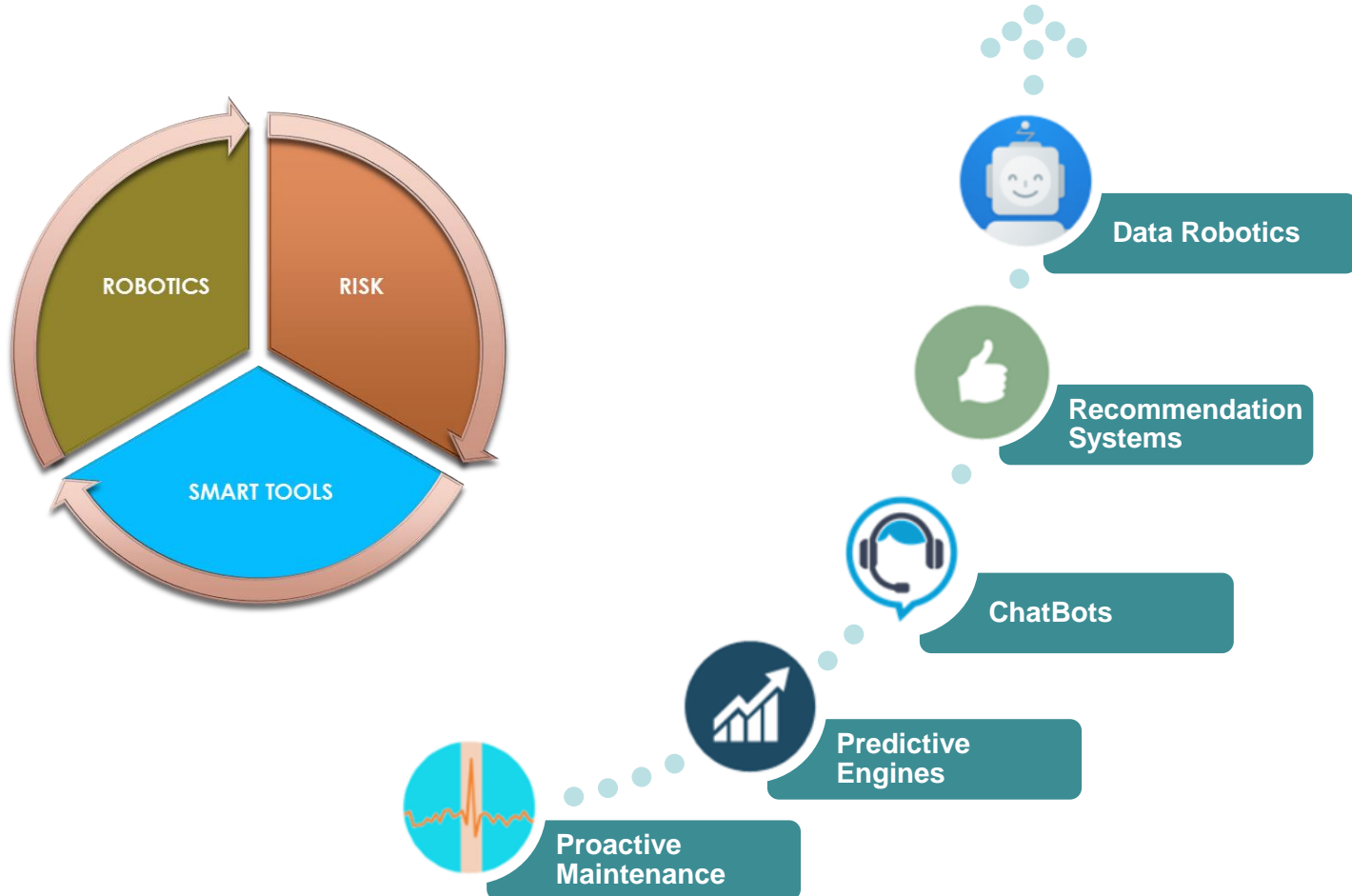**MACHINE LEARNING**

BIG DATA

IOT

Innovation Stack

REPLY strategic approach requires to move from a **focus on the objects** to an approach that considers the **overall integration** within a broader ecosystem
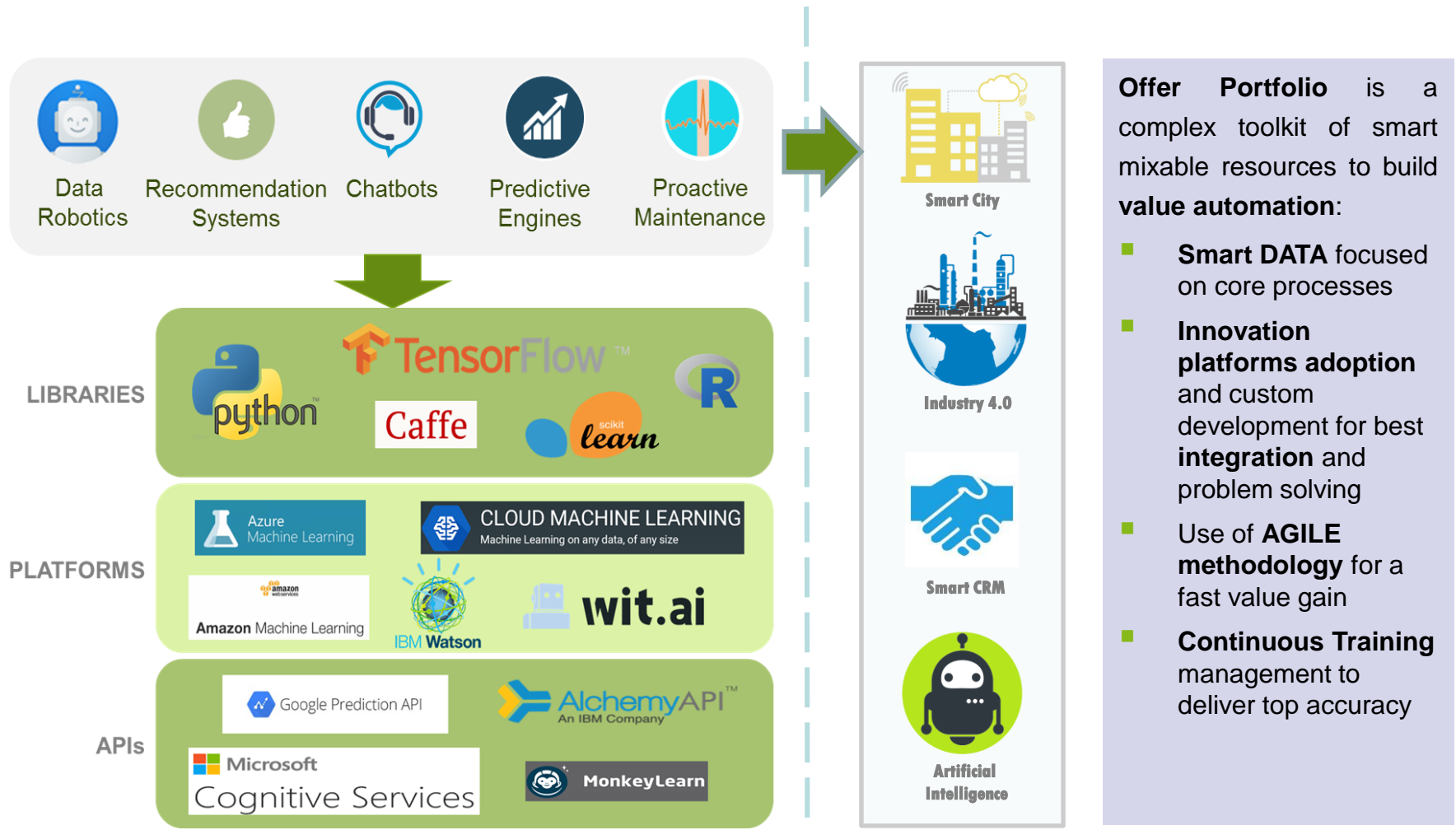
The whole **Innovation Stack** is covered by focused companies **retrieving value** at each step of the **process**:

- Specific **vertical capabilities** provided by each Reply Company

- **Innovation and experimentation** on IoT, Big Data and Machine Learning

- Developing of full stack **market vertical solutions**
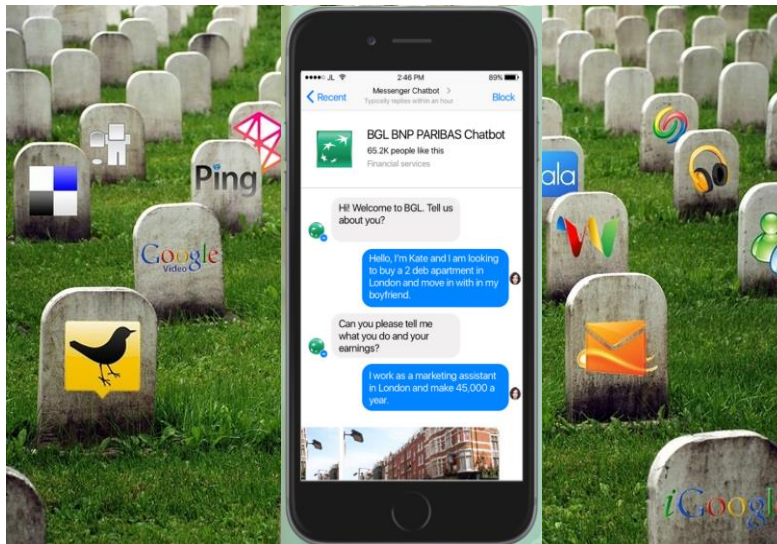
Machine Learning **APPLICATIONS**

Data Robotics

Recommendation Systems

ChatBots

Predictive Engines

Proactive Maintenance

ROBOTICS

RISK

SMART TOOLS

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Reply
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Technology & **PLATFORMS**

Data Robotics · **Recommendation Systems** · **Chatbots** · **Predictive Engines** · **Proactive Maintenance**

LIBRARIES
TensorFlow™ · python™ · Caffe · scikit learn · R™

PLATFORMS
Azure Machine Learning · CLOUD MACHINE LEARNING — Machine Learning on any data, of any size · amazon web services — Amazon Machine Learning · IBM Watson · wit.ai

APIs
Google Prediction API · AlchemyAPI™ An IBM Company · Microsoft Cognitive Services · MonkeyLearn

Smart City

Industry 4.0

Smart CRM

Artificial Intelligence

Offer Portfolio is a complex toolkit of smart mixable resources to build **value automation**:

- **Smart DATA** focused on core processes

- **Innovation platforms adoption** and custom development for best **integration** and problem solving

- Use of **AGILE methodology** for a fast value gain

- **Continuous Training** management to deliver top accuracy

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Smart Tools: **CHATBOTS**

B2C - Configurator
- Fidelity
- Customer Support

B2B - Smart Sales CB
- Customer Support

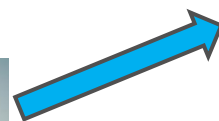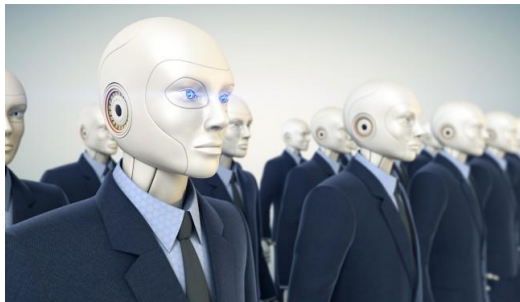**OLD FASHION** - Transactional Apps

Healthcare
- Patient experience improvement
- Advanced Booking
- Medical and prevention information
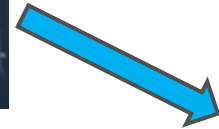- Customer first aid support
- …

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Smart Tools: **DATA ROBOTICS**
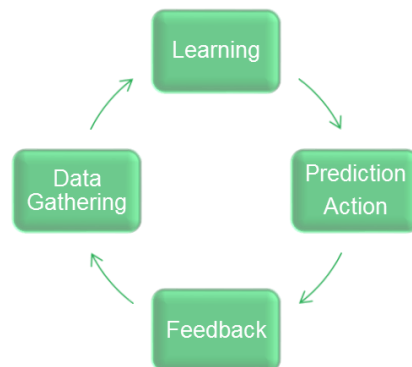
CUSTOM
- RECOMMENDATION ENGINES
- PREDICTIVE ENGINES
- PRESCRIPTIVE ANALYTICS

PLATFORM
- OCR
- INVOICE MATCHING
- ORDERS GATHERING

LANGUAGE
- NARRATIVE BI
- TEXT MINING

Learning → Prediction Action → Feedback → Data Gathering → Learning

Continuous Learning:
- Adjusts to time
- Improves accuracy

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machine learning

Smart Tools: **DATA ROBOTICS II**

Finance & Banking
- New account verification
- Data validation
- Customer account management
- Financial claims processing
- Report creation
- Form filling
- Change of address
- Loan application processing

Insurance
- Emissione
- Riconciliazione incassi/emessi
- Antifrode
- Apertura e liquidazione sinistri
- Carrozzerie convenzionate
- Recupero crediti
- Analisi polizze non standard

Telecommunications
- Collection & consolidate customer data from client phone systems
- Backing up information from client systems
- Uploading data
- Transferring customer data between applications
- Extracting data about competitor pricing

Retail
- Automatically updating online inventory & product information
- Importing website orders and email sales into back-end systems

Government
- Verification process
- Populating forms and assigning sub-contractors to jobs
- Integrating legacy systems with newer systems

Finance/Accounting
- Invoice processing
- Accounts payable and accounts receivables
- Reporting
- Bank reconciliation
- Fixed assets analysis
- Master data management
- Vendor and customer account creation
- ERP logging from another system
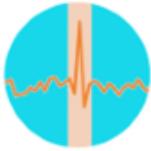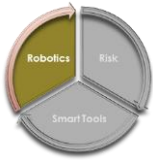
Healthcare
- Patient data migration and processing
- Reporting for doctors
- Medical bill processing
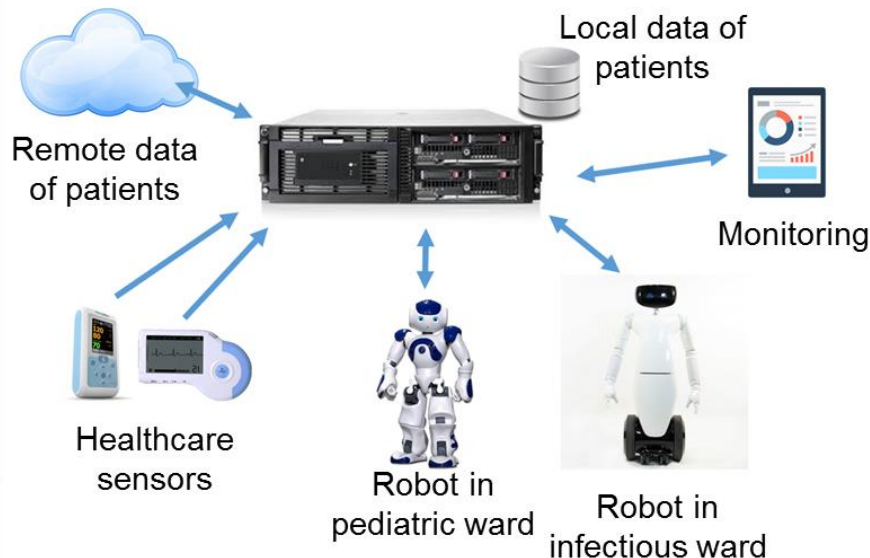- Patient record storage

IT
- Creating new accounts
- Software installations and updates
- Batch processing
- Printer set-ups

HR
- Employee on-boarding
- Leave of absence management
- Populating employee data into multiple systems
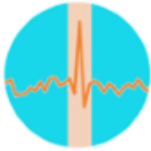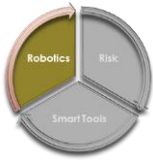- Performance appraisal management

Robotics: **PERSONAL ROBOTS**

Local data of patients

Remote data of patients

Monitoring

Healthcare sensors

Robot in pediatric ward

Robot in infectious ward

Robotics has an important role in Healtcare, adopting a robotic solution is possible to:

- **24x7 service** to support patients even in dangerous wards (for example infectious patients);

- **be a remote worker** controlled by humans;

- **integrate robots in a complex environment** in order to act according data like sensors on patients, their diagnosis and other information stored in a common storage.

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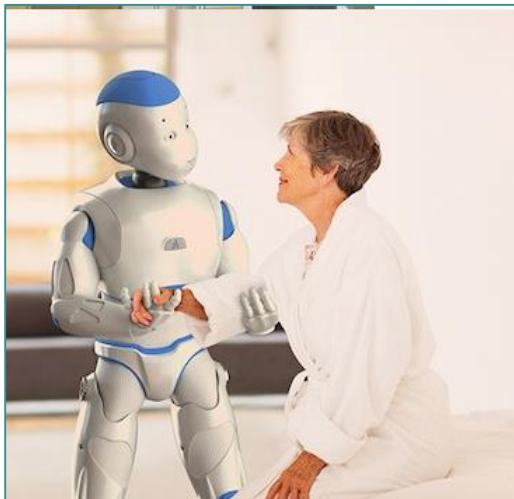# Robotics: **PERSONAL ROBOTS II**

Senior people assistance

Play children to improve communication capability.
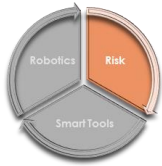

Act in dangerous wards
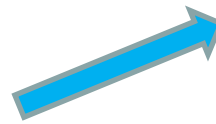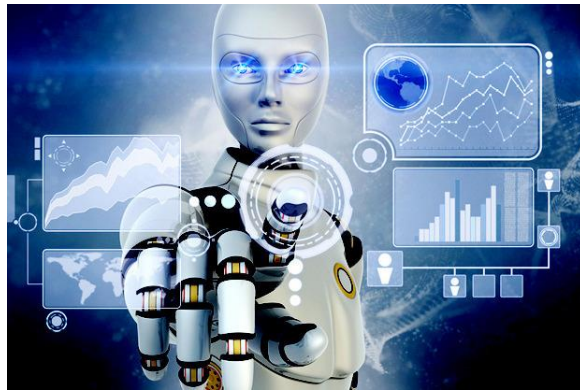

Support injured people

Robots are **connected** to a complex framework to **share information and act** when specific event happens (i.e. sensors identify a **critical situation for patients**) or when specific activities have to be performed (i.e. **meal transport**).

Transport patient meals, medical supplies, medical linens and trash.
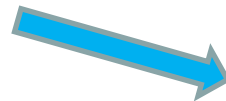
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Risk: **PREDICTIVE ENGINES**

FINANCE - DVA TOOL

HEALTH - CLINIC RISK

INSURANCE - FRAUD

PEDIATRIA	CRONICITÀ	TERZA ETÀ	OSPEDALE ESTESO

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Risk: **PREDICTIVE ENGINES II**

Data Gathering

Clinic Data	Weather	Medical Models	Region Information	Calendar and Holidays
Daily, Weekly, Monthly, Seasonal, Yearly	Rain, Fog, Snow, Thunderstorm, Hail	Location, Dimension, Pathology, Cure suggestion	Geographical Location Population Density, Area	Week days, Weekend, Holidays

Data Modeling

Data Integration → Data Cleaning → Data Exploration → Time Series Modeling

How would feel the patient in June, 2016?

Model ?

Actual
Predicted
Validation
Forecast

Thank you!

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