Enhanced Underwriting thanks to Artificial Intelligence

Documentation
Roland Berger

Zurich, January 2017

Artificial intelligence leads to fast, accurate and unbiased results in decision making processes

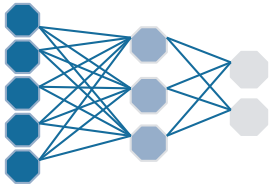
Comparison human vs. artificially intelligent decision making

1 Data Input

AI[1)]

Human

2 Data processing

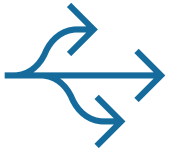


Hidden layers[2)]

Neuronal processing

3 Output/Result

Unbiased output



Biased output

Decision making AI

Duration: Very fast decision-making process

Accuracy: Depending on algorithm and maturity, but generally very accurate

Bias: Theoretically unbiased, but biases can be implemented in the underlying algorithm

Decision making Human

Duration: Intuitive and more time-consuming decision-making process

Accuracy: Depending on expertise ranging from very accurate to less accurate

Bias: Innate biases, hard to control

1) AI = Artificial intelligence 2) Hidden Layers: Identification of relationships between input data; different weighing of each input leading to complex operations

Source: Roland Berger

Various functionalities of Artificial intelligence allow application formats that impact the insurance value chain

Components and functionality of AI in insurance

Components

1 Algorithms
Set of rules allowing predictions from large amounts of unstructured data; enable handling of complex predictions with little adaption

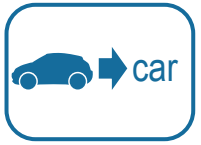
2 Computing power
Underlying technology allowing the processing of data; relates to the number of transistors

3 Data
Large data sets required for training the AI algorithms

Functionality (exemplary)

Natural Language Processing
> Includes text mining, voice recognition, and semantic analysis of the identified text/spoken language passages
> Application example: Virtual assistant, chatbots for customer management

Pattern recognition
> Efficient discovery of previously unknown patterns in large datasets
> Application example: Fraud detection, estimation of outstanding claims provision

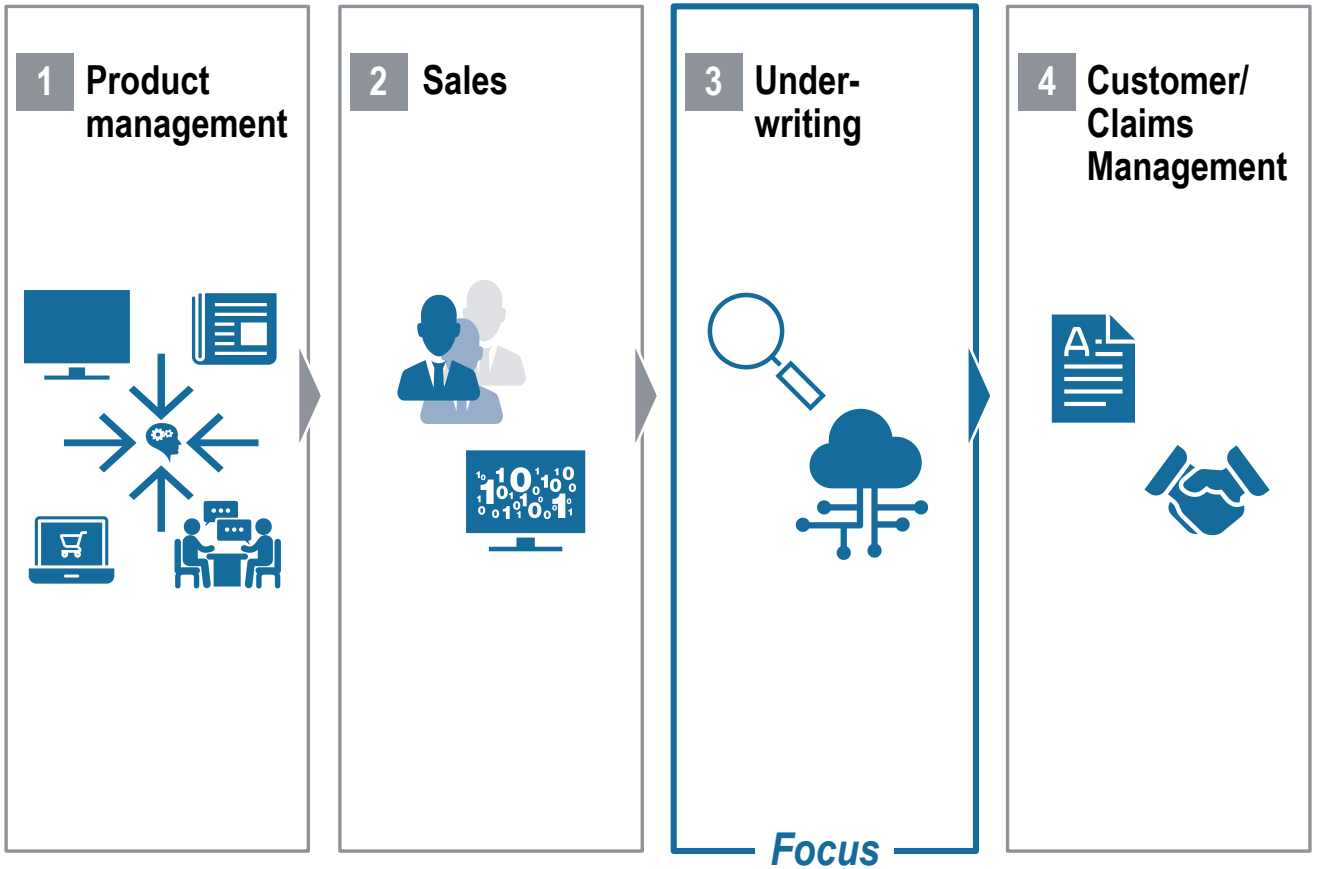


Visual recognition
> Algorithms analyze images for scenes, objects, faces, and other content, and return keywords that provide information about the content
> Application example: Claims management

Source: Roland Berger

Different possible application formats exist along the insurance value chain – Underwriting with very high potential

Overview of AI influence on insurance value chain (not exhaustive)



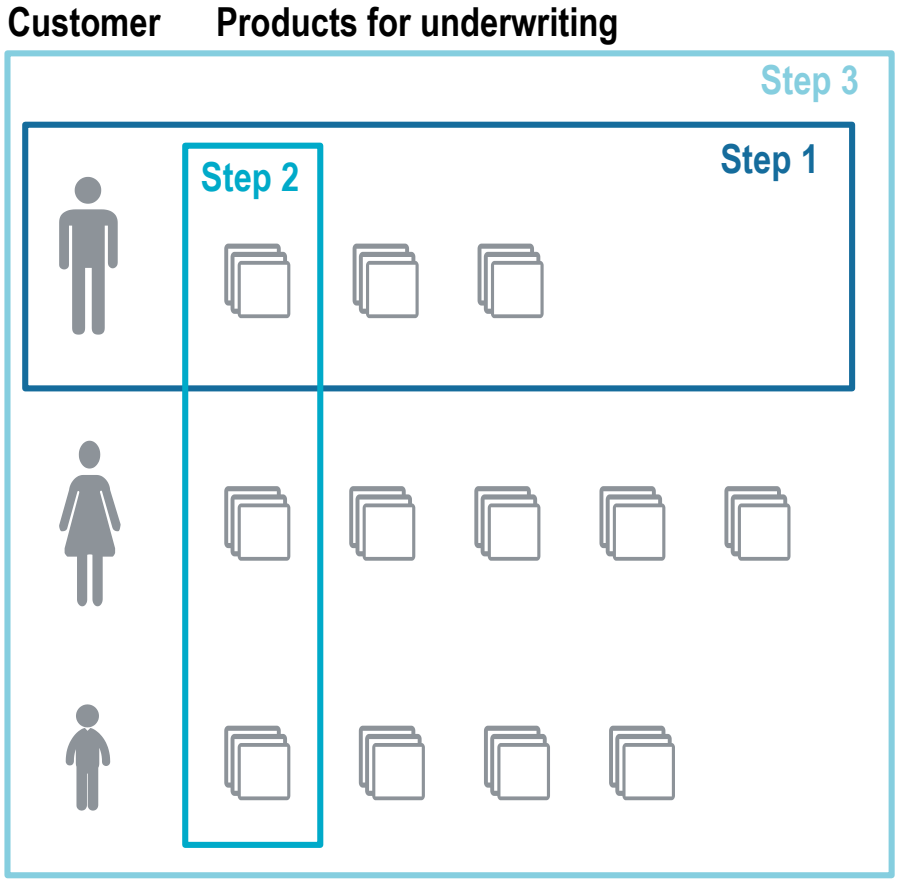
Possible applications of AI

1. Intelligent data analysis combining data from a variety of sources for clever pricing
2. Sentiment analysis, machine learning or pattern recog-nition support better understanding of customers
3. Underwriting evaluation realized **with machine learning algorithms** based on **large scale data analysis**
4. Algorithms enhance pattern recognition and claims processing, thereby reducing costs while improving the customer engagement

Source: Roland Berger

Artificial Intelligence allows integrating an overall customer profitability into underwriting, the traditional core competence of insurers

Overview of different views in underwriting



1 **Focus on each customer individually**

2 **Focus on each product per customer group individually**

3 **Focus on whole customer group holistically**

Comments

> From step 1 to step 3, underwriting gets increasingly more complex due to its need for large data sets

> Artificial intelligence per default operates with large amounts of (big) data sets

> Such large data sets are crucial for being able to generate an overall customer relationship

> Thus, AI algorithms finally allow generating an overall customer relationship instead of single tariffs

Source: Roland Berger

The insurance ecosystem is increasingly populated by non-traditional players – conventional companies need to act

Insurance innovation ecosystem

Innovation players with exemplary company overview

1 Start ups

Disruptive insurers (e.g. ZestFinance) use AI to tailor their support and create superior solutions to win, engage, and keep customers

2 e-commerce websites

Insurance is becoming a marketing API[2] item for e-commerce websites by leveraging e.g. big-data, cloud computing and partner API

3 IT giants

Google[1], IBM, Baidu etc. are active too in IT-based solution for insurances

1) By now, Google has intermediary stopped its advances in online insurance due to missing success 2) API = Application interface, set of clearly defined methods of communication between various software components

Source: Roland Berger

ZestFinance focuses on big data analytics with the help of AI for creating a transparent underwriting and credit system

Portrait ZestFinance

Company profile

> Founded in 2009
> Headquartered in Los Angeles
> Develops big data underwriting technologies
> Aims at giving lenders a better understanding of risk
> Aims at using machine learning algorithms to revolutionize how credit decisions are made
> Wants to provide fair and transparent credits

Technology

> Combination of machine learning techniques and data analysis with traditional credit scoring
> Technology allows to process many requests on parallel

Goal

> Helping financial service providers to better understand credit risk in their own businesses
> Helping financial service providers to better understand the creditworthiness of their borrowers

Use case

Methods/Results

1. ~ 1/4 of data running through underwriting models is based on new variables constructed by human predictive modelers
2. Humans analyze thousands of variables created by machine learning algorithms, modify them based on patterns, trends, and unique insights
3. Variables are fed into multiple big data models enhanced with AI algorithms
4. **New underwriting model offers a 54 % lower default rate compared to the best-in-class industry score**

Source: Company website, https://techcrunch.com/2012/11/19/zestfinance-debuts-new-data-underwriting-model-to-ensure-lower-consumer-loan-default-rates/, Roland Berger

Baidu employs its expertise in deep learning and big data analytics for reducing insurance risks by applying Artificial intelligence

Portrait Baidu

Company profile Baidu 百度

> Search engine company
> Multiple offerings across search, social and knowledge products
> Increasingly expanding into other industries
> E.g. joint venture with China Pacific Property Insurance, online insurance joint venture with Allianz, online banking joint venture with Citi group

Technology

> Announced to shift its core business from a search-oriented model to one based on AI in 2016
> Aims at developing voice search, automatic translation and driverless vehicles
> Application of AI already planned in insurance, loan writing, and image recognition

Goal

> Participating in the growing market of online insurance by deploying its vast amounts of data
> Putting the needs of individuals and companies in the center by offering affordable protection

Use case

Methods/Results

1. Focus on combining loan underwriting and artificial intelligence within its (online) insurance business
2. Application of artificial intelligence and machine learning for identifying patterns for risk assessment and risk reduction
3. AI algorithms are mainly used for pattern identification
4. **Usage of artificially intelligent search algorithms result in improved risk assessment**

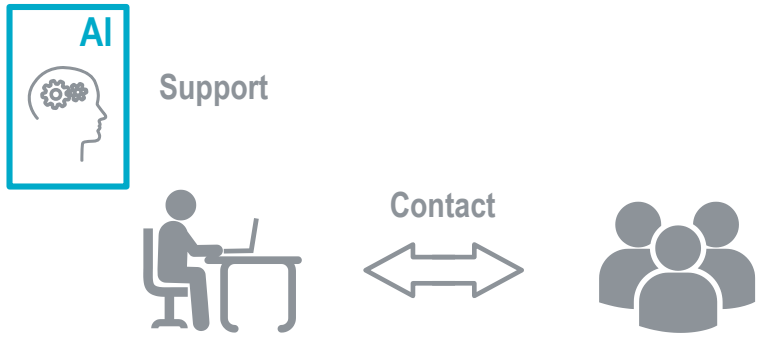
Source: Company website, https://www.bloomberg.com/news/articles/2016-01-20/baidu-looks-to-artificial-intelligence-to-reduce-insurance-risks, Roland Berger

A multi-step development process ensures a successful integration of Artificial intelligence into the underwriting process

Process development of AI in underwriting in two steps

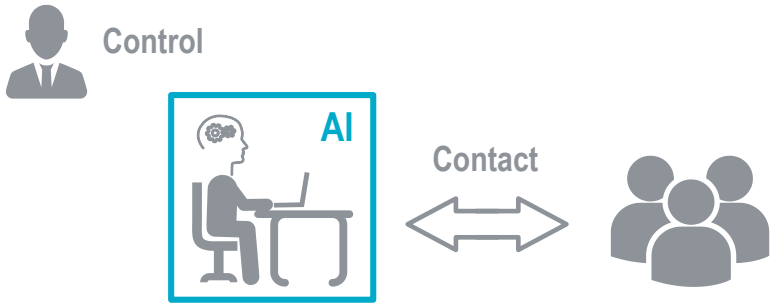
1 Assistance and adaption phase
Using AI as assistant to human employees

- **AI:** Conducts research, aggregates data, refines results, and presents findings to human worker
- **Human:** Takes underwriting decision based on AI inputs



2 Self-working phase
Applying self-reliant AI systems

- **AI:** Operates on its own, performs research & analysis of data, conducts whole underwriting process
- **Human:** Functions as control organs for selective checks



Up to 5 years

5-8 years

Source: Roland Berger

We have experience with applying AI in the financial sector, e.g. when assessing the quantitative & qualitative impact of IBM Watson

Project overview – Saving potential on customer advisors with IBM Watson

Background/objective

> Quantitative and qualitative assessment of the impact of the implementation of IBM Watson for the customer advisors of a French retail bank

Approach

> Bottom-up assessments to analyze the quantitative potential on customer advisors :
  – Time spent per task for each type of customer advisors
  – Assessment of Watson's potential to automate/speed up the tasks (assessment realized also through external benchmarks)
> Qualitative assessment of the impact of Watson's deployment through customer advisors interviews

Results

> Quantitative model built
> Assessments have presented to the Executive Committee and to the Employee Representatives

Chart 1: Background

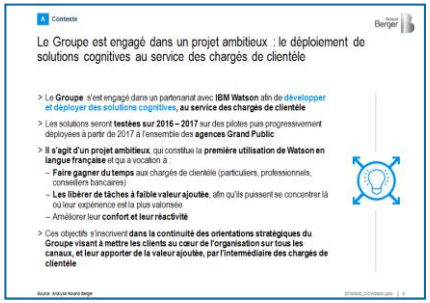


Chart 2: Objective

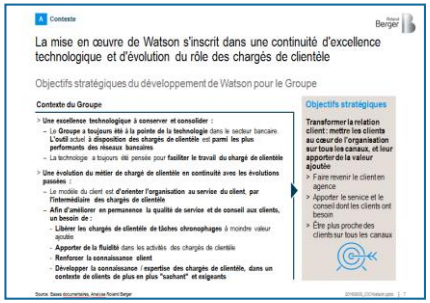


Chart 3: Approach

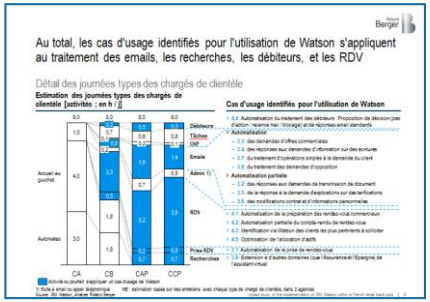
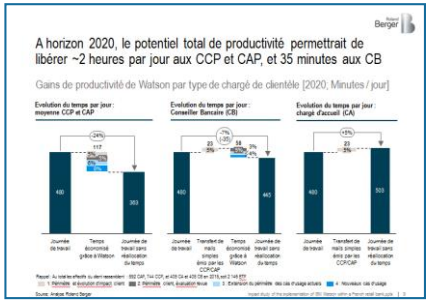


Chart 4: Results



Source: Roland Berger

Your key contacts for artificial intelligence in underwriting

Philipp Angehrn
Managing Partner

> 17 years of consulting experience and 6 years in industry
> Industrial expertise in financial services, engineered products, and high tech
> Competence in corporate finance, strategy, and new business models

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Urs Arbter
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> More than 17 years of experience in insurances incl. several leading positions
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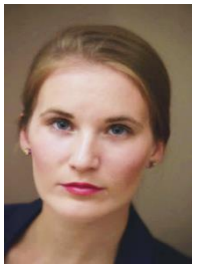

Theresa Schachner
Consultant

> More than 3 years of experience in consulting and industry
> Industrial expertise in banking, insurances, and pharmaceuticals
> Competence in artificial intelligence, digitalization, business development

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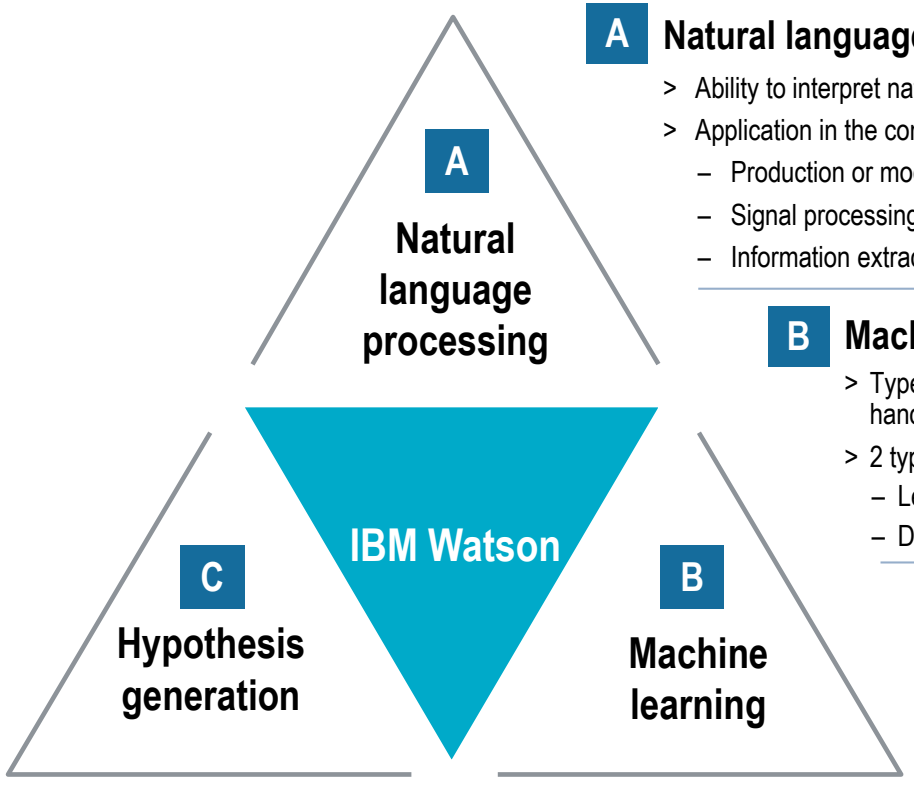
Roland
Berger

Watson provides 3 technologies relevant for AI applications: natural language processing, machine learning, and hypothesis generation

Overview over cognitive abilities of IBM Watson



A Natural language processing

> Ability to interpret natural language and taking according actions
> Application in the context of:
  – Production or modification of written text
  – Signal processing (e.g. automatic speech recognition)
  – Information extraction (e.g. automatic scanning of text)

B Machine learning

> Type of AI that allows computers to learn without specific programming for the task at hand
> 2 types of development of machine learning:
  – Learning with the help of existing content
  – Dynamic learning (adjustment via human supervisor and new input)

C Hypothesis generation

> Hypothesis: Possible answers to the question asked by the user
> Purpose of Watson's information analysis: to seek evidence that validates or eliminates the assumptions it has generated
> Following the proofs, classification of answers and synthesis to the user

Source: Roland Berger