Algorithmus Schmiede

Datenanalyse • Algorithmusentwicklung • Auftragsforschung

Development of a new machine learning model

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Use-Case: Control of production process

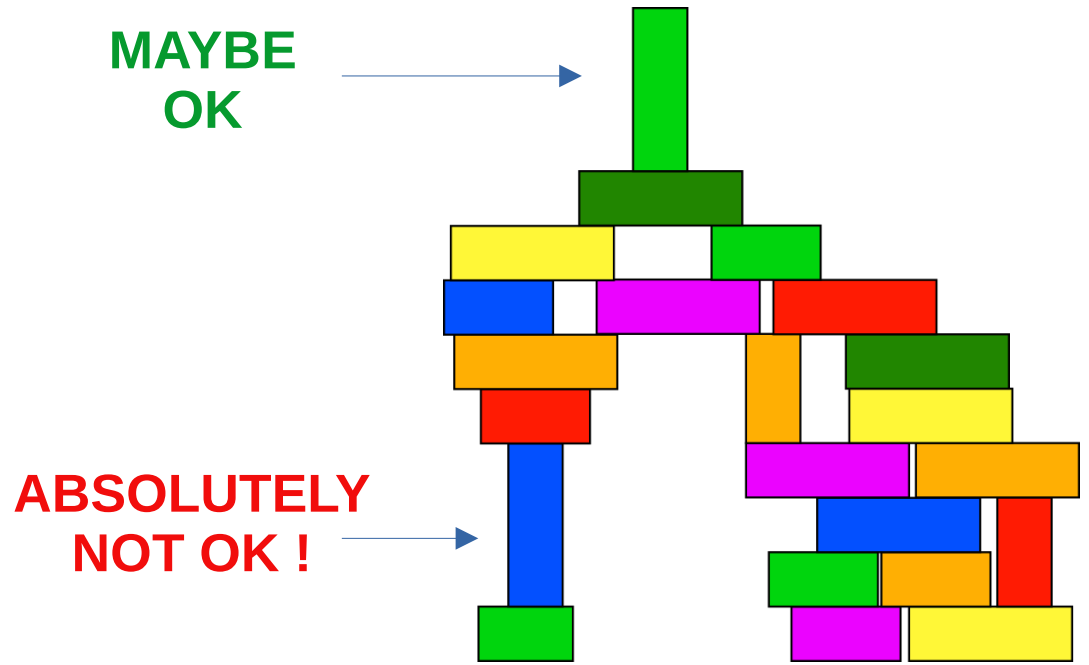
Multiple

- mathematical models
- research results
- experimental results
- software modules

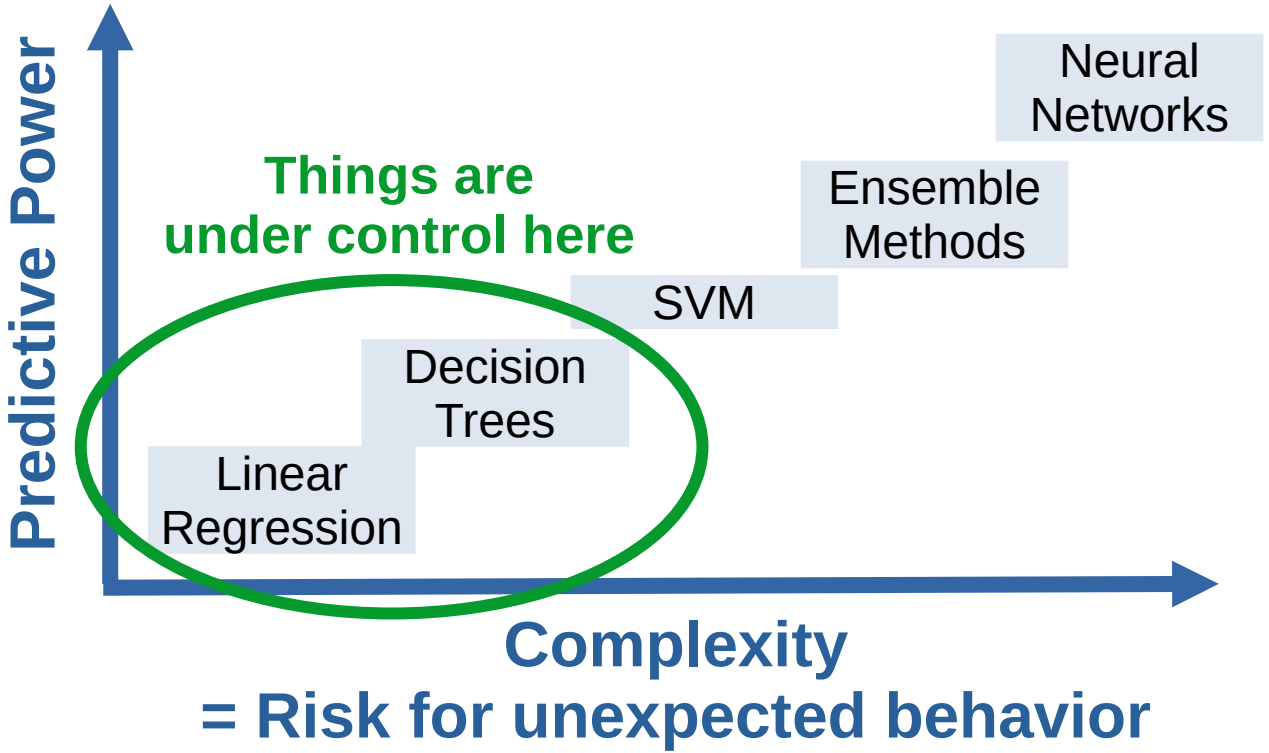
combined to fulfill target task.

High demand on reliability
for building blocks in foundation.

Using a fancy ML model which is not 100% understood?



Common Machine Learning Models



Cartesian Genetic Programming (CGP)

$$y = \sin\left(\cos(\frac{x}{5}) + \mathrm{e}^{\tanh(x+3)}\right)$$

Neural Network

Training:

- input: x, output: y

Reinvent trigonometric functions

Cartesian Generic Programming

Training:

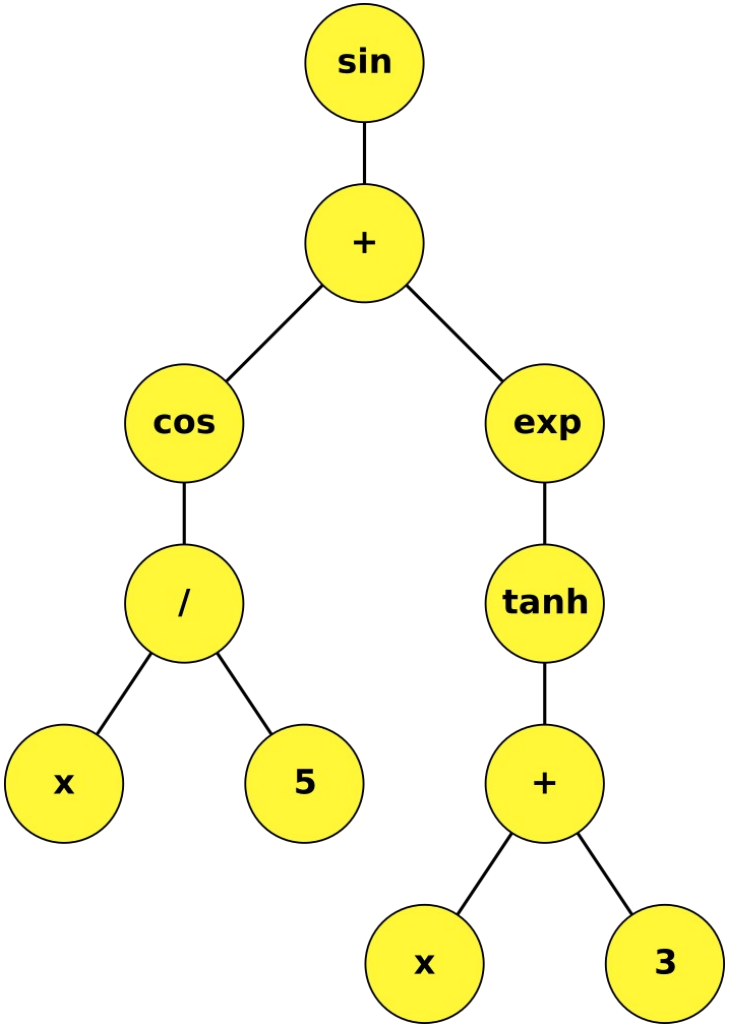
- input: x, output: y
- code snippets:
  sin(), cos(), exp(), tanh()

Combine code snippets by evolutionary algorithms until y can be reconstructed

Benefits

$$y = \sin\left(\cos(\frac{x}{5}) + \mathrm{e}^{\tanh(x+3)}\right)$$

- **no risk of unexpected behavior**
- **foreknowledge about the system as input**
- trained regressor helps understanding the system
- can be optimized further by human
- can be used to understand / re-engineer other regressors
- **shown to be competitive to neural networks**
  Wilson 2018, arXiv:1806.05695v1, Atari Benchmark



Shape the future of machine learning

Estimated development costs:

- 25k€, 1D CGP-model (example: x-y formula finder)
- 80k€, nD CGP-model for your specific use-case
- 200k€, scalable product

Cooperation:

- Customer: Use-Case for 1D formula finder
- Customer: Demand for fully controllable machine learning model
- Investor

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