



# Industrial Applications

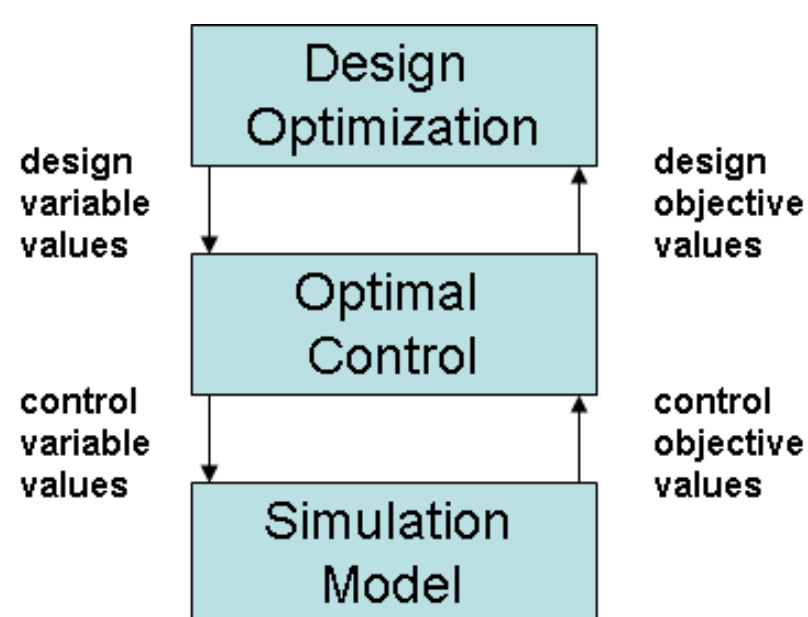
## Characteristic Properties

- Simulation-based optimization, *computational intensiveness*, non-differentiable and discontinuous functions, global vs. local optima, *multiple conflicting objectives*
- Typically, *black-box* type of problems from the optimization method's perspective

## Current Research Projects

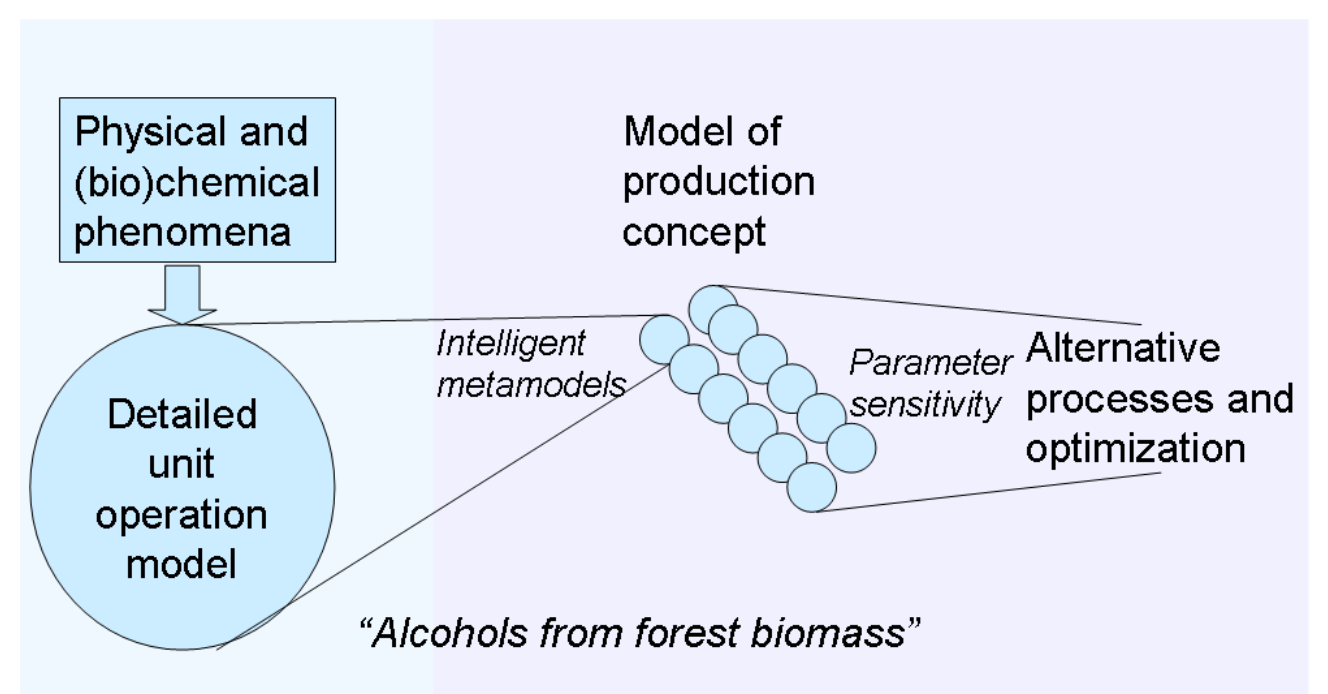
### New Process Design Concept for Capital Efficiency and Flexibility (POJo)

- Integrated design and control of a paper mill by multiobjective optimization
- Decrease the capital intensiveness of paper industry
- Bilevel optimization based on a dynamic simulation model
- Consideration of both short term and long term uncertainties
- Researchers: Prof. Kaisa Miettinen, PhD Petri Eskelinen, PhD student Sauli Ruuska
- International collaboration: Prof. Margaret Wiecek, Clemson University, USA

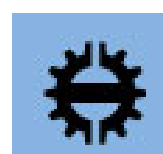


### Modelling of the Biorefinery Scenarios (BioScen)

- Basis for modelling unit operations of biorefinery and optimizing integrated biorefinery concepts
- Optimization based on metamodels of detailed unit operation models
- Estimation of parameter sensitivities
- Alternative process-product combinations in the context of "alcohols from forest biomass"
- Researchers: Prof. Kaisa Miettinen, PhD Timo Aittokoski, PhD Jussi Hakanen, PhD student Tomi Haanpää
- International collaboration: Prof. Lorenz T. Biegler, Carnegie Mellon University, USA



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## Previous Research Projects

- Wastewater treatment plant design
- Radiotherapy treatment planning
- Continuous casting of steel
- Optimization of a 2-stroke engine
- Heat exchanger network design
- Ultrasonic transducer design
- Optimization in papermaking process
- Optimization of chemical separation processes



# UNIVERSITY OF JYVÄSKYLÄ