Fachbereich Maschinenbau und Verfahrenstechnik
Faculty of Mechanical and Process Engineering

Organization

Lecturer	Prof. Dr. Wolfgang Grote-Ramm
Lecture (2 SWS) and practical exercises (2 SWS)	Fridays | 9:00 – 12:30 | weekly | lab 05.2.026 and online
Workload	150h | 60h (attendance time) | 90h (self-study)
Credits	5 CP
Conditions of participation	Nothing special. Math 1&2. Basic Matlab skills are required.
Type of examination	Homework (50%) and written exam (50%)
Language	English
Online resources	https://moodle.hs-duesseldorf.de/course/view.php?id=2264

General Information

The elective will be held in a mixture of online and presence in the upcoming semester. Lectures are accompanied by practical exercises using Matlab/Simulink and their respective apps.
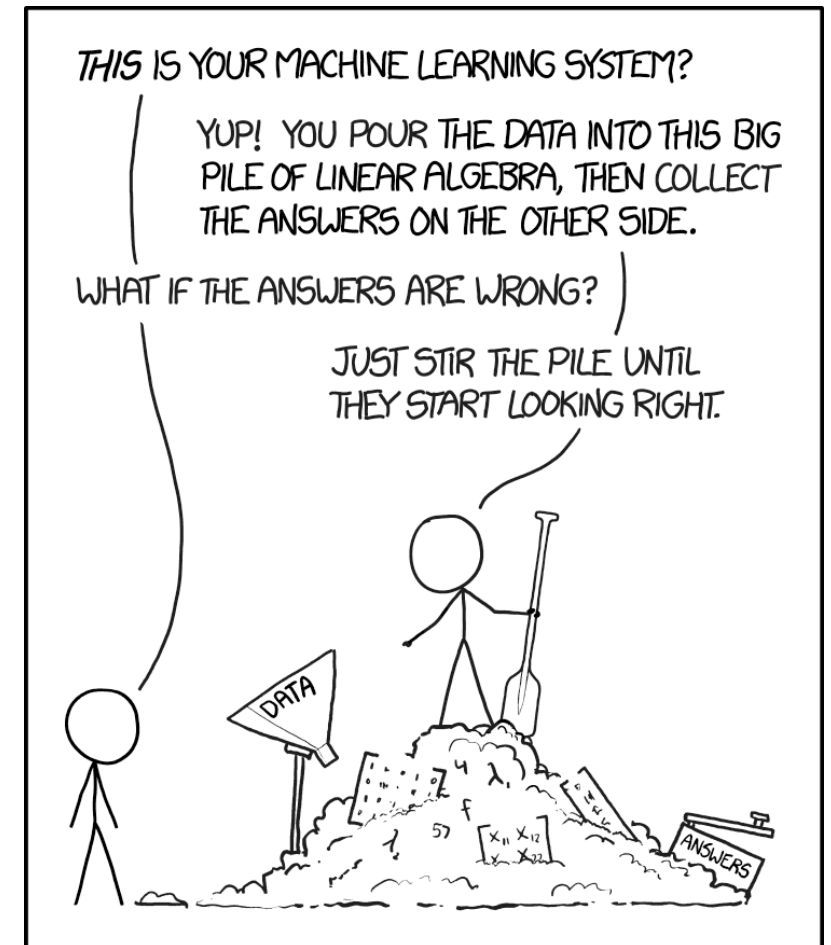Although the theoretical background will be worked out in the course we will focus on practical exercises using simulation models and real world data:

- Classification of product quality and the current renewable energy supply situation with support vector machines
- Training and evaluation of Artificial Neural Network (NN) for modeling the behavior of turbines and compressors
- Development of soft sensors to replace expensive hardware sensors in typical applications
- Fuzzy-based control of the microclimate in greenhouses
- Predictive maintenance for a continuous stirred-tank reactor in chemical engineering and predictive maintenance for aircraft jet engines using NN
- …

Source: Tom Gauld
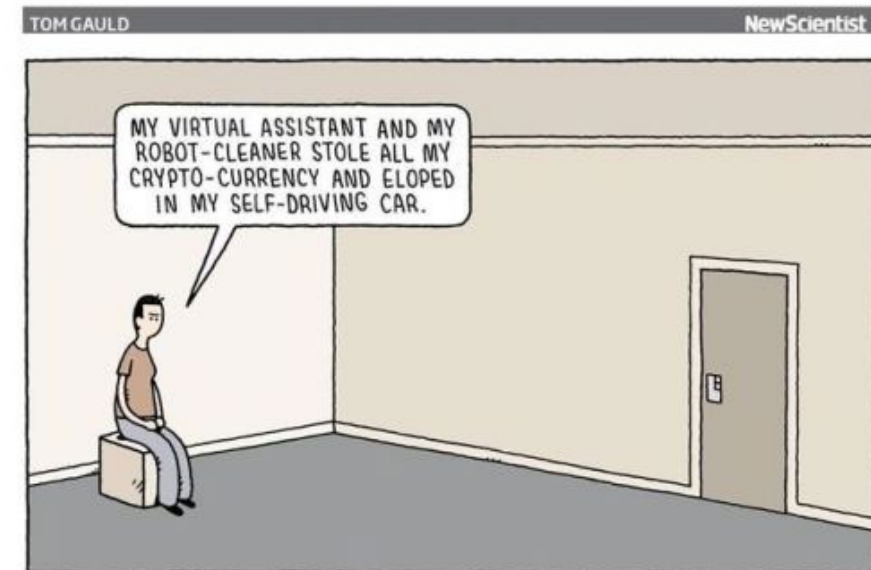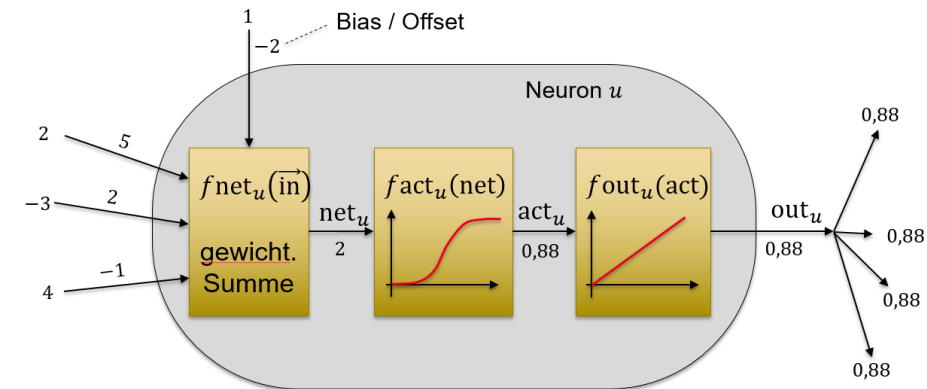
Contents

- Introduction to Artificial Intelligence in I&C, empirical vs. analytical models of technical systems, required data base and significance of data. Supervised / Unsupervised Learning and Reinforment Learning.

- "Simple" empirical models: Linear and nonlinear regression, classification with support vector machines and other basic Machine Learning methods.

- Fundamentals of ANN, types and structures of ANN, regression and classification problems. Recurrent networks for modeling dynamic behavior.

- Overview and application of supervised and reinforcement learning methods incl. online- and batch training

- Fundamentals of Fuzzy Logic, Fuzzy Control and Neuro-Fuzzy controllers

- Application of methods to I&C data sets

Source: Randall Munroe