

How Artificial Intelligence is Transforming Insurance

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Outline

- Machine Intelligence @Swiss Re
- Use Cases
- Platforms
- Challenges and next steps

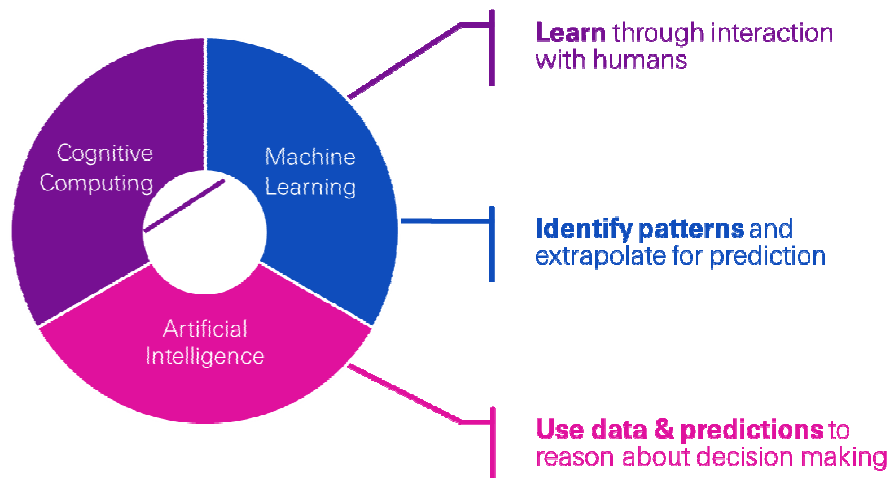
Machine Intelligence @Swiss Re (1/3)

Query Artificial-Intelligence Recognition
Language Reasoning
Learning Knowledge Semantic-Web
Wikipedia Cognition
Natural-Language-Processing Character Graphs Multiple
Recommender Handwritten WWW XML Machine-Learning Artificial
Neural Computational Web Semantic Algorithm
Kernel ML Constrains CBR Information
System Intelligence Unsupervised NLP Planning
Text Mining Method Data-Mining Mining Pattern
Neuroscience Clustering Supervised
Case-Base AI Data Memory
Ontology Theory Algorithm Alogorithm
Case-Based Networks

formal knowledge representation Artificial Intelligence
Information Extraction Information Retrieval
Approximate Bayesian inference predictive models
Biomedical Imaging neural networks numerical modeling
Statistical machine learning Semi supervised learning
Multimedia processing compressive sensing Probabilistic Modeling
Cloud Computing Image analytics Pattern Recognition
Image Processing Graph Mining Numerical Analysis
search log analysis Convex optimization C/C large scale data mining
Data Science Data Scientist Robotics Spam Filtering
quantitative imaging Pattern Classification Hadoop nonlinear dynamical systems
Social Computing Computational Vision Optimization
data analytics Bioinformatics spam detection
artificial neural networks Applied Machine Learning Recommender systems
mining content predictive analytics video analysis
Large scale learning Algorithms predictive modeling
Computer Vision Data Mining Statistics
Machine Learning Augmented Reality
computational neuroscience
Natural Language Processing

Machine Intelligence @Swiss Re (2/3)

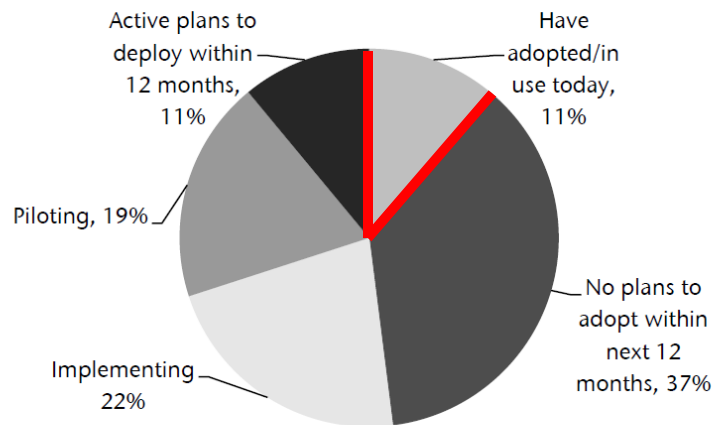
Machine Intelligence refers to the interplay between Artificial Intelligence, Machine Learning and Cognitive Computing



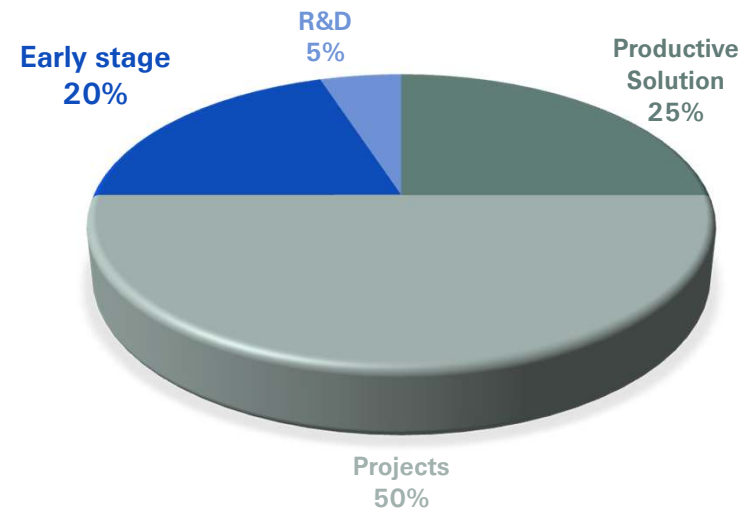
These three disciplines are very broad and specific capabilities are not interchangeable

Machine Intelligence @Swiss Re (3/3)

Balanced portfolio of projects between productive solutions, PoCs, feasibility checks for new requests and R&D activities

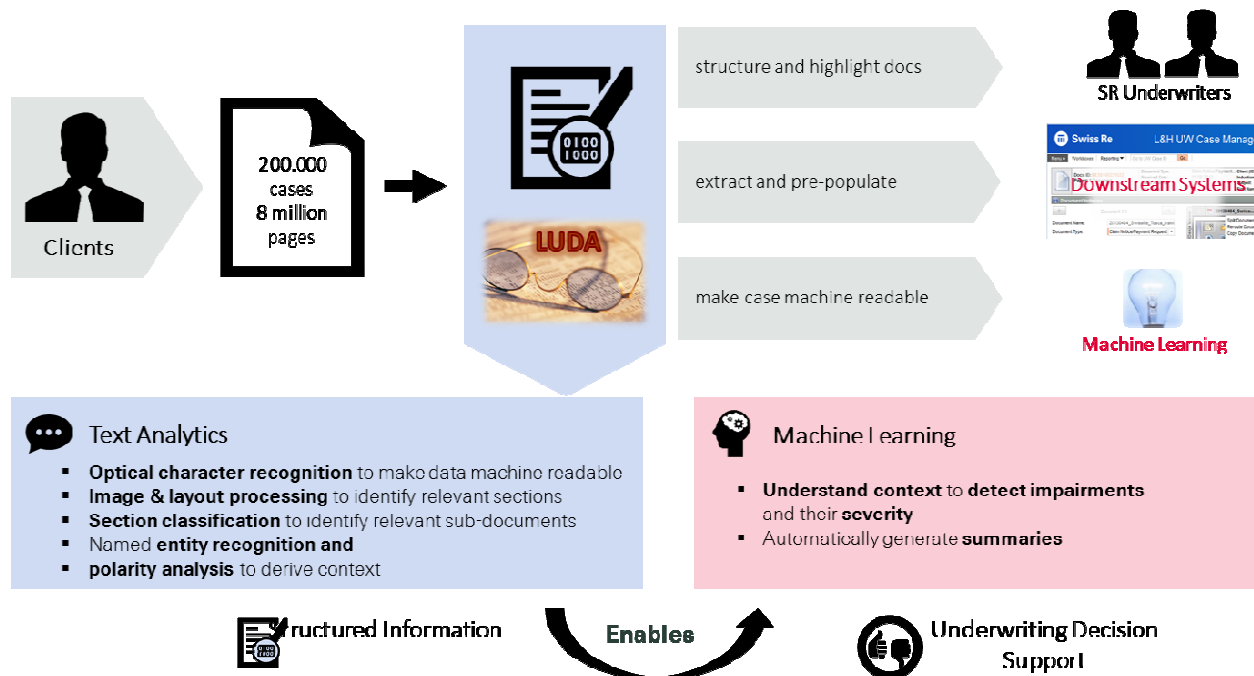


Source: Gartner (March 2017), Jefferies



Use Cases (1/6)

□ L&H Underwriting Analytics



Use Cases (2/6)

L&H Underwriting Analytics

1

What underwriters receive

2

What we can do today

3

What we are developing

Navigation


Highlighting

Search

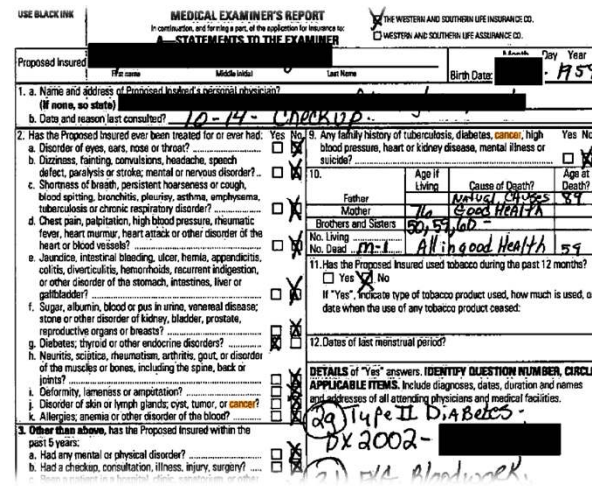
Read Forms

Extract Values

Understand Tick-Boxes



Follow-Up Note
Diagnosis: Breast cancer.
CC:
Follow-Up Note
Diagnosis: Breast **cancer**.
CC:
Evaluation/management/follow-up of breast **cancer**.
HPI:
The patient is a pleasant 52 y/o female with h/o early stage breast cancer who comes in for a fu appt. She has had lumpectomy and **radiation**, now started on Arimidex. Her main complaints are not flashes.
Allergies:
Codeine
Medications: (Reviewed)
Include Arimidex.
Family History: (Reviewed) unchanged from previous visit)
Social History: (Reviewed) unchanged from the previous visit)
is married. **radiation** as never smoked. She drinks occasionally. She consumes 1 day/week. reports the following support systems. Lives with spouse, significant other, family, or friends and Has a living will or advanced directives. She does not have any h/o alcohol or tobacco abuse. She drinks occasional wine. She is married. She is an office manager and lives with her husband.
Past Medical History: (Reviewed)
Changed for her completion of **radiation**.
Review of Systems:
Constitutional
Allergic/Immunologic
Eyes
ENT
Endocrine
Hematologic/Lymphatic
Breasts
Respiratory
Cardiovascular
Gastrointestinal
No fevers, chills, night sweats, excessive fatigue or weight loss.
No reactions
No significant visual difficulties. No diplopia.
No problems with hearing, no sore throat, no sinus drainage.
No diabetes, thyroid disease or hormone replacement. No hot flashes or night sweats.
No easy bruising or bleeding. The patient denies any tender or palpable lymph nodes.
Mild shingles R breast.
No dyspnea on exertion, chest pain, cough or hemoptysis.
No anginal chest pain, palpitations or orthopnea.
No nausea, vomiting, diarrhea, GI bleeding, or constipation. No change in bowel habits, no heartburn or early satiety.



USE BLACK INK
MEDICAL EXAMINER'S REPORT
In continuation, and forming a part, of the application for insurance for:
STATEMENTS BY THE EXAMINER
The name: [redacted] Middle Initial: [redacted] Last Name: [redacted] Birth Date: [redacted] - 1759
1. a. Name and address of Proposed Insured's personal physician? [redacted]
(If none, so state)
b. Date and reason last consulted? 10-14-2000
2. Has the Proposed Insured ever been treated for or over had:
a. Disorder of eyes, ears, nose or throat? [X] Yes [] No
b. Dizziness, fainting, convulsions, headache, speech defect, paralysis or stroke, mental or nervous disorder? [X] Yes [] No
c. Shortness of breath, persistent hoarseness or cough, blood spitting, bronchitis, pleurisy, asthma, emphysema, tuberculosis or chronic respiratory disorder? [X] Yes [] No
d. Chest pain, palpitation, high blood pressure, rheumatic fever, heart murmur, heart attack or other disorder of the heart or blood vessels? [X] Yes [] No
e. Jaundice, intestinal bleeding, ulcer, hernia, appendicitis, colitis, diverticulitis, hemorrhoids, recurrent indigestion, or other disorder of the stomach, intestines, liver or gallbladder? [X] Yes [] No
f. Sugar, albumin, blood or pus in urine, venereal disease, stone or other disorder of kidney, bladder, prostate, reproductive organs or breasts? [X] Yes [] No
g. Diabetes, thyroid or other endocrine disorders? [X] Yes [] No
h. Neuritis, sciatica, rheumatism, arthritis, gout, or disorder of the muscles or bones, including the spine, back or joints? [X] Yes [] No
i. Deformity, lameness or amputation? [X] Yes [] No
j. Disorder of skin or lymph glands; cyst, tumor, or cancer? [X] Yes [] No
k. Allergies, anemia or other disorder of the blood? [X] Yes [] No
3. Other than above, has the Proposed Insured within the past 5 years:
a. Had any mental or physical disorder? [X] Yes [] No
b. Had a checkup, consultation, illness, injury, surgery? [X] Yes [] No
c. Been a patient in a hospital, clinic, sanatorium or other [X] Yes [] No
10. Father: [redacted] Age at Death: [redacted]
Mother: [redacted] Cause of Death: [redacted] Age at Death: [redacted]
Brothers and Sisters: [redacted]
No. Living: [redacted] No. Dead: [redacted]
11. Has the Proposed Insured used tobacco during the past 12 months? [X] Yes [] No
If "Yes", indicate type of tobacco product used, how much is used, or date when the use of any tobacco product ceased.
12. Dates of last menstrual period?
DETAILS of "Yes" answers. IDENTIFY QUESTION NUMBER, CIRCLE APPLICABLE ITEMS. Include diagnoses, dates, duration and names and addresses of all attending physicians and medical facilities.
Type II Diabetes
DX 2002-
Accident - car

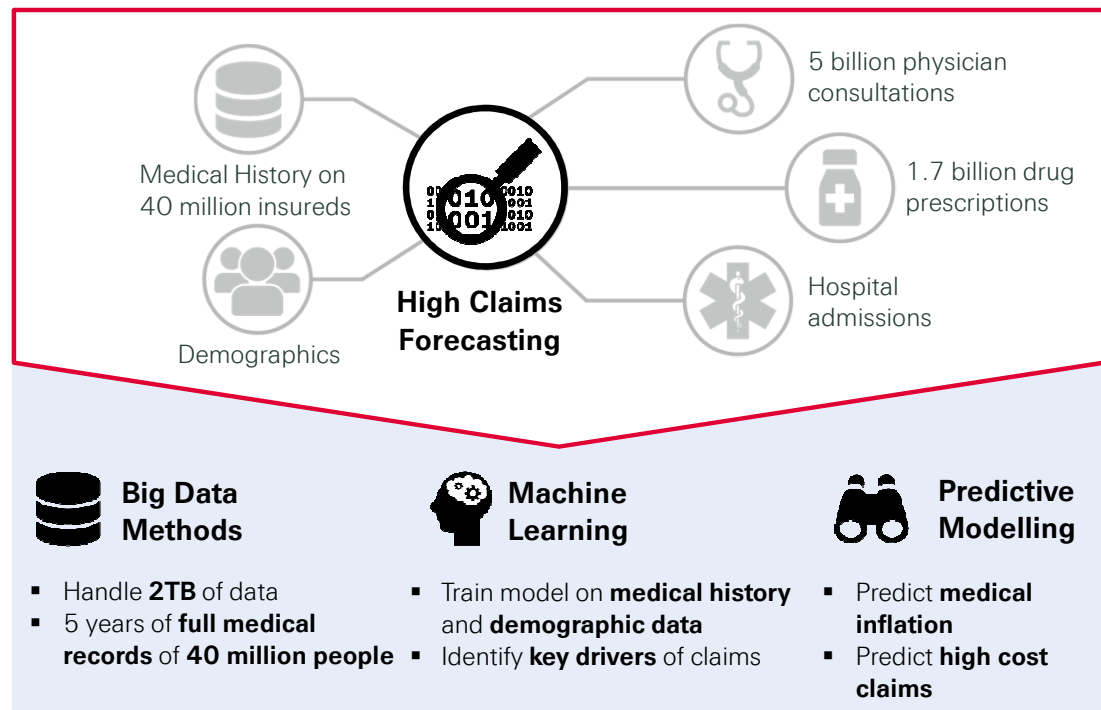
Use Cases (3/6)

□ Accident & Health Cost Claims Forecasting



Rising High Claims Costs

- Strong Medical Inflation
- Increase in the frequency of **catastrophic claims**
- From 2009 to 2013 share of losses caused by the upper 2% of the enrollees rose from **30% to 38%**
- Main drivers are **specialty drugs** where costs can reach USD 10m per year per individual



Use Cases (4/6)

Accident & Health Cost Claims Forecasting

Descriptive Analytics

- What is the **medical inflation** for the different **demographics**?
- What are **high claims** made of?
- How much does a given treatment cost, e.g. **lung cancer**?

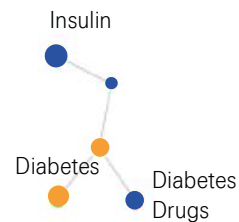
Predictive Analytics

- Which key features have the **highest forecasting power**?
- What will the medical inflation rates be **next year**?
- How to get **early warnings** on new high-cost treatments?

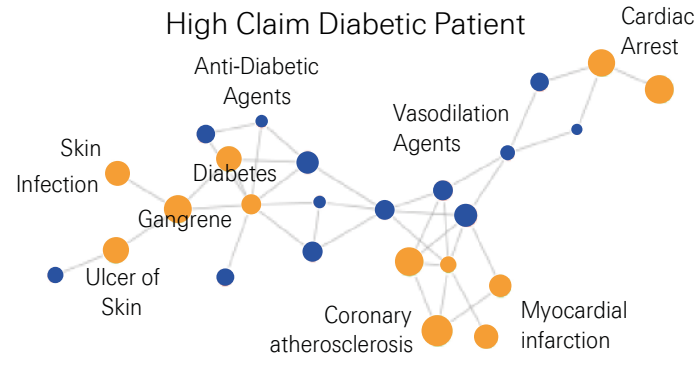
Business Impact

- Ability to flag **67%** of cases that **will exceed** a certain threshold
- 66%** of flagged case **do exceed** the threshold
- Leading indicators for catastrophic claims are **cancers** and **kidney diseases**

Normal Diabetic Patient



High Claim Diabetic Patient

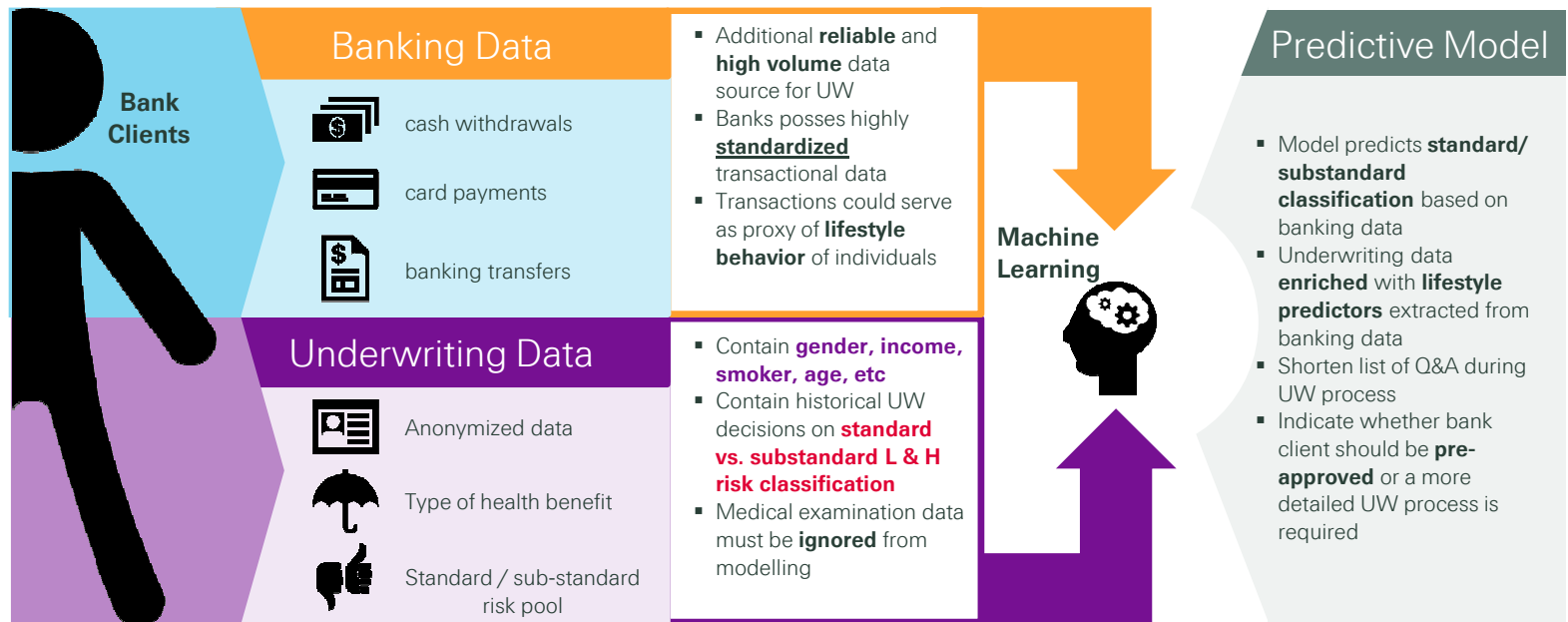


● Diagnosis ● Drugs

High cost (>USD 50k per year) diabetic patients are characterized by a high-level of co-morbidities, including skin and cardio-vascular diagnoses.

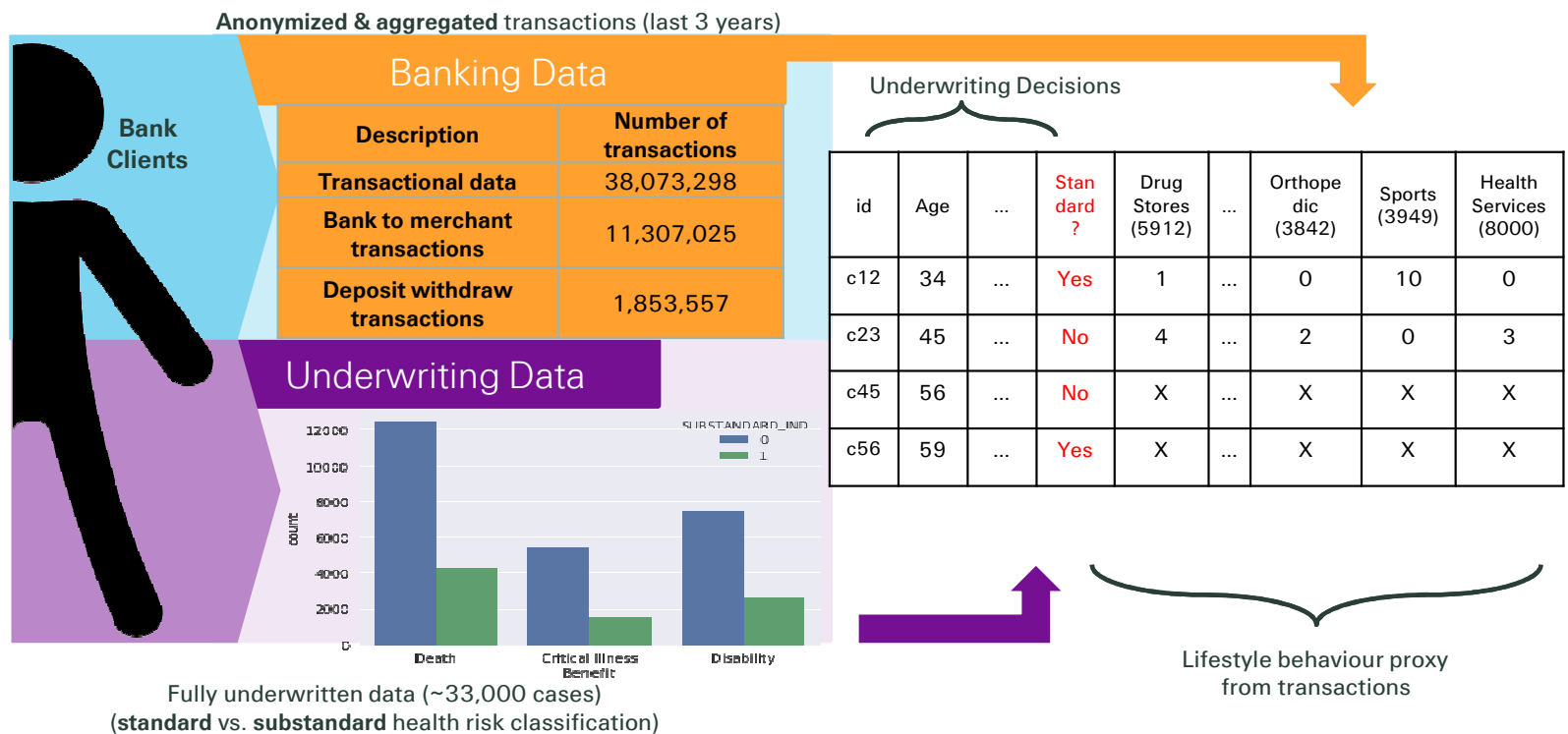
Use Cases (5/6)

Bank-insurance



Use Cases (6/6)

Bank-insurance



Machine Intelligence Platforms @SR

We provide three platforms for our productive solutions



ADAPT is a scalable platform that uses machine learning to **automate** repetitive **document processing** tasks



- Smart automation (claims' processing, contract intelligence, submissions' processing)



Insights Re is a **document enrichment** platform powered by semantic search and AI capabilities



- Document intelligence (classification, summarisation, search)
- Information retrieval



Pythia is a scalable platform which enables to rapidly deploy **models** and **visualizations**



- Predictive modelling using state-of-the-art machine learning (e.g. Data Robot)

Challenges and next steps

A potential cultural clash...

Statistical Science
2001, Vol. 16, No. 3, 199–231

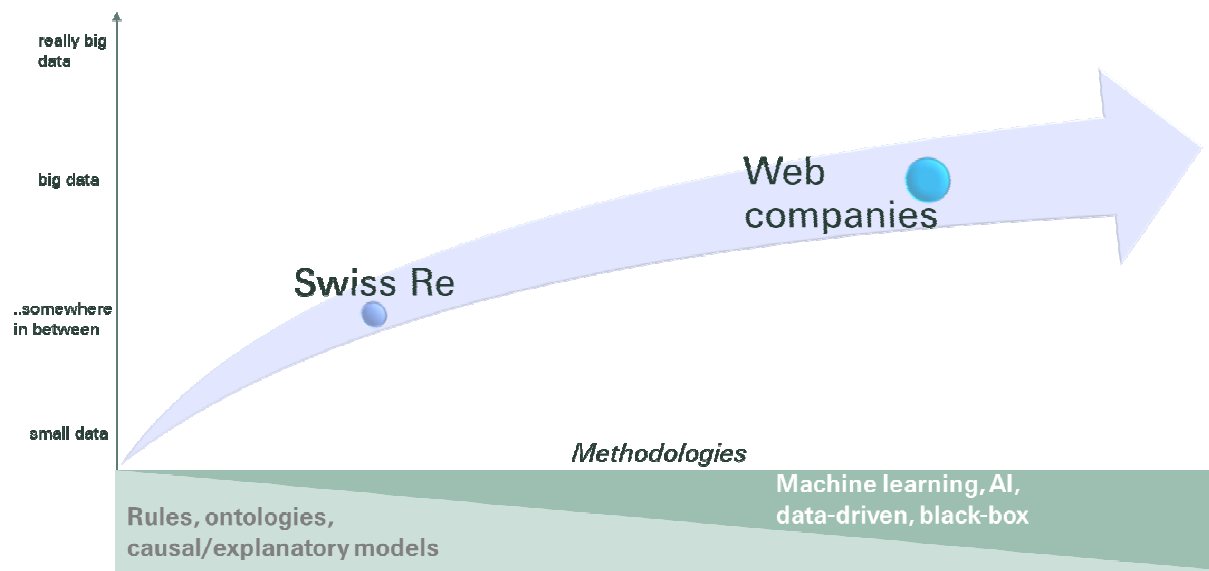
Statistical Modeling: The Two Cultures

Leo Breiman

Abstract. There are two cultures in the use of statistical modeling to reach conclusions from data. One assumes that the data are generated by a given stochastic data model. The other uses algorithmic models and treats the data mechanism as unknown. The statistical community has been committed to the almost exclusive use of data models. This commitment has led to irrelevant theory, questionable conclusions, and has kept statisticians from working on a large range of interesting current problems. Algorithmic modeling, both in theory and practice, has developed rapidly in fields outside statistics. It can be used both on large complex data sets and as a more accurate and informative alternative to data modeling on smaller data sets. If our goal as a field is to use data to solve problems, then we need to move away from exclusive dependence on data models and adopt a more diverse set of tools.

Challenges and next steps

Different Machine Intelligence methods have different relevance depending on the amount and type of data available for analysis



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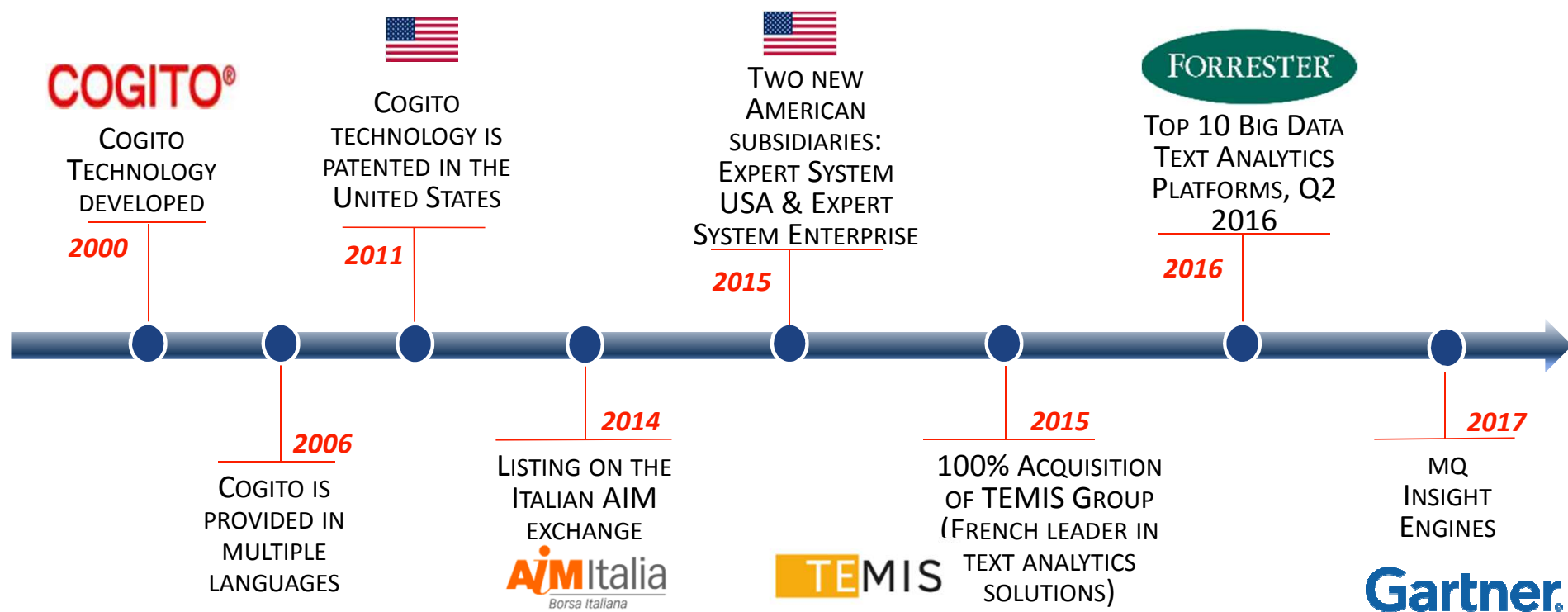


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About Expert System

- **LARGEST EUROPEAN VENDOR**
of Artificial Intelligence for Text Analytics with more than €30 M in turnover
- **PUBLIC COMPANY (EXSY)**
with offices and R&D labs in Europe and USA and 235 global employees
- **PATENTED TECHNOLOGY**
- The technology of choice **FOR ENTERPRISES** in all sectors and **FOR GOVERNMENTS**

Expert System group highlights



Customers in Key Verticals

BANKING & INSURANCE



MEDIA & PUBLISHING



GOVERNMENT



OTHERS

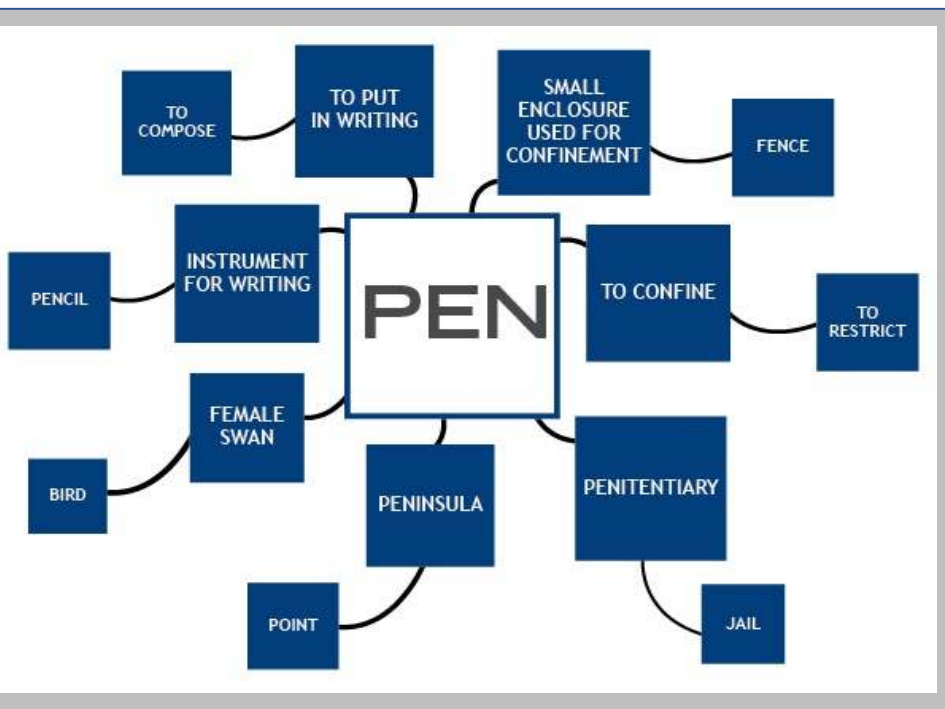


Artificial Intelligence



Which policy?

Artificial Intelligence



Morphological Analysis



dog, dog-catcher, and doggy-bag are closely related

Part of Speech Analysis



«*There are 40 rows in the table*» (rows = noun)
«*She rows 5 times a week*» (rows = verb)

Logical Analysis



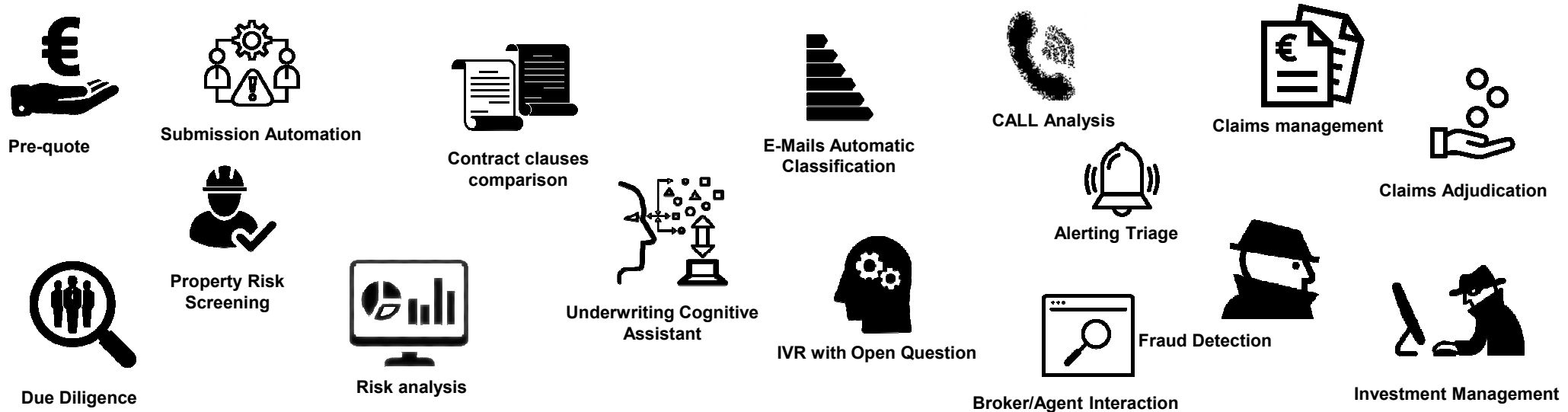
«*Davey Jones, represented by attorney Daniel Stanley, is married to Rebecca Carter*»
Rebecca is married to Davey and not Daniel

Semantic Analysis

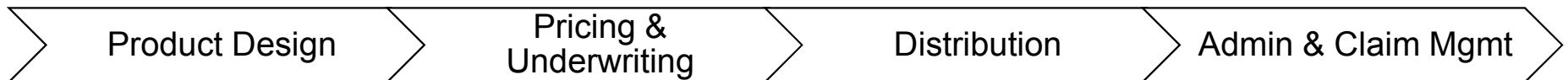


«*I used chicken broth for my soup stock*» (stock = food)
«*The company keeps lots of stock on hand*» (stock = inventory)

How Artificial Intelligence is Transforming Insurance



Insurance Value Chain

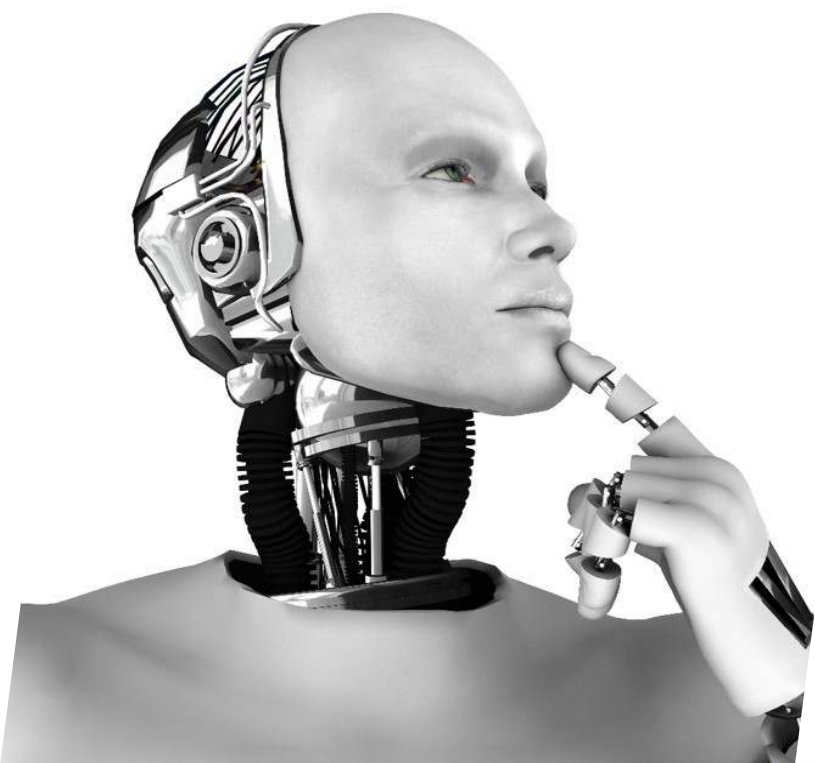


How Artificial Intelligence is Transforming Insurance

It is not only a matter of efficiency gain, but also of risk exposure reduction:

- Speed
- Free up time
- Accuracy
- Standardization
- Easier audits
- Reduce leakage
- Improve customer satisfaction
- Reduce reserving

Hints for success



- **Have confidence in the value of AI and experience:** sometimes road is long and winding, but at the end the results are real, solid and measurable
- **Prefer a gradual approach:** targeting a step-by-step implementation of AI solutions is often the best recipe for success
- A bit of **healthy skepticism** is always a good start to set the right expectations for AI



Questions

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