Use cases of machine learning

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About me

2011-2016 Physics PhD/PostDoc

2016-2018 Data Science / Engineering - Individual contributor @Deutsche Telekom

2018-2019 Data Science - Team lead @Deutsche Telekom

2019-end 2021 Data/Product Manager @Klarna

2021 - end 2022 Managing Coordinator, Industry Projects @Cyl (full)

end 2022 - middle 2023 Senior Product Manager @Orfium

Middle 2023 - today Head of Data and Product @Epikast

Outline

- Benefits of machine learning
- Popular uses case in industry
- EuroCC industry projects
- Evolution of machine learning adoption in industry

Benefits of machine learning

Machine learning

Benefits of machine learning

- Enhanced decision making
- Cost optimization
- Product and service innovation
- Prevention of human error
- Streamline operations
- Customer assistance
- Augmentation of creativity
- Reduction of repetitive tasks / productivity

Popular use cases in industry

Voice assistants, chatbots, conversational agents

Tools like HealthTap's chatbot improve user access to medical information and symptom checking while connecting them directly with healthcare professionals.

- **Accessibility and Convenience**: Immediate medical answers, benefiting those with busy schedules or limited healthcare access.
- **Efficient Symptom Checking**: Quick symptom assessments, guiding users on whether to seek medical attention.
- **Seamless Professional Connectivity**: It facilitates virtual consultations, enhancing patient care.
- **Enhanced Customer Engagement**: The user-friendly interface increases interaction and personal health management.
- **Cost-Effectiveness**: Automating customer service tasks saves costs, allowing resource reallocation to other business areas.

Uptime and reliability of web services

Companies like Netflix, Uber, Facebook, Salesforce, Klarna, are using AI to monitor, maintain, and keep their services up and running

- **Enhanced System Reliability**: Higher uptime for web services, crucial for customer satisfaction and business continuity.
- **Proactive Issue Detection**: Early detection of potential system failures or security threats, preventing disruptions.
- **Improved Security**: Detect and mitigate security breaches faster than traditional methods.
- **Cost Efficiency**: Automated monitoring and maintenance reduce the need for extensive manual oversight, lowering operational costs.
- **Data-Driven Insights**: Insights into system performance and user behavior, aiding in continuous improvement and optimization.

Process automation

Companies like Orfium, use machine learning to automate time consuming processes that are prone to human error

- **Accurate Identification**: Recognize copyrighted music in videos, even in cases of modifications or distortions.
- **Speed and Efficiency**: Automation allows for the rapid scanning of large volumes of content
- **Scalability**: As the number of videos increases, ML systems can scale accordingly to handle the growing workload.
- **Reduced Manual Effort**: Frees up human resources, allowing them to focus on more complex tasks that require human judgment.
- **Consistent Monitoring**: Ensures continuous and consistent monitoring of content for copyright infringement.

Fraud detection

Companies like Klarna, use machine learning to detect fraudulent activity coming from the billions of daily transactions

- **Pattern Recognition:** Recognize unusual spending behaviors or irregular transaction patterns, that are indicators of fraudulent activities.
- **Adaptive learning**: Continuously improve based on new data, making algorithms more effective over time enhancing their ability to detect new and evolving types of fraud
- **Cost efficiency:** Reduction of the need for extensive manual review process, saving labor costs

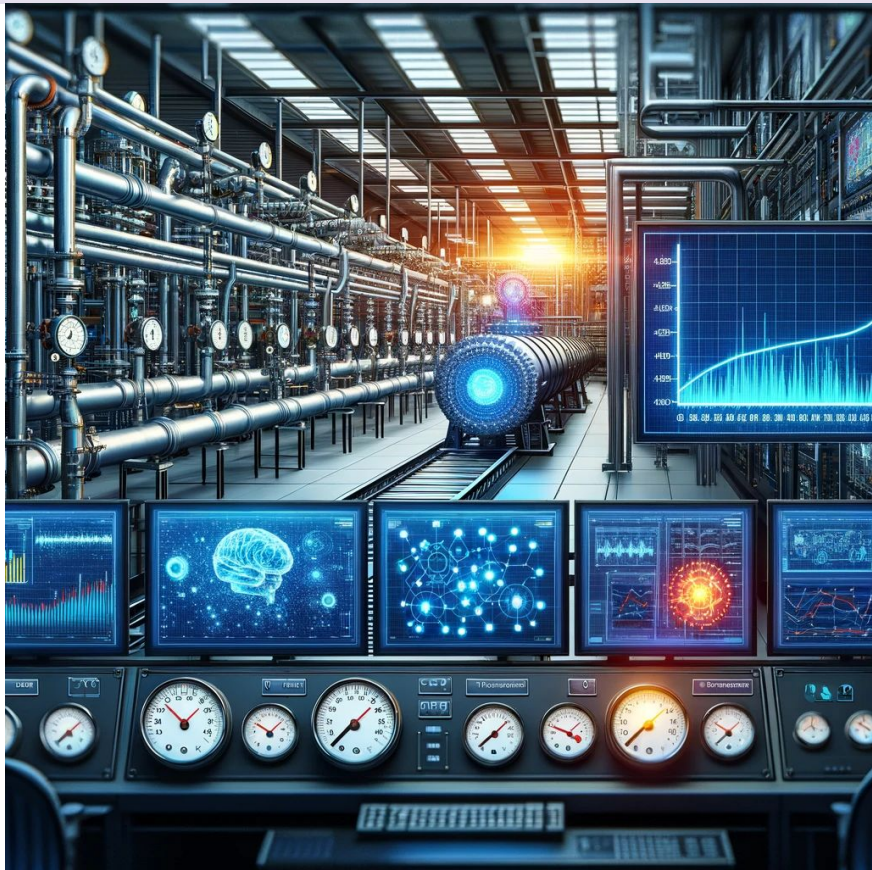
Industry projects under EuroCC

EuroCC project

Quality Prediction in Polymer Production

- Developed a pilot ML model that predicts the polumer quality based on selected and engineered time-series features

- Multi-dimensional sensor data in production pipeline, such as temperature, pressure, etc, measured before or during the time the material is in the reactors



EuroCC
project

Quality Prediction in Polymer Production

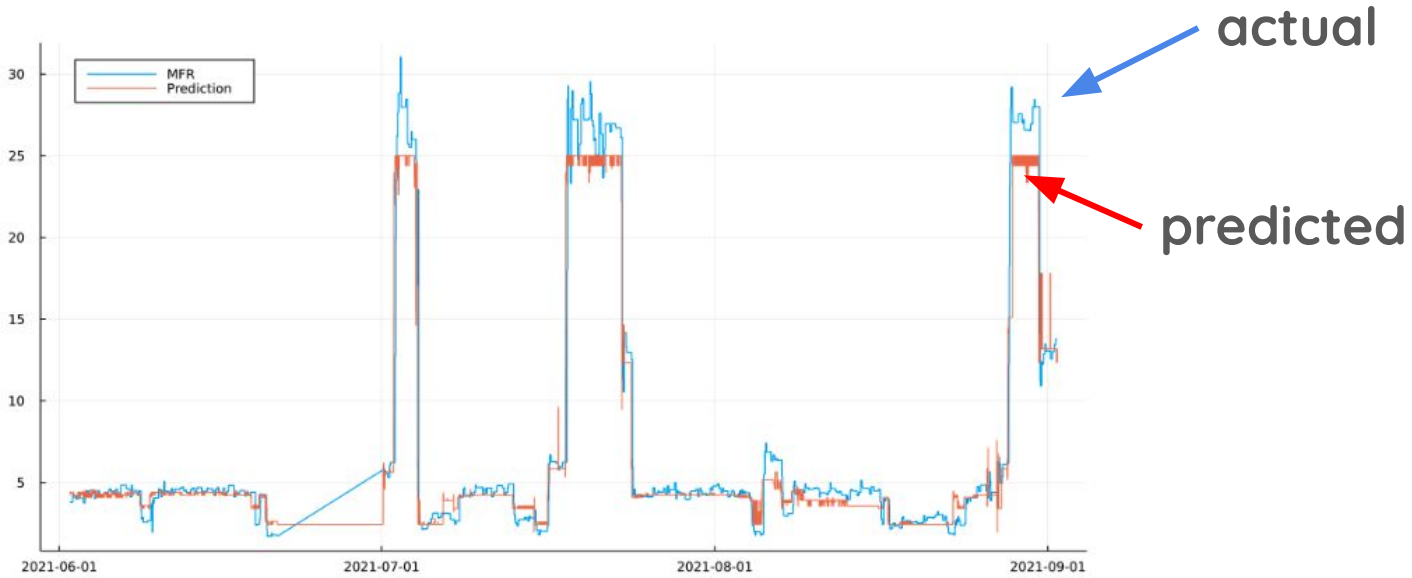


Figure 7: Actual MFR vs Predicted.

EuroCC project

Item recommendation in Retail

- Provided an approach for estimation of the association rules among group of products in a user-product database

- Evaluated various algorithms for the personalised suggestion of user products

EuroCC project

Item recommendation in Retail

Association Rules among the products, by counting common products' purchases, divided by the total purchases of the pair of products

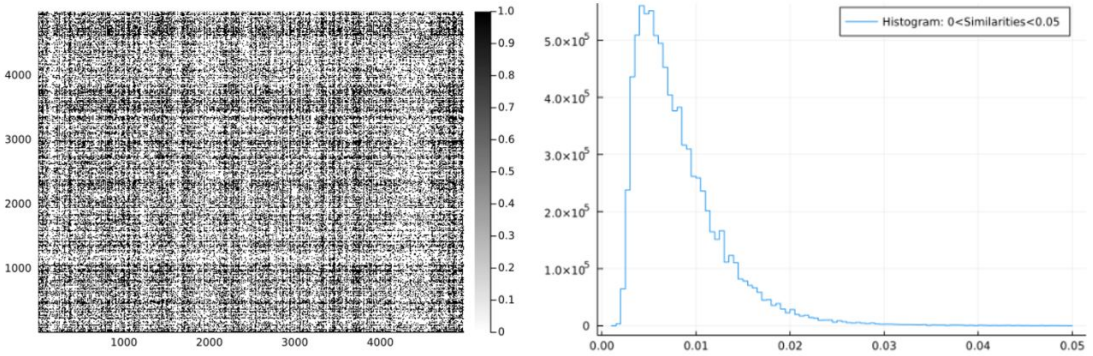
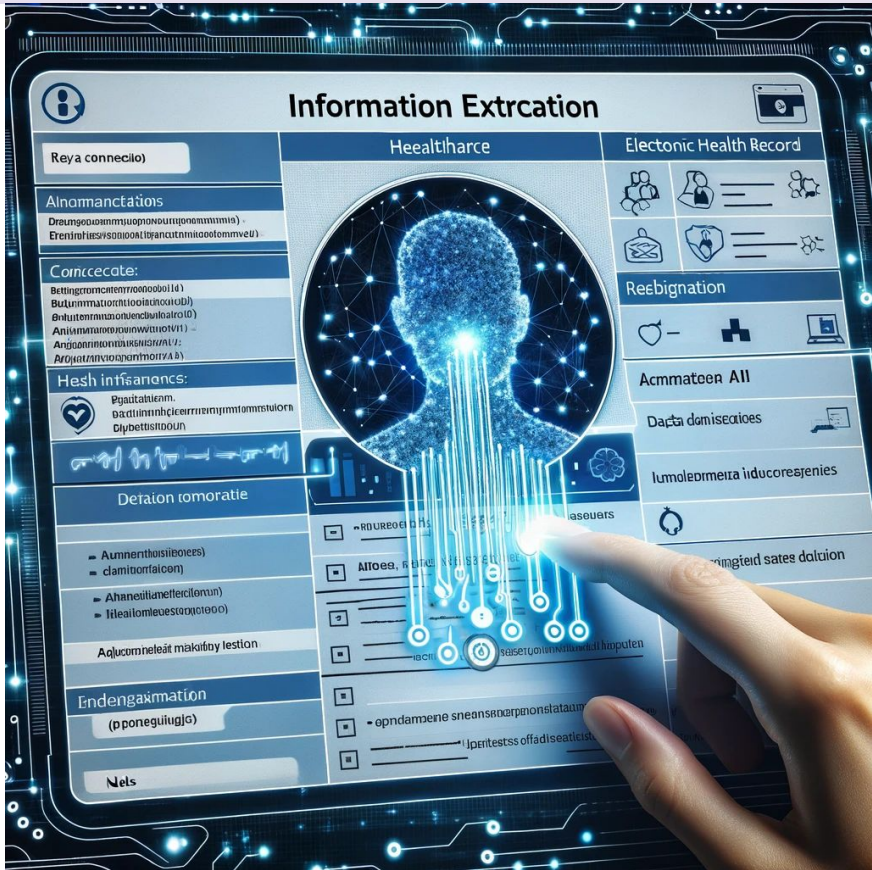


Figure 4: Similarity matrix

Information extraction in Healthcare

- Information Categorization
  Categorization, or structuring according to standard terminologies, or formatting standards
- Data Normalization
  Mapping synonyms, e.g., hypertension, high blood pressure, HTN refer to same condition
- Relationship extraction
  Identify relationships between data points, such as linking medication to a diagnosis or lab result



EuroCC project

Information extraction in Healthcare

Electronic Healthcare Records (EHR)

Unstructured data elements

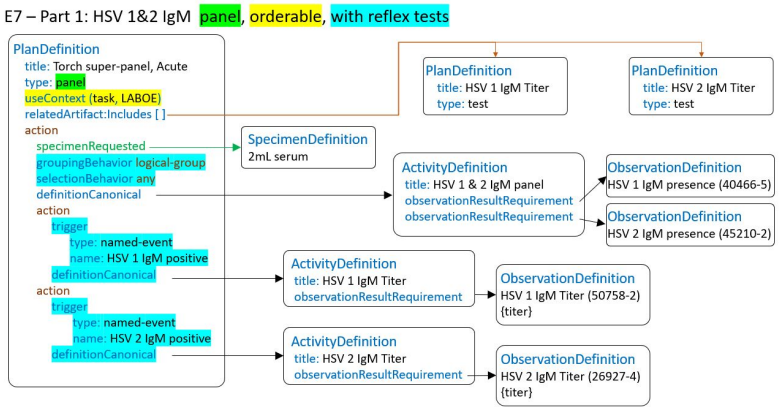
Radiology reports
Visit notes
Discharge summaries
Chief complaints

Structured data elements

Demographics
Vital signs
Prescriptions
Medications
Lab results

LLM

Structured data elements



EuroCC project

Information extraction in Real Estate

pdf

LLM

Extracted information


```
{'auction_date': '07/05/2023',
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 'dining_rooms': 'Yes',
 'living_rooms': 'Yes',
 'bathrooms': 'A1: 1, A2: 2',
 'bedrooms': 'A1: 3, A2: 3',
 'elevator': 'Yes',
 'staircases': 'Yes',
 'warehouse': 'A1: 3, A2: 2',
 'parking_space': 'A1: Yes, A2: Yes',
 'offer_price': 'A1: €72,000.00, A2: €85,600.00',
 'auctioneer': 'Notary Public of Alexandroupolis Athanasia-Spyridoula Katranitsa',
 'auction_location': 'Alexandroupoli',
 'auction_website': 'https://www.eauction.gr'}
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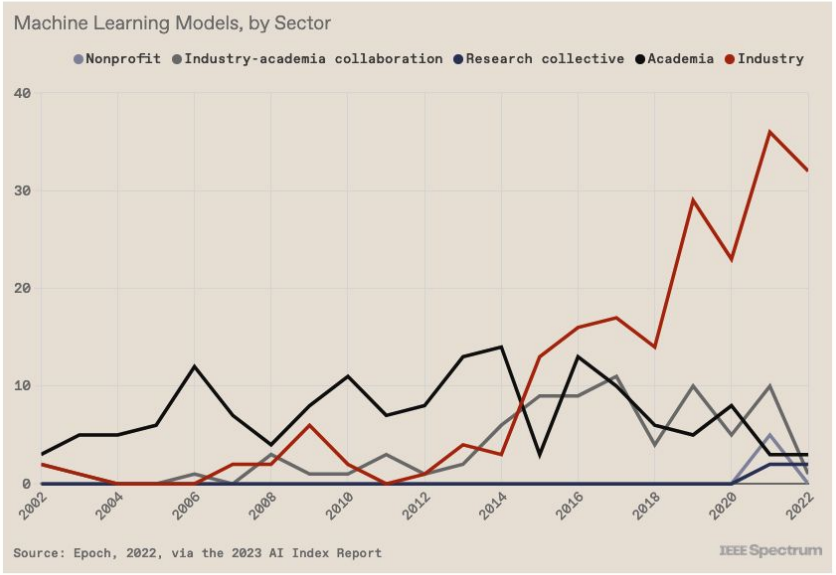
Evolution of the industry in adopting machine learning

Machine learning in the industry
New machine learning models

- The industry has raced ahead of academia in producing new machine learning models
- Industry has also access to large amounts of data, computer power, capital

Industry is also the place for new machine learning models



With greater numbers of Ph.D.'s, it's no surprise that industry has raced ahead of academia in producing new machine learning models. Until 2014, most new machine learning models came from academia, but industry has quickly surged ahead. In 2022, according to data collected by HAI, there were 32 industry-produced machine learning models, compared with only three produced by academia. The AI Index Report notes that industry also has an advantage in terms of access to large amounts of data, computer power, and money, necessary to build state-of-the-art AI systems.

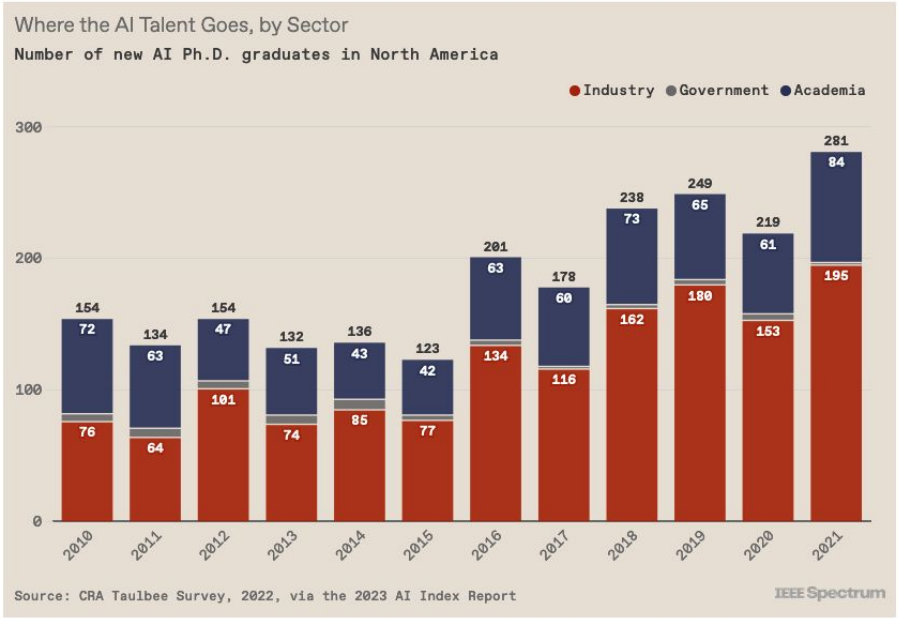
Given this trend, Perrault says, "one of the big questions is the extent to which universities will be given resources to build their own large models rather than tinker with models from the outside."

Machine learning in the industry

Talent attraction by industry

In recent years, industry started attracting more AI talent than academia, when looking to new AI Ph.D. graduates

Industry, not academia, is drawing new AI Ph.D.'s



In 2021 (that's the latest numbers available), 65.4 percent of all AI Ph.D.'s went to industry, compared with 28.2 percent who took jobs in academia, according to the AI Index Report. (Others, not shown here, are self-employed, unemployed, or report "other.") This split has steadily grown since 2011, when the percentages were nearly equal.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