Genetic programming is an evolutionary algorithm based on the principles of Darwin’s evolution theory, capable of synthesizing analytic expressions given a grammar of operations. The algorithm starts with a pool of random candidate solutions (individuals), which are encoded in a form that is easy to manipulate. Individuals are scored on their performance using a fitness function. Based on their fitness, individuals are selected for reproduction, i.e. generating new individuals by means of mutation and crossover. This creates a new population and the cycle is repeated, until a termination criterion is met.

Automatic controller synthesis using genetic programming

Controller design of complex nonlinear systems requires a lot of expert knowledge. Hence we aim to automate the controller synthesis by means of genetic programming and apply the developed techniques on actual industrial benchmarks.

Possible MSc thesis projects:
• Feedforward control of a nonlinear wet clutch (in cooperation with Flandersmake)
• Field curvature control of an active wafer controller (in cooperation with ASML)