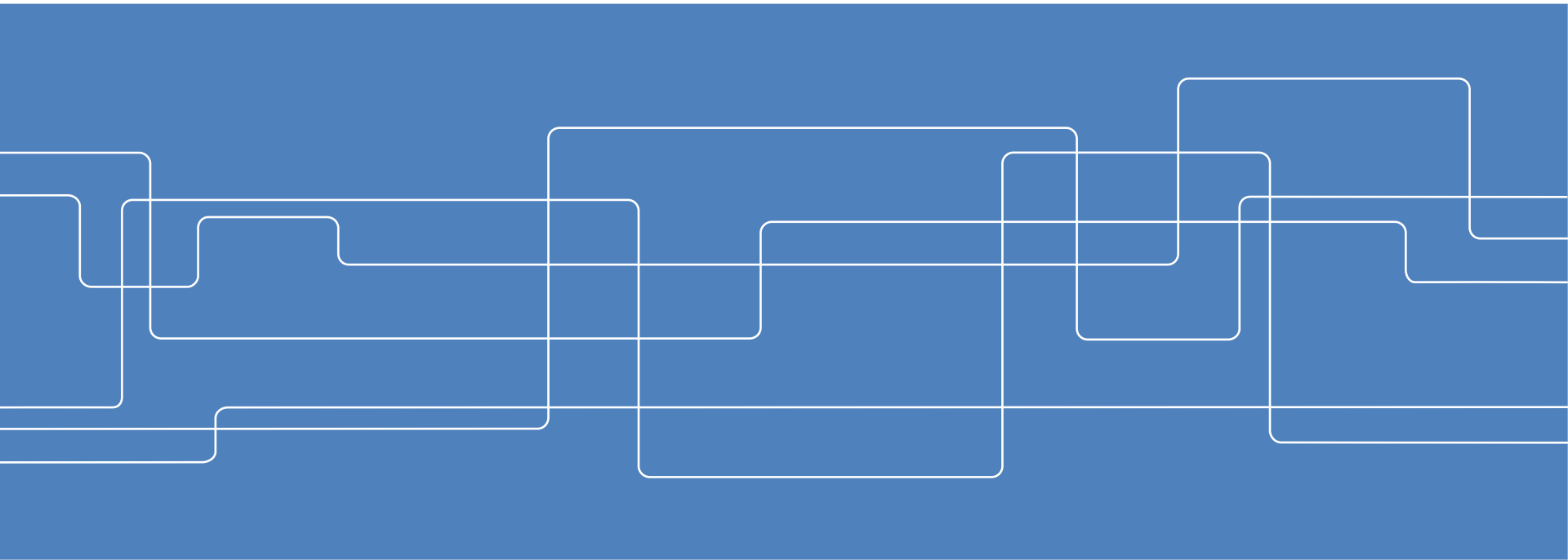
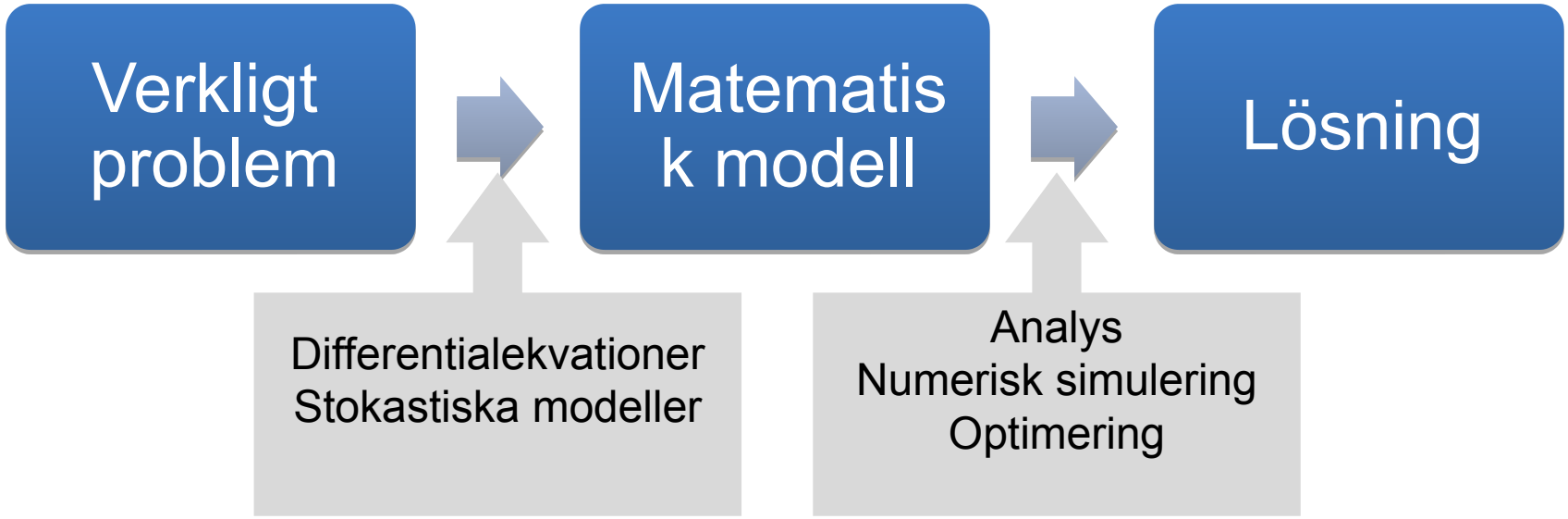
Tillämpad matematik och beräkningsmatematik



Mål

Ge **bred kunskap** om tillämpad matematik + **djup** inom en specialisering

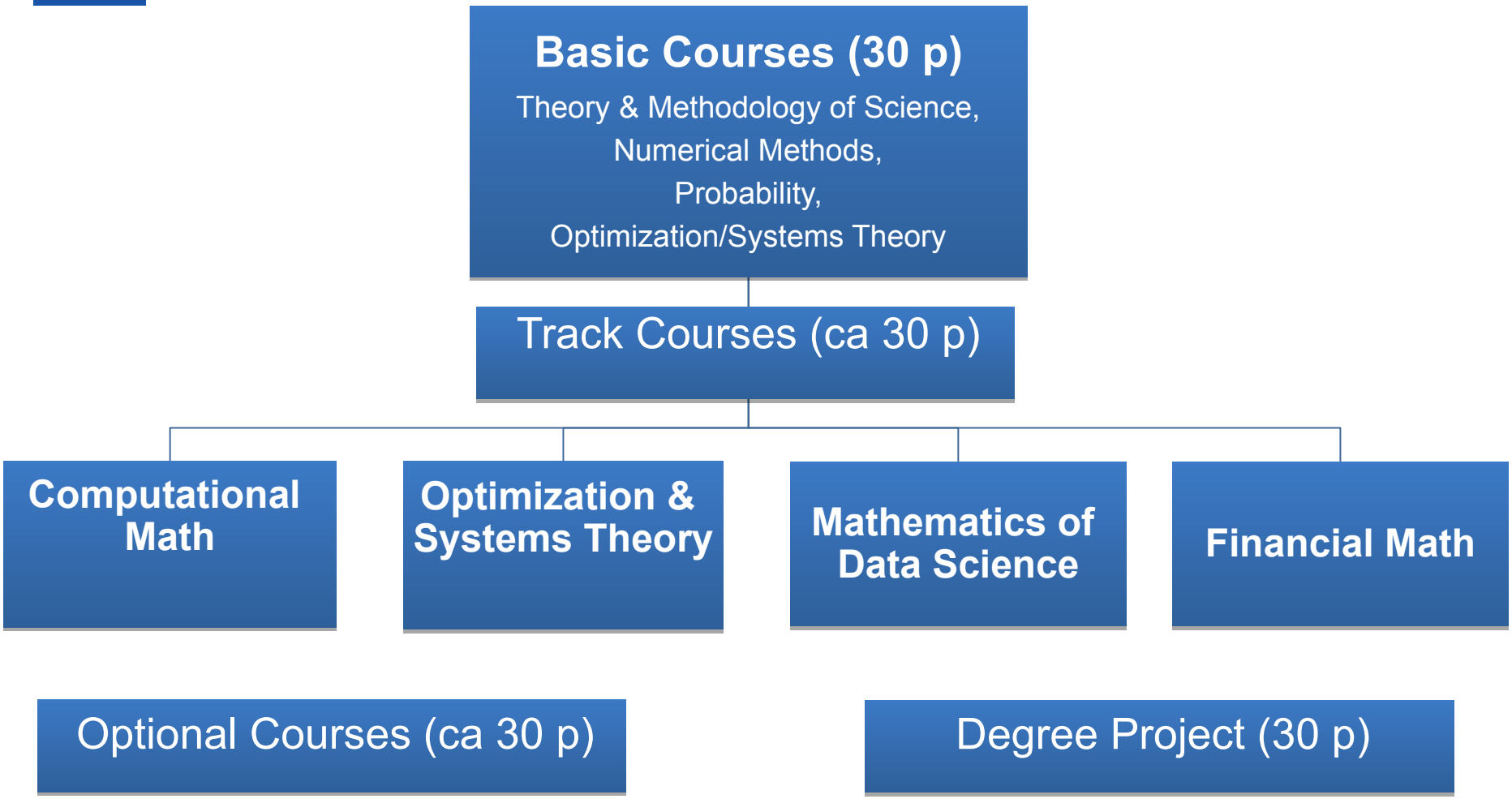


Utveckla **självständigt, systematiskt, kritiskt, kreativt** matematiskt tänkande.

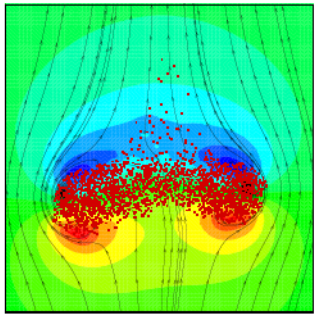
Allmänt

- Masterprogram, 120 hp
- Mappat till Fysik, Farkost, Data, Maskin
- Ca 70 studenter/år,
- Särskilda behörighetskrav:
  - Maskin: SF1901, SF1904, SF1632
  - Data: SF1626, SF1676 (SF1632, SF1633)

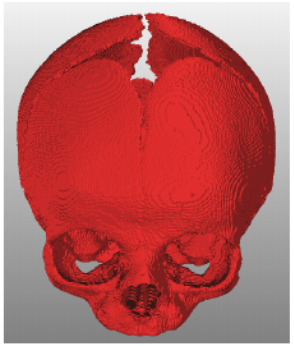
Program Outline

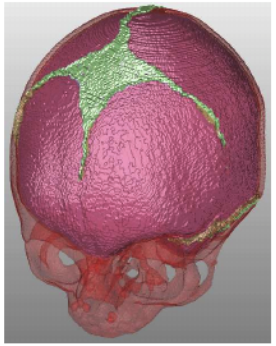


Computational Mathematics



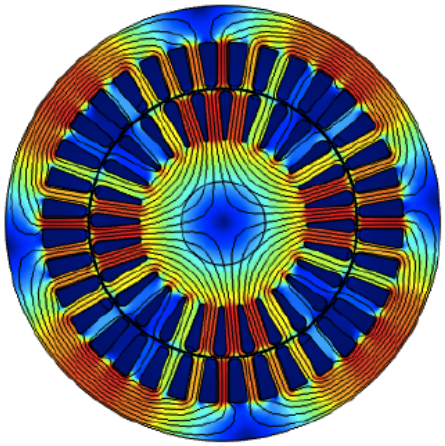
- **Solve mathematically formulated problems with a computer**
- Fast, accurate and stable algorithms
- Tools/theory: numerical analysis, mathematical modeling, differential equations, linear algebra, programming
- Applications in many areas: fluid mechanics, structural mechanics, electro magnetism, climate/meterology, materials science, biology, medicine, ...





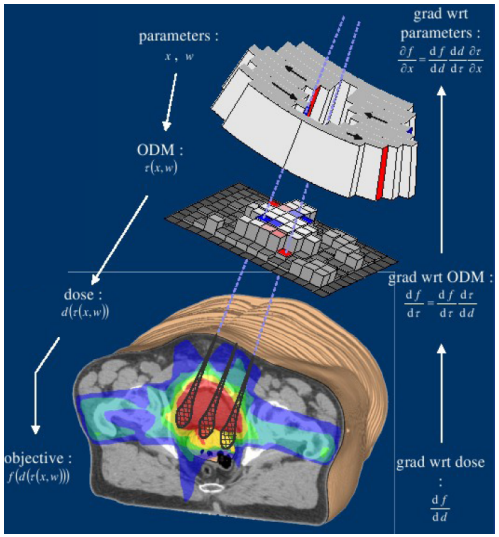
Track Courses (compulsory/conditionally elective)

- Finite Element Method
- Matrix Computations for Large Scale Systems
- Numerical Solutions of Differential Equations
- Parallel Computations for Large Scale Problems
- Programme Construction in C++
- Computational Methods for Stochastic Diff Equations
- Numerical Algorithms for Data-Intensive Science



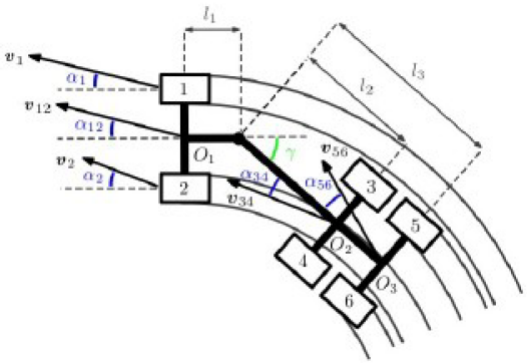
Optimization and Systems Theory

- **Art of doing something as well as possible within given constraints**
- Theory of mathematical modeling, analysis and control of dynamical systems
- Tools from e.g. linear algebra, mechanics, differential equations, optimization and stochastic processes
- Applications in operations research, economics, biology, robotics, control theory, signal processing, ...



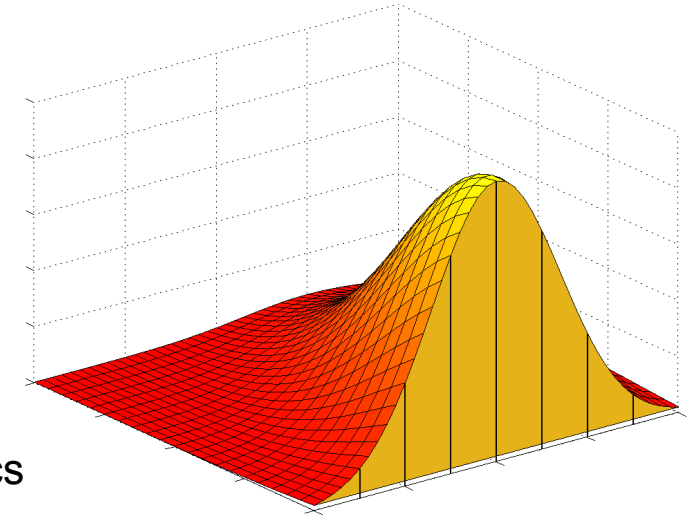
Track Courses (3 of the following)

- Applied Linear Optimization
- Applied Nonlinear Optimization
- Mathematical Systems Theory
- Geometric Control Theory
- Optimal Control Theory
- Systems Engineering
- Applied Systems Engineering



Mathematics of Data Science

- **Mathematical analysis and interpretation of big data**
- Probability theory and mathematical statistics
- Mathematical modelling and analysis
- Computational statistics
- Applications in sciences, enterprises and humanities

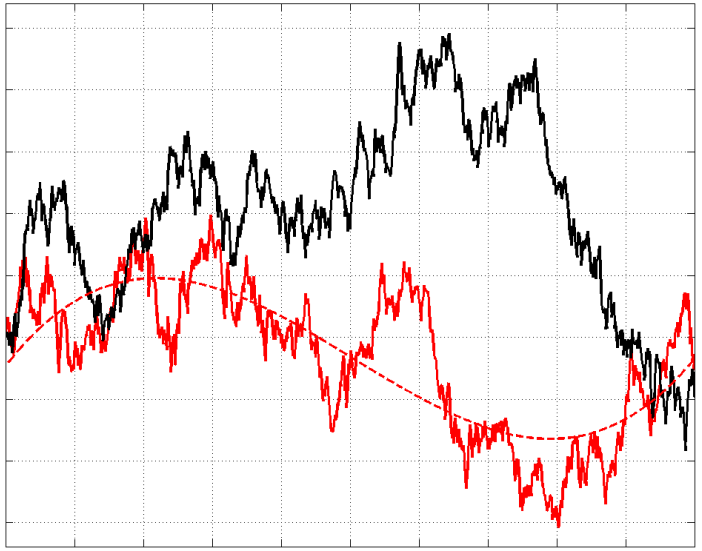


Track courses (compulsory/conditionally elective)

- Regression Analysis
- Computer Intensive Methods in Mathematical Statistics
- Topological Data Analysis
- Statistical Machine Learning
- Image Analysis and Computer Vision
- Algorithms and Complexity

Financial Mathematics

- **Mathematical modeling of financial markets**
- Probability theory, stochastic calculus
- Mathematical modeling and analysis
- Derivative pricing, risk and portfolio management



Track courses

- Financial Mathematics
- Portfolio Theory and Risk Management
- *One of:*
  - Time Series Analysis
  - Regression Analysis
- *One of*:
  - Risk Management
  - Financial Derivatives

Dual Master Programme with UCL

- UCL: *Université Catholique de Louvain-la-Neuve (Belgium)* is a leading Belgish university.
- Students of the dual masterprogramme will:
    - Learn one year at KTH, one year at UCL
    - Receive two degrees upon successful completion of the programme
    - Have all courses taught in English
    - Have all courses accepted automatically at both partners
- The master thesis is jointly supervised
- Contact: Michael Hanke at KTH, Pierre-Antoine Absil at UCL
- *Ask your fellow students from UCL*

Why a Dual Master?

- It combines *the best of two*, or more, universities
- It provides *international experience* both with respect to research and intercultural exchange
- It provides a *coordinated curriculum*
- You will obtain *two degrees* of the two leading universities
- You will gain *competitive advantage* for careers in industry and academia

Career prospects

- Advanced mathematics and computer simulations are **essential** within several important fields
- Application **dramatically increased** by the rapid development in computer software and hardware
- Future career in **industry** and **academia**
- **Company employments** include Ericsson, ABB, Comsol, SAAB, RaySearch Labs, Modelon, If, Citibank, Brainlab, ÅF, Atlas Copco, Elekta, Goldman Sachs, and many others
- **Doctoral studies** at KTH, other Swedish universities, or other leading European and US universities

Personnel

- Director of programme: *Michael Hanke* (hanke@kth.se)
- Track responsibles:
  - Computational Mathematics: *Mattias Sandberg* (msandb@kth.se)
  - Optimization and Systems Theory: *Xiaoming Hu* (hu@kth.se)
  - Mathematics of Data Science: *Henrik Hult* (hult@kth.se)
  - Financial Mathematics: *Camilla Landén* (landen@kth.se)
- Student counsellor: *My Delby, Karin Gorgén* (master@sci.kth.se)

MAS: *Emanuel Ravemyr* (ravemyr@kth.se)