



Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

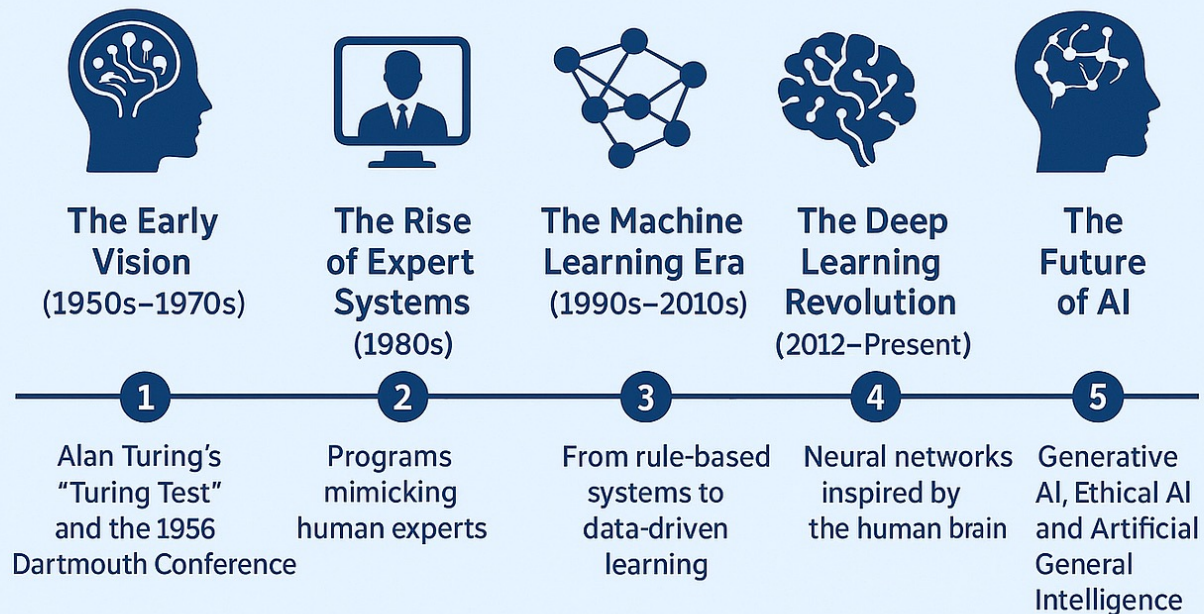
NAIL Conference, Jul 3, 2026



AI in the 21st century

Chris Biemann, Hub of Computing & Data Science, U Hamburg

THE EVOLUTION OF ARTIFICIAL INTELLIGENCE





Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

Machine Learning: Regression & Features



Machine Learning (ML)

Uses data to create predictive/classification models

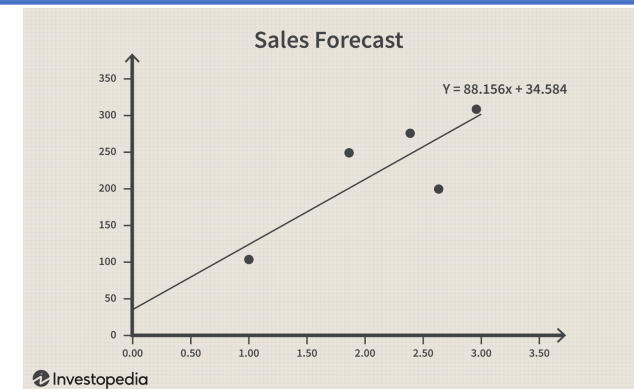
Examples

- Sales forecasting
- Credit scoring
- Predictive maintenance

Learn to map given input variables/features to an output, one task at a time

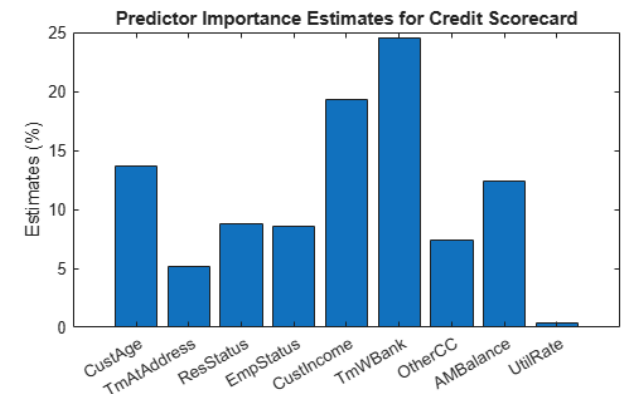
- Early models based on statistics and regression
 - full control over input variables / features
 - explainability and transparency
- Complex ML models
 - reach better performance
 - are less transparent/explainable due to nonlinearity

The simpler the model, the less performant, but the more explainable and transparent.



Investopedia

<https://www.investopedia.com/articles/financial-theory/09/regression-analysis-basics-business.asp>



Predictors

<https://www.mathworks.com/help/risk/creditscorecard-compare-logistic-regression-decision-trees.html>



Generative AI (GenAI)

Uses LLM to generate
new content
(text, images, code)

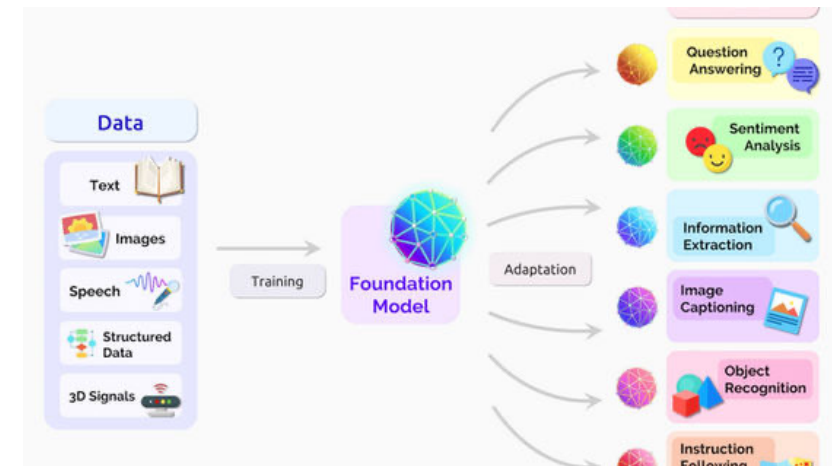
Examples

- Report summarization
- Email writing
- Image design

Deep Learning: Representation Learning & Generation

First learn a good representation for data, a 'model'. Then use it to perform many tasks

- Zero-shot/few-shot: Model can perform the task with minimal instruction
- Fine-tuning: Model has to be trained for the task at hand



Models have billions of parameters and are themselves entirely opaque. They can generate (non-causal) explanations for their decisions.

Generative Models hallucinate intrinsically.

Agentic AI



Agentic AI

Acts as an 'AI agent' to perform tasks autonomously

Examples

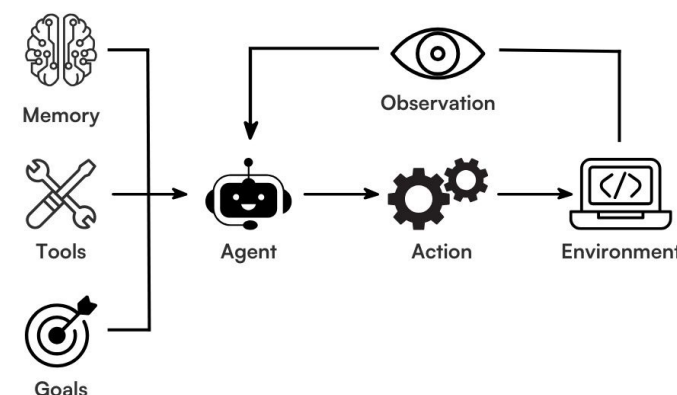
- AI control tower agent
- AI HR recruiter agent

Orchestrate a set of AI models that have skills, such as calling external functions, for conducting complex tasks.

'Agents' are foundation models

- with special prompts
- that communicate with each other
- and call external functions

Working of Agentic AI



<https://www.omdena.com/blog/agentic-ai>

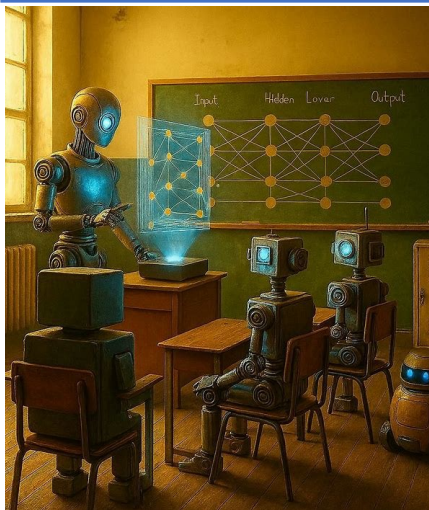
Agent models can generate explanations for their decisions and support them with evidence from environment and data. Their inner workings are opaque.

In 2026, all frontier models originate from countries with authoritarian regimes.

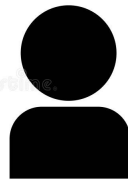


Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

A note on Agentic AI and AGI



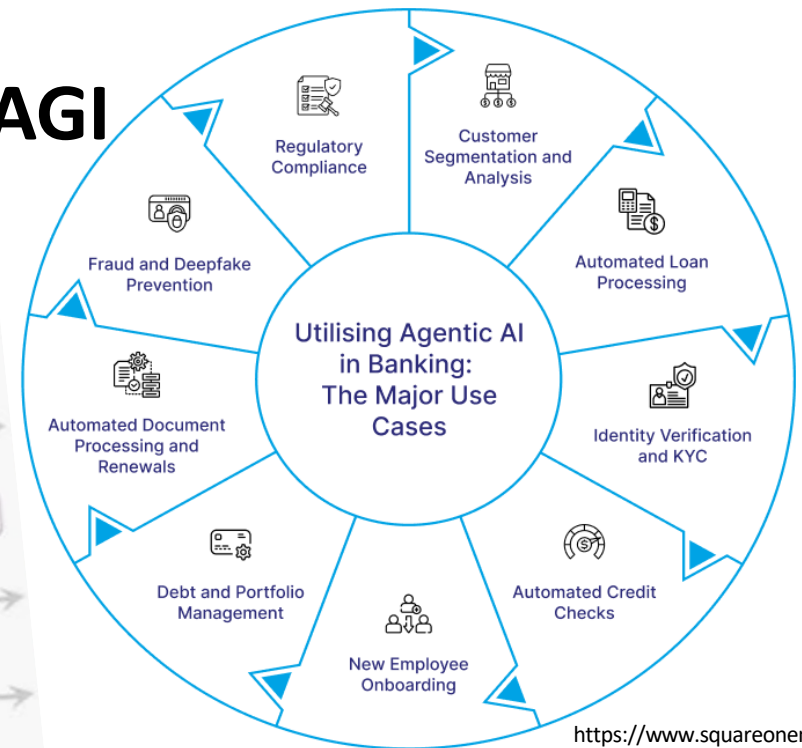
From Bing Image Creator 14.5.2026, C. Biemann



Alignment



Adaptation



<https://www.squareonemea.com/blogs/agentic-ai-in-banking-use-cases-benefits-future-trends/>

Who has more motivation to align the underlying models to their goals? Man or Machine?

Herd behavior: unexpected interconnectedness and correlation of decisions.

-
- will continue to **lack transparency/explainability**
 - will **reproduce biases** in the training data even when forbidding discriminatory signals
 - will be **aligned according to an agenda**
 - will get increasingly complex **beyond what humans can verify**

Regulation Check

In a recent publication*, the BIS provided the following summary:

- **Societal and environmental well-being.** The development of AI should be done in ways that benefit society at large, including environmental sustainability and **model owners think otherwise** considering the long-term impact of AI on social structures, democracy, and the planet.
- **Transparency.** AI systems should be open and understandable, requiring clear explanations of how AI systems work, the logic behind decisions, and the data used. **naïve**
- **Accountability.** Entities developing or deploying AI are responsible for the outcomes of their systems, ensuring that mechanisms are in place to address any negative impacts or errors. **diffusion**
- **Fairness.** AI systems should not perpetuate biases or discrimination, ensuring equitable treatment across diverse populations. **naïve**
- **Privacy protection.** AI systems should **less privacy, more data, better models** data protection laws and principles.
- **Safety and security.** AI systems should operate reliably and safely, implementing safeguards against failures, misuse, or malicious attacks. **same as with all systems**
- **Human oversight.** Human judgment should be involved in AI decision-making processes, emphasising the importance of human expertise and ethics in guiding AI. **naïve. We will be AI idiots.**
- **Robustness and reliability.** AI systems should perform consistently under various conditions without failure, ensuring accuracy and reliability over time. **same as with all systems**

* BIS (n 6) p. 23.

Discussion