
BIG DATA MEETS ARTIFICIAL INTELLIGENCE

CHALLENGES AND IMPLICATIONS FOR THE SUPERVISION AND REGULATION OF FINANCIAL SERVICES

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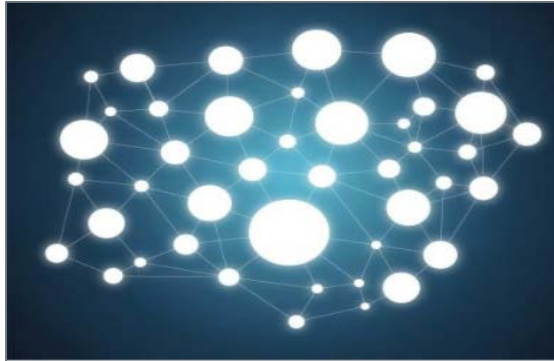
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Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS

Digital Innovation powered by Machine Learning



Question answering and dialogue systems

Personal assistant systems



Cognitive Process Automization

Automated decision making from documents



Fraud Detection

Real-time detection of credit card fraud

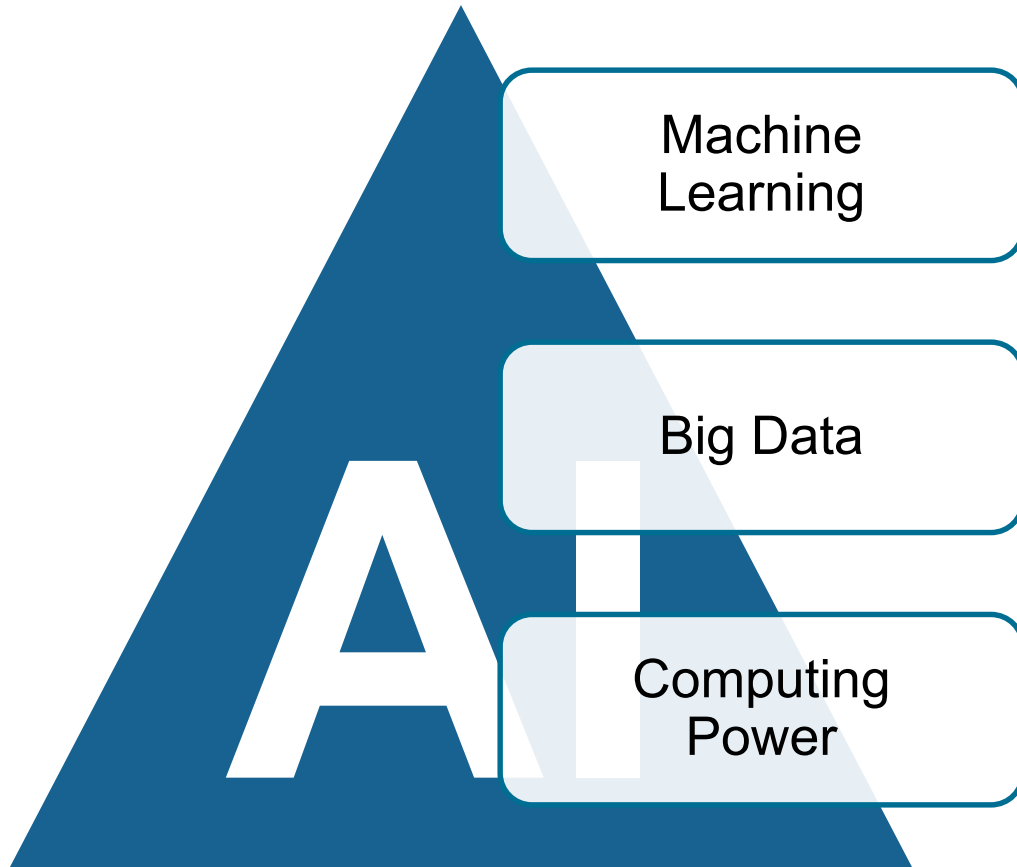


AI & ML Studies

Studies with PwC, BMBF, Fraunhofer, BaFin

Today's definition of Artificial Intelligence

AI as a Triumvirate

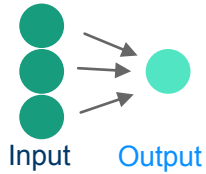


Enabler of AI:

- Computing power
 - Growing computational power and cheaper technologies
- Big Data
 - Like social media and sensor data
- Machine Learning
 - For example Machine Learning methods like Deep Neural Networks

Machine learning (ML) comprises three different types of learning methods

SUPERVISED LEARNING

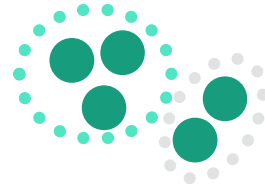


Prognosing a target variable from explanatory variables

Example applications:

- Image recognition
- Prediction of stock trading

UNSUPERVISED LEARNING

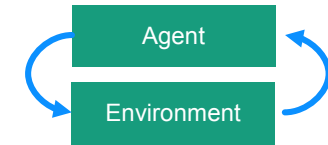


Extracting intrinsic patterns from unlabeled data sets

Example applications:

- Natural language processing
- Anomaly detection for predictive maintenance

REINFORCEMENT LEARNING



Independent learning of strategies to maximize reward

Example applications:

- Behavior training of robots
- Training game agents to learn the rules of Go & Chess



ML is ideally suited to replace repetitive tasks provided large amounts of data are available

Case Study: Credit Card Transactions

Using Artificial Intelligence to detect fraud in real time

Situation

- Credit card fraud causes \$23 bn in damage worldwide per year*
- Investigation of fraudulent behavior is often **done by hand on a subjective basis**

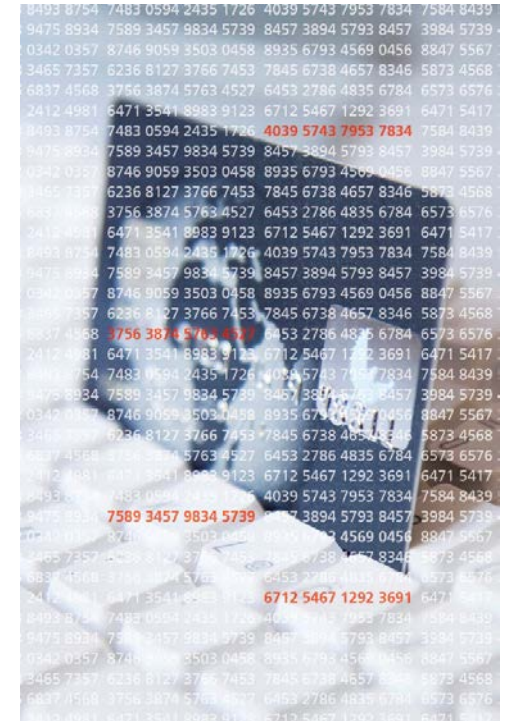
Fraunhofer contribution

- Developed **Artificial Intelligence** algorithm to detect fraud in **real time**
- **Successfully launched software** together with a leading European payment processor

Results

- ↑ Protection of millions of credit card holders and significant reduction of fraud cases
- ↑ Automatic, objective and highly efficient countermeasure

Source: *The Nilson report, October 2017, Issue 1118



Case Study: Contract Analytics

Using Artificial Intelligence to process contracts

Situation

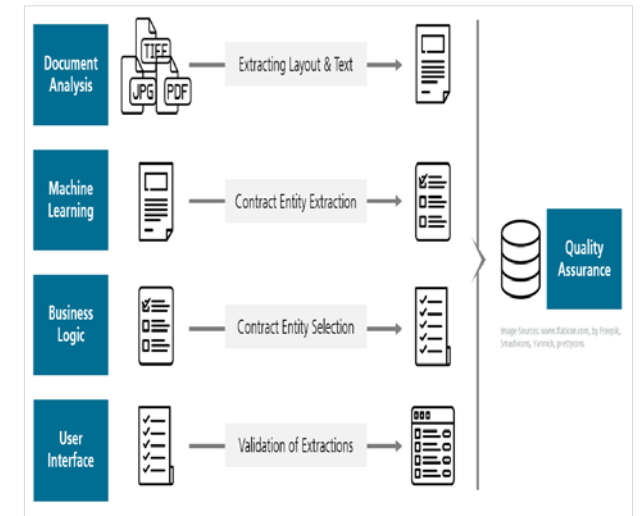
- **New reporting standards** force insurance companies to review thousands of contracts
- Current procedures require **a lot of manual work** to extract structured information from current contracts

Fraunhofer contribution

- Developed **self-learning text mining** algorithm that „understands“ contracts and **extracts desired information automatically**
- Used **highly flexible modular architecture** to deal with complexity of document types

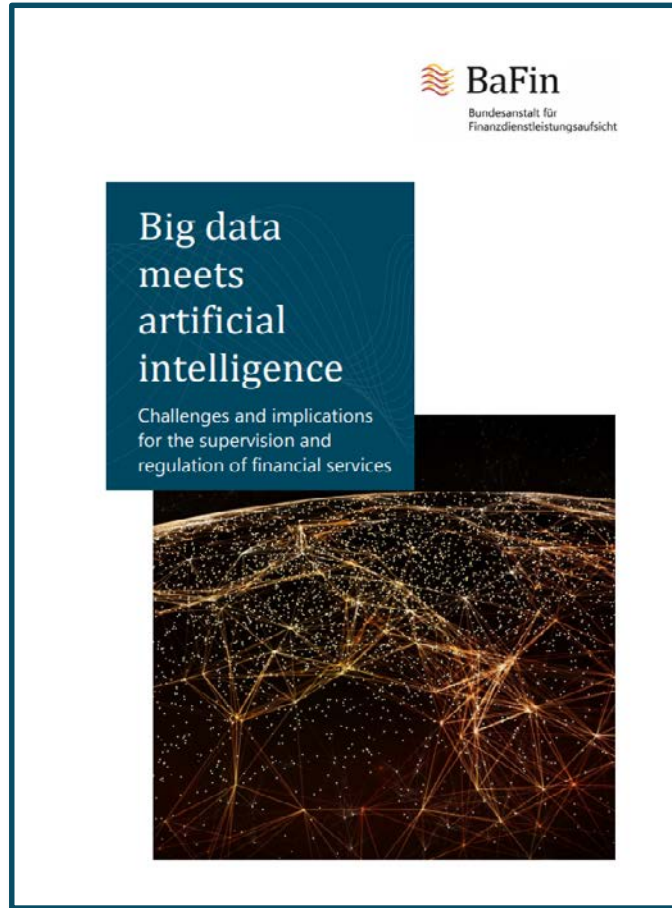
Results

- ⬆ High performance text mining solution which keeps continuously evolving through user feedback
- ⬆ Solution is applicable for huge variety of contracts leading to significant reduction of required manual work



Big Data meets Artificial Intelligence

Challenges and implications for the supervision and regulation of financial services



*“The following report describes the **interaction** between **Big Data and Artificial Intelligence**; how fundamentally the **BDAI** phenomenon can **change the financial system**; and what **implications** this has for **supervisory and regulatory bodies**.”*



Felix Hufeld
President of BaFin



Source: Big Data meets Artificial Intelligence, Challenges and implications for the supervision and regulation of financial services, BaFin, 2018

Big Data meets Artificial Intelligence

Regulatory implications for technology used

Prerequisites to use BDAI

- Responsibility of supervised firms to ensure that **BDAI-based decisions are comprehensible** and are understood by third-party experts
- Need to **develop common standards** for **supervisory approval** for use of BDAI-based models

Non-discrimination

- Responsibility of supervised firms to **prevent unlawful discrimination** of individual customers or customer groups
- **Both, programming algorithms and controlling the generated results** need to be addressed in this context

Data protection & sovereignty

- Creating awareness among customers how their **data are used and processed** and which **data are critical** in order to receive the desired service
- Closer cooperation between **supervisory authorities and data protection authorities** is expected

Source: Big Data meets Artificial Intelligence, Challenges and implications for the supervision and regulation of financial services, BaFin, 2018

Societal acceptance of AI is challenged

Four fields of action need to be addressed in order to build trust

I



**Comprehensibility
of Models**

II



Data privacy

III



Non-discrimination

IV



Data Sovereignty

Comprehensibility of algorithmic decisions is crucial for societal acceptance

LIME algorithm as an example for new research approach

Algorithm

The LIME (Local Interpretable Model-Agnostic Explanations) algorithm explains predictions of complex models by local effects

Input

Classification result & explanation

Comprehensible?

Example 1: LIME algorithm



Labrador
playing guitar



Option 1:
Electric guitar



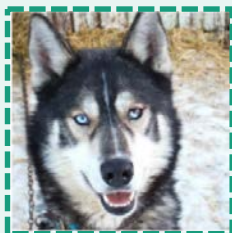
Option 2:
Acoustic guitar



Option 3:
Labrador

Algorithm **provides comprehensible „reasoning“** for each option

Example 2: „Black box“ algorithm



Husky



Wolf

Algorithm **does not provide comprehensible „reasoning“** why Husky has been classified as wolf

Source: „Why Should I Trust You?“ Explaining the Predictions of Any Classifier; M.T. Ribeiro, S. Singh, C. Guestrin

Non-discrimination as a key prerequisite for AI applications

Microsoft's Tay chatbot

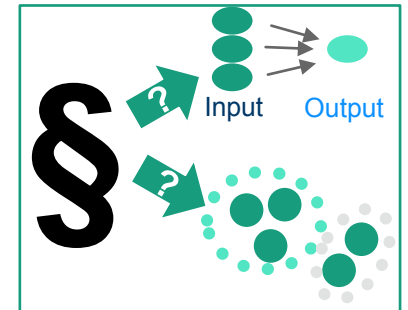
Example

- Microsoft released **Artificial Intelligence Twitter-chatbot** Tay that was **trained by tweets** from the public community
- Soon after the release, Tay started to post **offensive and discriminating tweets** that forced Microsoft to terminate the service



Challenge

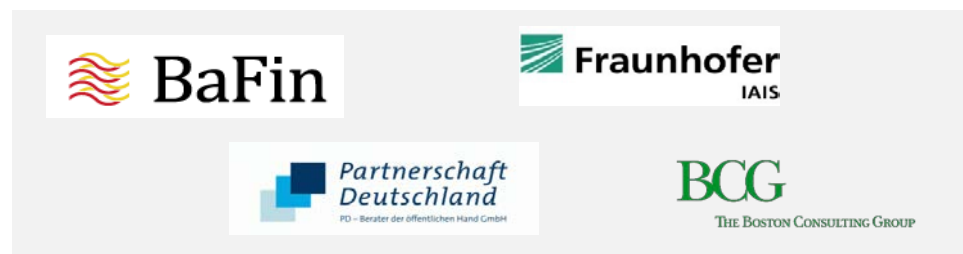
- How can **discriminating behavior be prevented?** (Removing certain features such as gender etc. ist not sufficient)
- How can **legal & ethical standards** be translated into **mathematical rules?**



Many approaches to prevent discriminating behavior but no final solution


Key Take Aways & Further Information

- BDAI is disrupting the insurance market, resulting in **new, digital-born market players and non-traditional products** (e.g. selling anonymized data)
- Embracing the opportunities offered by BDAI, insurance companies can become **highly customer-centric** and address **radical cost savings** at the same time
- Rise of data-driven technologies and business models offers **opportunities and risks for society** that need to **addressed by regulatory authorities**



https://www.bafin.de/SharedDocs/Downloads/EN/dl_bdai_studie_en.html

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