AI for Computational Design and Manufacturing, July 17-21, 2023

Day 1

Morning: 9 am – 12 pm

- Computational design and manufacturing workflow (Matusik)

- Digital design representations (Matusik)

- Representing design space and parametric modelling (Matusik)

Afternoon: 1 pm – 5 pm

- Procedural modelling (Matusik)

- Geometric deformation methods (Matusik)

- Lab 1: Designing customizable models (Spielberg)

Day 2

Morning: 9 am – 12 pm

- Overview of advanced manufacturing processes (Matusik)

- From geometry to hardware abstraction languages (Matusik)

Afternoon: 1 pm – 5 pm

- Lab 2: Designing and printing models using a virtualized 3D printer (Spielberg)

- Predicting design performance using simulation and bridging the simulation to reality gap (Matusik)

- Lab 3: Predicting design performance for additive manufacturing (Spielberg)

Day 3

Morning: 9 am – 12 pm

- Inverse methods and performance-driven design (Matusik)

- Introduction to optimization (Matusik)

- Topology optimization (Matusik)

Afternoon: 1 pm – 5 pm

- Lab 4: Design for AM using topology optimization (Spielberg)

- Optimizing design for multiple objectives (Matusik)

- Introduction to AI and machine learning (Matusik)

Day 4
Morning: 9 am – 12 pm

- Symbolic AI methods for computational design and manufacturing (Matusik)

- Machine learning methods for computational design (neural networks as simulation surrogates) (Matusik)

Afternoon: 1 pm – 5 pm

- Lab 5: Designing and building a machine learning model (Spielberg)

- Advanced AI tools (deep neural networks, convolutional neural networks, transformers, large language models) (Matusik)

- Lab 6: Computational design and manufacturing using ChatGPT (Spielberg)

Day 5
Morning: 9 am – 12 pm

- Advanced AI methods for representing design spaces, evaluating performance, and inverse design (Matusik)

- Intelligent manufacturing systems (Matusik)

Afternoon: 1 pm – 5 pm

- Advanced AI tools for manufacturing process optimization (Bayesian optimization) (Matusik)

- Lab 7: Process optimization using Bayesian optimization (Matusik)

- Course review: developing an intelligent computational design and manufacturing workflow (Matusik)