Bauhaus-Universität Weimar

Vorlesungsverzeichnis

M.Sc. Digital Engineering

Sommer 2019

Stand 12.11.2019

M.Sc. Digital Engineering

Faculty Welcome for Master's Students Computer Science and Media

Monday, 1st April 2019, 11.00 a.m., room 015, Bauhausstraße 11

Project fair

Monday, 1st April 2019, 5 p.m., Lecture Hall A, Marienstraße 13C

Fundamentals (F)

Advanced Numerical Mathematics

4556105 Advanced Numerical Mathematics

K. Gürlebeck, D. Legatiuk, S. Bock Veranst. SWS: 4

Vorlesung

Mo, wöch., 11:00 - 12:30, Coudraystraße 13 A - Hörsaal 2, ab 08.04.2019
Mo, wöch., 15:15 - 16:45, Coudraystraße 13 A - Hörsaal 2, ab 08.04.2019
Mo, wöch., 15:15 - 16:45, Coudraystraße 13 D - Pool Fak. B 009, ab 29.04.2019

Beschreibung

Höhere Numerik

Effiziente Lösung linearer und nichtlinearer Gleichungssysteme;
• Diskretisierungsmethoden für verschiedene Typen partieller Differentialgleichungen
• Projektionsverfahren, Stabilität, Konvergenz und Konditionszahl
• Direkte Löser für schwach besetzte Systemmatrizen
• Fixpunktsatz, iterative Löser, Gesamtschrittverfahren, Einzelschrittverfahren, Gradientenverfahren, Relaxationsverfahren, Multiskalenmethoden und Überblick über andere Zugänge
• Eigenwertprobleme, iterative Löser
• Gebietszerlegungsverfahren

engl. Beschreibung/ Kurzkommentar

Advanced Numerical Mathematics

Efficient solution of linear and non-linear systems of algebraic equations;
• Discretization methods for different types of partial differential equations
• Projection methods, stability and convergence, condition number
• Direct solvers for sparse systems
• Fixed-point theorem, iterative solvers: Total step method, single step method, gradient methods, relaxation methods, multiscale methods and a survey on other approaches
• Eigenvalue problems, iterative solvers
• Domain decomposition methods

Voraussetzungen

Courses in Linear Algebra, Analysis

Leistungsnachweis

Project

Algorithms and Datastructures

4555211 Algorithmen und Datenstrukturen

C. Wüthrich, G. Pandolfo Veranst. SWS: 4

Vorlesung

Do, wöch., 11:00 - 12:30, Bauhausstraße 11 - Seminarraum 015, Vorlesung, ab 11.04.2019
Fr, wöch., 15:15 - 16:45, Bauhausstraße 11 - Seminarraum 015, Übung, ab 26.04.2019
Do, Einzel, 10:00 - 12:00, Coudraystraße 9 A - Hörsaal 6, Klausur / exam, 18.07.2019 - 18.07.2019

Beschreibung

Das Lernziel dieser Veranstaltung soll zum einen der generelle Umgang und die selbstständige Entwicklung, Analyse, und Optimierung von Algorithmen und Datenstrukturen sein. Zum anderen soll ein Überblick über gängige problemspezifische Verfahren und deren Anwendung in der Praxis vermittelt werden.

engl. Beschreibung/ Kurzkommentar

Algorithms and Data Structures

The lecture deals with the principle and the implementation of basic algorithms and data structures. The course teaches among all, the Strings, geometric problems, graphs, mathematical algorithms and NP-complete problems.

Leistungsnachweis

Beleg, Klausur

Applied Mathematics and Stochastics

Nonlinear Continuum Mechanics

Object-oriented Modeling and Programming in Engineering

Software Engineering

417290000 Software Engineering (M.Sc.)

F. Echtler, N. Ruckel Veranst. SWS: 3

Vorlesung

Di, wöch., 15:15 - 16:45, Karl-Haußknecht-Straße 7 - Seminarraum (IT-AP) 001, ab 02.04.2019
Di, Einzel, 15:15 - 16:45, Marienstraße 13 C - Hörsaal C, 09.07.2019 - 09.07.2019
Mi, Einzel, 10:00 - 12:00, Marienstraße 13 C - Hörsaal A, exam, 24.07.2019 - 24.07.2019

engl. Beschreibung/ Kurzkommentar

Software Engineering (M.Sc.)

Developing software requires more than just programming skills. Answering conceptual questions is perhaps even more important than excellent knowledge of a programming language. This course introduces participants to the basics of structured software development. During the course of a larger development project, the presented techniques will be exercised in practice. Topics include all phases of the development process, such as requirements analysis, UML modelling, design patterns or agile development.

Voraussetzungen

programming skills

Leistungsnachweis

Exercise assignments + written exam

Statistics

301005 Statistics

R. Illge Veranst. SWS: 4

Integrierte Vorlesung

Di, wöch., 13:30 - 15:00, Coudraystraße 13 B - Hörsaal 3, Lecture / Lab class, ab 09.04.2019
Do, wöch., 07:30 - 09:00, Coudraystraße 13 B - Hörsaal 3, Lecture / Lab class, ab 11.04.2019
Do, Einzel, 09:00 - 12:00, Coudraystraße 13 A - Hörsaal 2, exam, 25.07.2019 - 25.07.2019

engl. Beschreibung/ Kurzkommentar

Statistics

Contents:
- Probability (Events, classical probability, axiomatic approach, conditional probability)
- Random variables (Discrete random variables, continuous random variables, limit theorems)
- Descriptive statistics (Graphical representation and frequency distributions, location and scattering parameters, bivariate and multivariate analysis: dependence and correlation, regression analysis)
- Inductive statistics
- Point and interval estimation
- Parameter testing
- Goodness-of-fit-tests
- Nonparametric tests
- Tests for independence and correlation

Voraussetzungen

B.Sc. in a related study field, Basic knowledge on random variables and the most important distributions

Leistungsnachweis

Written exam

Structural Dynamics

Structural Engineering Models

401007 Structural Engineering Models

C. Könke Veranst. SWS: 4

Integrierte Vorlesung

Di, wöch., 15:15 - 16:45, Marienstraße 7 B - Seminarraum 205, ab 02.04.2019
Di, Einzel, 11:00 - 13:00, Marienstraße 13 C - Hörsaal A, exam, 30.07.2019 - 30.07.2019
Do, wöch., 15:15 - 16:45, Marienstraße 7 B - Seminarraum 102

Beschreibung

Student will be able to build an abstract model for structural engineering problem and to assess its restriction and quality. The student will be able to perform dimen-sion reduction in structural engineering using concepts from structural mechanics. They will be capable of classify different types of civil engineering structures and to distinguish

different principal load transfer processes. The student can classify line-ar/nonlinear problems and time variant/ invariant problems in structural engineering.

Fundamental equations in structural mechanics for 1D, 2D and 3D structures, equi-librium equation, kinematic relation, constitute law, Method to establish the govern-ing differential equations, Differences between geometric / physical linear and non-linear problems, Classification of different types of structures: truss, beam, plate, shell problems

Voraussetzungen

basic course in structural mechanics

basic course in applied mathematics

Leistungsnachweis

written test

Requirements for exam registration: 2 home works accepted

Modelling (M)

4- und 5D-Building Information Modeling (BIM)

Advanced Building Information Modeling

303001 Advanced Building Information Modelling

C. Koch, T. Behnke, J. Wagner Veranst. SWS: 4

Vorlesung

Mi, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal C, 03.04.2019 - 08.05.2019
Do, wöch., 09:15 - 10:45, Marienstraße 7 B - Projektraum 301, lab, ab 04.04.2019
Do, wöch., 09:15 - 10:45, Marienstraße 7 B - Projektraum 302, lab, ab 04.04.2019
Fr, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, lab, ab 05.04.2019
Fr, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302, lab, ab 05.04.2019
Mi, Einzel, 11:00 - 12:30, Coudraystraße 13 A - Hörsaal 2, 15.05.2019 - 15.05.2019
Mi, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal C, ab 22.05.2019
Do, wöch., 09:15 - 10:45, lab, 23.05.2019 - 11.07.2019
Di, Einzel, 09:00 - 11:00, Coudraystraße 9 A - Hörsaal 6, exam, 16.07.2019 - 16.07.2019

engl. Beschreibung/ Kurzkommentar

Advanced Building Information Modelling

Content: Advanced geometric and parametric modelling, Interoperability and collaboration concepts (IFC, IDM, BEP), Advanced use cases (e.g. clash detection, as-built model-ing), BIM programming (incl. visual programming)

Target qualifications: This module introduces advanced concepts of Building Information Modelling (BIM) to provide students with advanced knowledge in order to understand, analyze and discuss scientific research approaches related to BIM. Within the frame of the mod-ule project (coursework) the students will choose a topic from a pre-defined list or come up with their own topic. Based on that they will do detailed research, imple-ment a representative concept in a software prototype and discuss findings and limi-tations. Also the students acquire skills of scientific working and presentation.

Voraussetzungen

Recommended require-ments for participation: Basic knowledge of Computer-Aided Design, BIM concepts, and object-oriented programming

Leistungsnachweis

written report, presentation

Advanced Modelling - Calculation

301013 Advanced Modelling – Calculation/CAE

K. Gürlebeck, D. Legatiuk Veranst. SWS: 4

Vorlesung

Mo, Einzel, 13:00 - 15:00, Coudraystraße 13 A - Hörsaal 2, 29.07.2019 - 29.07.2019
Di, wöch., 09:15 - 12:30, Coudraystraße 13 B - Seminarraum 210, Final examination

Beschreibung

Scientifically orientated education in mathematical modelling and computer science in view of a complex interdisciplinary and networked field of work and research, modelling and simulation. Students will have experience in Computer Aided Engineering (CAE) by establishing a problem specific model on the basis of a mathematical formulation, an applicable solution technique, design of efficient data structures and software implementation.

Numerical and analytical solution of partial differential equations, series expansions, integral representations, finite difference methods, description of heat flow, diffusion, wave propagation and elastostatic problems. The topics are discussed theoretically and then implemented. Convergence, stability and error analysis of finite difference methods (FDM). Modelling of steady and unsteady heat conduction problems, wave propagation and vibrations and problems from linear thermo-elasticity in 2D and 3D. After considering the mathematical basis, the students will work on individual projects passing all levels of work (engineering model, mathematical model, numerical model, computer model, simulation, evaluation). The solution methods will be implemented by help of MAPLE or MATLAB.

Bemerkung

This lecture replaces "Advanced Analysis". It is therefore not possible to receive credits for both courses.

Die Veranstaltung ersetzt "Advanced Analysis" und kann daher nicht gemeinsam mit dieser Veranstaltung angerechnet werden.

Leistungsnachweis

1 exam (written or oral)

Collaborative Data Management

Computer models for physical processes – from observation to simulation

Introduction to Optimization

451002+45 Introduction to Optimization / Optimization in Applications

T. Lahmer Veranst. SWS: 4

Vorlesung

Fr, Einzel, 09:00 - 11:00, Coudraystraße 13 B - Hörsaal 3, Final examination, 19.07.2019 - 19.07.2019
Fr, Einzel, 09:00 - 11:00, Coudraystraße 13 A - Hörsaal 2, Final examination, 19.07.2019 - 19.07.2019
Mo, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D
Mi, wöch., 17:00 - 18:30, Marienstraße 7 B - Projektraum 301
Mi, wöch., 17:00 - 18:30, Marienstraße 7 B - Projektraum 302

Beschreibung

Introduction to Optimization (451002 - 3ECTS):

Definitions, Classification of Optimization Problems, Linear Problems, Simplex Method, Duality, Optimization on Graphs Nonlinear Problems: Constrained and unconstrained continuous problems, descent methods and variants

Optimization in Applications (451006 - 3 ECTS):

This course treats topics concerned with the combination of optimization methods and (numerical) models. Typical problems, where such combinations arise, are Calibration of Models, Inverse Problems; (Robust) Structural Optimization (including Shape and Topologyoptimization); Design of Experiments

Bemerkung

The course can be regarded as a continuation of „Introduction to Optimization“, however a visit of that course is not mandatory.

Leistungsnachweis

1 written or oral exam (depending on the number of participants)
„Introduction to Optimization”/ (50%)

1 written or oral exam (depending on the number of participants)
„Optimization in Applications”/ (50%)

Modelling in the development process

401020 Modelling in the development process

C. Könke, N.N. Veranst. SWS: 2

Blockveranstaltung

Mo, Einzel, 07:30 - 11:00, Marienstraße 7 B - Seminarraum 102, 29.04.2019 - 29.04.2019
Mo, Einzel, 17:00 - 20:00, Marienstraße 7 B - Seminarraum 102, 29.04.2019 - 29.04.2019
Mo, Einzel, 07:30 - 11:00, Marienstraße 7 B - Seminarraum 102, 13.05.2019 - 13.05.2019
Mo, Einzel, 17:00 - 20:00, Marienstraße 7 B - Seminarraum 102, 13.05.2019 - 13.05.2019
Mo, Einzel, 07:30 - 11:00, Marienstraße 7 B - Seminarraum 102, 03.06.2019 - 03.06.2019
Mo, Einzel, 17:00 - 20:00, Marienstraße 7 B - Seminarraum 102, 03.06.2019 - 03.06.2019
Mo, Einzel, 07:30 - 11:00, Marienstraße 7 B - Seminarraum 102, 24.06.2019 - 24.06.2019
Mo, Einzel, 17:00 - 20:00, Marienstraße 7 B - Seminarraum 102, 24.06.2019 - 24.06.2019
Mo, Einzel, 07:30 - 11:00, Marienstraße 7 B - Seminarraum 102, Ersatztermin, 01.07.2019 - 01.07.2019
Mo, Einzel, 17:00 - 20:00, Marienstraße 7 B - Seminarraum 102, Ersatztermin, 01.07.2019 - 01.07.2019
Mo, Einzel, 09:00 - 11:00, Marienstraße 13 C - Hörsaal D, Final examination, 15.07.2019 - 15.07.2019

engl. Beschreibung/ Kurzkommentar

Content:

In the modelling process, several development stages with increasing level of detail are used. According to these levels the appropriate models should be chosen:

- Descriptive models

- Schematic models

- Qualitative models

- Quantitative models

Several criteria for model selection and a variety of tools for modeling are demonstrated.

Target qualifications:

The students will be familiar with a procedure for the solution of tasks from engineering practice with the help of models from structural mechanics. This development and planning process serves as a guideline for modelling. The students will be trained to use modern CAD software (CATIA) and FEM Code (Abaqus, including pre- and post-processing).

Bemerkung

external lecturer: Dr.-Ing. Christian Guist – BMW Group

Teaching and learning forms: Lectures, exercises in computer pool, self-study, Demonstration exercises.

This module is comprised of: Modelling in the development process ”Modeling in the Development Process” (Block seminar, 2 SWS)

Voraussetzungen

Formal requirements for participation: ---

Recommended requirements for participation: Basic knowledge of mechanics and FEM

Leistungsnachweis

written exam

Optimization in Applications

451002+45 Introduction to Optimization / Optimization in Applications

T. Lahmer Veranst. SWS: 4

Vorlesung

Fr, Einzel, 09:00 - 11:00, Coudraystraße 13 B - Hörsaal 3, Final examination, 19.07.2019 - 19.07.2019
Fr, Einzel, 09:00 - 11:00, Coudraystraße 13 A - Hörsaal 2, Final examination, 19.07.2019 - 19.07.2019
Mo, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D
Mi, wöch., 17:00 - 18:30, Marienstraße 7 B - Projektraum 301
Mi, wöch., 17:00 - 18:30, Marienstraße 7 B - Projektraum 302

Beschreibung

Introduction to Optimization (451002 - 3ECTS):

Definitions, Classification of Optimization Problems, Linear Problems, Simplex Method, Duality, Optimization on Graphs Nonlinear Problems: Constrained and unconstrained continuous problems, descent methods and variants

Optimization in Applications (451006 - 3 ECTS):

This course treats topics concerned with the combination of optimization methods and (numerical) models. Typical problems, where such combinations arise, are Calibration of Models, Inverse Problems; (Robust) Structural Optimization (including Shape and Topologyoptimization); Design of Experiments

Bemerkung

The course can be regarded as a continuation of „Introduction to Optimization“, however a visit of that course is not mandatory.

Leistungsnachweis

1 written or oral exam (depending on the number of participants)
„Introduction to Optimization”/ (50%)

1 written or oral exam (depending on the number of participants)
„Optimization in Applications”/ (50%)

Simulation and Validation (SaV)

Design and Interpretation of Experiments / Signal Processing

Experimental Structural Dynamics

Extended Finite Elements and Mesh Free Methods

Fundamentals of structural health monitoring (SHM) and intelligent structural systems

Linear FEM

2401012 Applied Finite element methods (Exercise)

C. Könke Veranst. SWS: 1
Seminar
1-Gruppe Do, wöch., 17:00 - 18:30, Marienstraße 7 B - Projektraum 302, Group A, ab 06.06.2019
2-Gruppe Di, wöch., 17:00 - 18:30, Marienstraße 7 B - Projektraum 302, Group A, ab 28.05.2019
3-Gruppe Do, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302, Group A, ab 06.06.2019
4-Gruppe Do, wöch., 11:00 - 12:30, Marienstraße 7 B - Projektraum 302, Group A, ab 06.06.2019

2401012 Applied Finite element methods (Lecture)

C. Könke Veranst. SWS: 2
Vorlesung
Mi, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D, ab 29.05.2019
Fr, wöch., 07:30 - 09:00, Marienstraße 13 C - Hörsaal D, ab 31.05.2019
Fr, Einzel, 10:45 - 12:15, Marienstraße 7 B - Seminarraum 102, Final examination, 26.07.2019 - 26.07.2019
Fr, Einzel, 10:45 - 12:15, Marienstraße 7 B - Seminarraum 103, Final examination, 26.07.2019 - 26.07.2019
Fr, Einzel, 10:45 - 12:15, Marienstraße 7 B - Seminarraum 104, Final examination, 26.07.2019 - 26.07.2019
Fr, Einzel, 10:45 - 12:15, Marienstraße 7 B - Seminarraum 105, Final examination, 26.07.2019 - 26.07.2019

Modelling of Steel Structures and Numerical Simulation

205007 Modelling of steel structures and numerical simulation

M. Kraus, S. Mämpel, B. Wittor Veranst. SWS: 4
Vorlesung
1-Gruppe Mo, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 301
1-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301
2-Gruppe Mo, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 302
2-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302
Mi, Einzel, 09:00 - 11:00, Marienstraße 13 C - Hörsaal D, Final examination, 31.07.2019 - 31.07.2019
Mo, wöch., 13:30 - 15:00, Coudraystraße 13 A - Hörsaal 2
Mi, wöch., 07:30 - 09:00, Marienstraße 13 C - Hörsaal C

engl. Beschreibung/ Kurzkommentar

Design of steel structures using finite element methods; basics of the design; modelling of structures and loads; nonlinear material behaviour, numerical analyses of steel-members and structures regarding geometric and physical nonlinearities; stability behaviour of members including flexural and lateral torsional buckling

Leistungsnachweis

1 Project report ”Modelling of steel structures and numerical simulation” (0%) / SuSe

1 written exam „Modelling of steel structures and numerical simulation”/ 120 min (100%) / SuSe + WiSe

Nonlinear FEM

Process modelling and simulation in logistics and construction

Simulation Methods in Engineering

303002 Simulation Methods in Engineering

C. Koch, M. Artus Veranst. SWS: 4

Vorlesung

Fr, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal A, lecture, ab 05.04.2019
Fr, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 301, lab (7mal), ab 05.04.2019
Fr, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 302, lab (7mal), ab 05.04.2019
Mo, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, lab, ab 08.04.2019
Mo, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302, lab, ab 08.04.2019
Fr, wöch., 13:30 - 15:00, Marienstraße 7 B - Student Design Studio – SDS 303, lab, 24.05.2019 - 12.07.2019

engl. Beschreibung/ Kurzkommentar

Simulation Methods in Engineering

Content:

- System analysis and modelling
- System dynamics
- Discrete event simulation
- Multi-agent simulation
- Input data and stochastic simulation
- Simulation based optimization
- Introduction to the software AnyLogic

Target qualifications:

This module provides students with comprehensive knowledge about computer based simulation concepts to address practical challenges in engineering. Modern simulation and optimization software is introduced within tutorials. The module project (coursework) offers an opportunity to students to work in groups on current problems in the context of civil and environmental engineering (e.g. production logistics, pedestrian simulation, pollutant dispersion). Using object-oriented simula-tion software the students will analyze, model and simulate different engineering systems. The programming is carried out using Java. Also the students acquire team working and presentation skills.

Voraussetzungen

Recommended require-ments for participation: Basic knowledge of programming

Leistungsnachweis

Short group report, group presentation, written exam

Stochastic Simulation Techniques and Structural Reliability

Structural Health Monitoring

Visualization and Data Science (VaDS)

Image Analysis and Object Recognition

4336010 Image analysis and object recognition

V. Rodehorst, M. Kaisheva Veranst. SWS: 3

Vorlesung

Di, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal C, Lecture, ab 02.04.2019
Do, unger. Wo, 11:00 - 12:30, Marienstraße 13 C - Hörsaal A, Lab, ab 11.04.2019
Do, Einzel, 11:00 - 12:30, Karl-Haußknecht-Straße 7 - Hörsaal (IT-AP), lab class, 11.07.2019 - 11.07.2019
Di, Einzel, 11:00 - 13:00, Marienstraße 13 C - Hörsaal A, exam , 23.07.2019 - 23.07.2019

Beschreibung

Bildanalyse und Objekterkennung

Die Vorlesung gibt eine Einführung in die Grundlagen der Mustererkennung und Bildanalyse. Behandelt werden unter anderem die Bildverbesserung, lokale und morphologische Operatoren, Kantenerkennung, Bilddarstellung im Frequenzraum, Fourier-Transformation, Hough-Transformation, Segmentierung, Skelettierung, Objektklassifizierung und maschinelles Lernen zur visuellen Objekterkennung.

engl. Beschreibung/ Kurzkommentar

Image analysis and object recognition

The lecture gives an introduction to the basic concepts of pattern recognition and image analysis. It covers topics as image enhancement, local and morphological operators, edge detection, image representation in frequency domain, Fourier transform, Hough transform, segmentation, thinning, object categorization and machine learning for visual object recognition.

Bemerkung

Digital Engineering: 4 SWS

Leistungsnachweis

Erfolgreiche Bearbeitung der Übungen (sowie des Projekts) und Klausur

Introduction to Machine Learning

Photogrammetric Computer Vision

Search Algorithms

Search-Based Software Engineering

417290001 Search-Based Software Engineering

N. Siegmund Veranst. SWS: 3

Vorlesung

Di, wöch., 11:00 - 12:30, Bauhausstraße 11 - Seminarraum 014, Lab class, ab 02.04.2019
Mo, wöch., 09:15 - 10:45, Bauhausstraße 11 - Seminarraum 015, Lecture, ab 08.04.2019
Mo, Einzel, 09:00 - 11:00, Marienstraße 13 C - Hörsaal D, exam, 22.07.2019 - 22.07.2019

engl. Beschreibung/ Kurzkommentar

Search-Based Software Engineering

Search-Based Software Engineering is about learning and optimizing complex tasks that are computationally intractable for exact methods. The goal of this course is to understand the principles of meta-heuristics in optimization as well as on handling constraints and dimensionality.

Students should understand the following techniques and theories:

- Problem space exploration and search-based optimization
- Meta-heuristics for single and multiple objective optimization
- Relationship between biological learning and optimization with algorithms
- Dimensionality-reduction techniques
- Constraint resolution

Students should be able to apply the above theories for solving concrete learning and optimization problems. Furthermore, they should appreciate the limits and constraints of the individual methods above.

Students should be able formalize and generalize their own solutions using the above concepts and implement them in a specified language (preferable in Python).

Students should master concepts and approaches such as

- Simulated annealing
- Swarm optimization
- Ant colonization
- Evolutionary algorithms
- Dimensionality Reduction (PCA + Feature Subset Selection)
- Constraint Satisfaction Problem Solving

in order to tackle problems learning and optimizing huge problems, which are inherent to Digital Media. They should also be able to implement the algorithms and techniques in Python and be able to understand a proposed problem, to compare different approaches and techniques regarding applicability and accuracy, to make well-informed decisions about the preferred solution and, if necessary, to find their own solutions.

Students should develop an understanding of the current state of research in optimization and learning. With appropriate supervision, students should be able to tackle new research problems, especially in the area of search-based software engineering.

Bemerkung

Ehemals "Machine Learning for Software Engineering". Dieser Kurs kann daher nur belegt werden, wenn der Kurs "Machine Learning for Software Engineering (417130002)" noch nicht erfolgreich abgeschlossen wurde.

Formely known as "Machine Learning for Software Engineering". Therefore the class can only be taken, if the class "Machine Learning for Software Engineering (417130002)" has not yet been sucessfully completed.

Voraussetzungen

BSc in a relevant study field

Leistungsnachweis

Written or oral examination. Participation requires the successful completion of the course labs (tasks over the semester). Digital Engineering students will be required to successfully complete an additional project.

Software Product Line Engineering

418120019 Software Product Line Engineering

N. Siegmund, N. Ruckel Veranst. SWS: 3

Vorlesung

Mi, wöch., 09:15 - 10:45, Karl-Haußknecht-Straße 7 - Seminarraum (IT-AP) 001, Lecture, ab 03.04.2019
Fr, wöch., 11:00 - 12:30, Karl-Haußknecht-Straße 7 - Seminarraum (IT-AP) 001, Lab class, ab 05.04.2019

Beschreibung

Softwareproduktlinien und konfigurierbare Softwaresysteme bilden eine Schlüsseltechnologie für die Massenproduktion individuell angepasster Software. Ziel ist es bei der Entwicklung maßgeschneiderter Software, die Codebasis weiterhin wartbar zu halten sowie gleichzeitig die Produktionskosten zu reduzieren. Die Veranstaltung vermittelt die wichtigsten Kenntnisse und Fähigkeiten, um dieses Ziel zu erreichen:

- Die Studierenden kennen die Vorteile und Nachteile des Produktlinienansatzes sowie klassischer und moderner Programmiermethoden wie z.B. Präprozessoren, Versionsverwaltungssysteme, Komponenten, Frameworks, Feature-Orientierung, Aspekt-Orientierung.
- Die Studierenden haben die Befähigung zur Bewertung, Auswahl und Anwendung moderner Programmierparadigmen, Techniken, Methoden und Werkzeuge erlangt, insbesondere in Hinblick auf die Entwicklung von Kompetenzen im Bereich der Softwareproduktlinien.
- Die Studierenden erwerben Urteilsvermögen über den Einsatz von Programmiermethoden für die Entwicklung von Softwareproduktlinien.

Folgender Inhalt wird bei der Lehrveranstaltung vermittelt:

- Einführung in die Problematik der Entwicklung komplexer, maßgeschneiderter Softwaresysteme am Beispiel von eingebetteten Datenbankmanagementsystemen
- Modellierung und Implementierung von Programmfamilien, Produktlinien und domänenspezifischen Generatoren
- Wiederholung von Grundkonzepten der Software-Technik (Kohäsion, Scattering und Tangling, Information Hiding, Modularisierung)
- Einführung in verschiedene klassische und moderne Sprachen und Werkzeuge zur Entwicklung von Softwareproduktlinien u.a. Präprozessoren, Frameworks, Komponenten, Feature-Module, Aspekte, Kollaborationen, Rollen, etc.
- Vergleich grundlegender Konzepte, Methoden, Techniken und Werkzeuge der vorgestellten Ansätze
- Kritische Diskussion von Vor- und Nachteilen der einzelnen Ansätze sowie ihrer Beziehung untereinander
- Weiterführende Themen: Nicht-funktionale Eigenschaften, Analyse von Produktlinien, Featureinteraktionen,

Aktuelle Forschungsergebnisse des Lehrstuhls werden in der Veranstaltung besprochen, angewendet und diskutiert

engl. Beschreibung/ Kurzkommentar

Software Product Line Engineering

Software product lines and configurable software systems are the main driving factor for mass customization, tailor-made products, and product diversity while keeping a maintainable code base and saving development time. The lecture will teach about central elements of product line modelling and development.

Students should understand the following techniques and theories:

- Configuration management and variability modeling
- Classic and modern programming techniques, such as preprocessors, version control systems, components, frameworks, aspect-oriented programming, and feature-oriented programming
- Feature interactions and virtual separation of concerns

Students should be able to apply the above theories and concepts to judge points in favour and against a certain technique depending on the application scenario at hand. Hence, the students will be able to decide which techniques, tools, and methods to use.

Students should master concepts and approaches such as

- The exponential complexity of variability spaces
- Modelling and implementation of program families, product lines, and domain specific generators
- Basic concepts of software engineering (e.g., cohesion, scattering, tangling, information hiding)
- Classic and modern concepts, such as preprocessors, plug-in systems, feature modules, collaborations, aspects, and roles
- Critical discussion about pros and cons of the above techniques and concepts
- Feature interactions, non-functional properties, product line analysis

Students will implement these concepts in Java.

Students should develop an understanding of the current state of research in software product lines. With appropriate supervision, students should be able to tackle new research problems, especially in the area of product line development and optimization.

Voraussetzungen

BSc in a relevant study field; Software Engineering course for Digital Engineering students

Leistungsnachweis

Written or oral examination. Participation requires the successful completion of the course labs. Digital Engineering students will be required to successfully complete an additional project / course lab

Visualization

4555262 Visualisierung

B. Fröhlich, P. Riehmann, C. Matthes Veranst. SWS: 3

Vorlesung

Do, wöch., 13:30 - 15:00, Marienstraße 13 C - Hörsaal C, Vorlesung/Lecture, ab 04.04.2019
Di, wöch., 11:00 - 12:30, Bauhausstraße 11 - Pool-Raum 128, Übung (Bachelor), ab 09.04.2019
Di, wöch., 17:00 - 20:00, Bauhausstraße 11 - Pool-Raum 128, Übung /Lab class (Master), ab 09.04.2019
Mi, Einzel, 10:00 - 13:00, Bauhausstraße 9a - Meeting-/Präsentationsbereich 301/302, 04.09.2019 - 04.09.2019
Mo, Einzel, 10:00 - 12:00, Bauhausstraße 11 - Seminarraum 015, Vorbesprechung Klausur, 16.09.2019 - 16.09.2019
Di, Einzel, 10:00 - 12:00, Bauhausstraße 11 - Seminarraum 015, Vorbesprechung Klausur, 17.09.2019 - 17.09.2019
Mo, Einzel, 10:00 - 13:00, Steubenstraße 6, Haus F - Hörsaal K20, Klausur, 23.09.2019 - 23.09.2019

Beschreibung

Im ersten Teil der Veranstaltung werden die wichtigsten Verfahren und Techniken aus dem Bereich der Informationsvisualisierung für folgende Datentypen vorgestellt: multi-dimensionale und hierarchische Daten, Graphen, Zeitreihen, kartographische und kategorische Daten. Der zweite Teil beschäftigt sich mit verschiedenen Ansätzen und Algorithmen zur Visualisierung volumetrischer und vektorieller Simulations- und Messdaten. Die Veranstaltung wird englischsprachig angeboten.

engl. Beschreibung/ Kurzkommentar

Visualization

The first part of this course presents fundamental and advanced information visualization techniques for multi-dimensional and hierarchical data, graphs, time-series data, cartographic and categorical data. During the second half, algorithms and models for the scientific visualization of volumetric and vector-based data as well as corresponding out-of-core and level-of-detail techniques for handling very large datasets are introduced.

Various approaches presented in lectures will be studied, in part practically through labs and assignments, and with case studies. Lab classes focus on implementing, testing and evaluating the visualization approaches presented during the lectures. This course will be taught in English.

Bemerkung

Die Veranstaltung wird englischsprachig angeboten.

Voraussetzungen

Fundamental programming skills are required. Java and basic GLSL programming will be used in the lab classes. Basic computer graphics knowledge is helpful, e.g. the computer graphics course of the Medieninformatik Bachelor programme.

Leistungsnachweis

Vorlesungsbegleitende Übungen, Abschlussprojekt, mündliche oder schriftliche Prüfung

Elective Modules

205007 Modelling of steel structures and numerical simulation

M. Kraus, S. Mämpel, B. Wittor Veranst. SWS: 4

Vorlesung

1-Gruppe Mo, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 301
1-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301
2-Gruppe Mo, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 302
2-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302
Mi, Einzel, 09:00 - 11:00, Marienstraße 13 C - Hörsaal D, Final examination, 31.07.2019 - 31.07.2019
Mo, wöch., 13:30 - 15:00, Coudraystraße 13 A - Hörsaal 2
Mi, wöch., 07:30 - 09:00, Marienstraße 13 C - Hörsaal C

engl. Beschreibung/ Kurzkommentar

Design of steel structures using finite element methods; basics of the design; modelling of structures and loads; nonlinear material behaviour, numerical analyses of steel-members and structures regarding geometric and physical nonlinearities; stability behaviour of members including flexural and lateral torsional buckling

Leistungsnachweis

1 Project report ”Modelling of steel structures and numerical simulation” (0%) / SuSe

1 written exam „Modelling of steel structures and numerical simulation”/ 120 min (100%) / SuSe + WiSe

301005 Statistics

R. Illge Veranst. SWS: 4

Integrierte Vorlesung

Di, wöch., 13:30 - 15:00, Coudraystraße 13 B - Hörsaal 3, Lecture / Lab class, ab 09.04.2019
Do, wöch., 07:30 - 09:00, Coudraystraße 13 B - Hörsaal 3, Lecture / Lab class, ab 11.04.2019
Do, Einzel, 09:00 - 12:00, Coudraystraße 13 A - Hörsaal 2, exam, 25.07.2019 - 25.07.2019

engl. Beschreibung/ Kurzkommentar

Statistics

Contents:
- Probability (Events, classical probability, axiomatic approach, conditional probability)
- Random variables (Discrete random variables, continuous random variables, limit theorems)
- Descriptive statistics (Graphical representation and frequency distributions, location and scattering parameters, bivariate and multivariate analysis: dependence and correlation, regression analysis)
- Inductive statistics
- Point and interval estimation
- Parameter testing
- Goodness-of-fit-tests
- Nonparametric tests
- Tests for independence and correlation

Voraussetzungen

B.Sc. in a related study field, Basic knowledge on random variables and the most important distributions

Leistungsnachweis

Written exam

301013 Advanced Modelling – Calculation/CAE

K. Gürlebeck, D. Legatiuk Veranst. SWS: 4

Vorlesung

Mo, Einzel, 13:00 - 15:00, Coudraystraße 13 A - Hörsaal 2, 29.07.2019 - 29.07.2019
Di, wöch., 09:15 - 12:30, Coudraystraße 13 B - Seminarraum 210, Final examination

Beschreibung

Scientifically orientated education in mathematical modelling and computer science in view of a complex interdisciplinary and networked field of work and research, modelling and simulation. Students will have experience in Computer Aided Engineering (CAE) by establishing a problem specific model on the basis of a mathematical formulation, an applicable solution technique, design of efficient data structures and software implementation.

Numerical and analytical solution of partial differential equations, series expansions, integral representations, finite difference methods, description of heat flow, diffusion, wave propagation and elastostatic problems. The topics

are discussed theoretically and then implemented. Convergence, stability and error analysis of finite difference methods (FDM). Modelling of steady and unsteady heat conduction problems, wave propagation and vibrations and problems from linear thermo-elasticity in 2D and 3D. After considering the mathematical basis, the students will work on individual projects passing all levels of work (engineering model, mathematical model, numerical model, computer model, simulation, evaluation). The solution methods will be implemented by help of MAPLE or MATLAB.

Bemerkung

This lecture replaces "Advanced Analysis". It is therefore not possible to receive credits for both courses.

Die Veranstaltung ersetzt "Advanced Analysis" und kann daher nicht gemeinsam mit dieser Veranstaltung angerechnet werden.

Leistungsnachweis

1 exam (written or oral)

303001 Advanced Building Information Modelling

C. Koch, T. Behnke, J. Wagner Veranst. SWS: 4

Vorlesung

Mi, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal C, 03.04.2019 - 08.05.2019
Do, wöch., 09:15 - 10:45, Marienstraße 7 B - Projektraum 301, lab, ab 04.04.2019
Do, wöch., 09:15 - 10:45, Marienstraße 7 B - Projektraum 302, lab, ab 04.04.2019
Fr, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, lab, ab 05.04.2019
Fr, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302, lab, ab 05.04.2019
Mi, Einzel, 11:00 - 12:30, Coudraystraße 13 A - Hörsaal 2, 15.05.2019 - 15.05.2019
Mi, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal C, ab 22.05.2019
Do, wöch., 09:15 - 10:45, lab, 23.05.2019 - 11.07.2019
Di, Einzel, 09:00 - 11:00, Coudraystraße 9 A - Hörsaal 6, exam, 16.07.2019 - 16.07.2019

engl. Beschreibung/ Kurzkommentar

Advanced Building Information Modelling

Content: Advanced geometric and parametric modelling, Interoperability and collaboration concepts (IFC, IDM, BEP), Advanced use cases (e.g. clash detection, as-built model-ing), BIM programming (incl. visual programming)

Target qualifications: This module introduces advanced concepts of Building Information Modelling (BIM) to provide students with advanced knowledge in order to understand, analyze and discuss scientific research approaches related to BIM. Within the frame of the mod-ule project (coursework) the students will choose a topic from a pre-defined list or come up with their own topic. Based on that they will do detailed research, imple-ment a representative concept in a software prototype and discuss findings and limi-tations. Also the students acquire skills of scientific working and presentation.

Voraussetzungen

Recommended require-ments for participation: Basic knowledge of Computer-Aided Design, BIM concepts, and object-oriented programming

Leistungsnachweis

written report, presentation

303002 Simulation Methods in Engineering

C. Koch, M. Artus Veranst. SWS: 4

Vorlesung
Fr, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal A, lecture, ab 05.04.2019
Fr, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 301, lab (7mal), ab 05.04.2019
Fr, wöch., 13:30 - 15:00, Marienstraße 7 B - Projektraum 302, lab (7mal), ab 05.04.2019
Mo, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, lab, ab 08.04.2019
Mo, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302, lab, ab 08.04.2019
Fr, wöch., 13:30 - 15:00, Marienstraße 7 B - Student Design Studio – SDS 303, lab, 24.05.2019 - 12.07.2019

engl. Beschreibung/ Kurzkommentar

Simulation Methods in Engineering

Content:

- System analysis and modelling
- System dynamics
- Discrete event simulation
- Multi-agent simulation
- Input data and stochastic simulation
- Simulation based optimization
- Introduction to the software AnyLogic

Target qualifications:

This module provides students with comprehensive knowledge about computer based simulation concepts to address practical challenges in engineering. Modern simulation and optimization software is introduced within tutorials. The module project (coursework) offers an opportunity to students to work in groups on current problems in the context of civil and environmental engineering (e.g. production logistics, pedestrian simulation, pollutant dispersion). Using object-oriented simula-tion software the students will analyze, model and simulate different engineering systems. The programming is carried out using Java. Also the students acquire team working and presentation skills.

Voraussetzungen

Recommended require-ments for participation: Basic knowledge of programming

Leistungsnachweis

Short group report, group presentation, written exam

401007 Structural Engineering Models

C. Könke Veranst. SWS: 4

Integrierte Vorlesung
Di, wöch., 15:15 - 16:45, Marienstraße 7 B - Seminarraum 205, ab 02.04.2019
Di, Einzel, 11:00 - 13:00, Marienstraße 13 C - Hörsaal A, exam, 30.07.2019 - 30.07.2019
Do, wöch., 15:15 - 16:45, Marienstraße 7 B - Seminarraum 102

Beschreibung

Student will be able to build an abstract model for structural engineering problem and to assess its restriction and quality. The student will be able to perform dimen-sion reduction in structural engineering using concepts from structural mechanics. They will be capable of classify different types of civil engineering structures and to distinguish different principal load transfer processes. The student can classify line-ar/nonlinear problems and time variant/ invariant problems in structural engineering.

Fundamental equations in structural mechanics for 1D, 2D and 3D structures, equi-librium equation, kinematic relation, constitute law, Method to establish the govern-ing differential equations, Differences between geometric / physical linear and non-linear problems, Classification of different types of structures: truss, beam, plate, shell problems

Voraussetzungen

basic course in structural mechanics

basic course in applied mathematics

Leistungsnachweis

written test

Requirements for exam registration: 2 home works accepted

417290000 Software Engineering (M.Sc.)

F. Echtler, N. Ruckel Veranst. SWS: 3

Vorlesung

Di, wöch., 15:15 - 16:45, Karl-Haußknecht-Straße 7 - Seminarraum (IT-AP) 001, ab 02.04.2019
Di, Einzel, 15:15 - 16:45, Marienstraße 13 C - Hörsaal C, 09.07.2019 - 09.07.2019
Mi, Einzel, 10:00 - 12:00, Marienstraße 13 C - Hörsaal A, exam, 24.07.2019 - 24.07.2019

engl. Beschreibung/ Kurzkommentar

Software Engineering (M.Sc.)

Developing software requires more than just programming skills. Answering conceptual questions is perhaps even more important than excellent knowledge of a programming language. This course introduces participants to the basics of structured software development. During the course of a larger development project, the presented techniques will be exercised in practice. Topics include all phases of the development process, such as requirements analysis, UML modelling, design patterns or agile development.

Voraussetzungen

programming skills

Leistungsnachweis

Exercise assignments + written exam

417290001 Search-Based Software Engineering

N. Siegmund Veranst. SWS: 3

Vorlesung

Di, wöch., 11:00 - 12:30, Bauhausstraße 11 - Seminarraum 014, Lab class, ab 02.04.2019
Mo, wöch., 09:15 - 10:45, Bauhausstraße 11 - Seminarraum 015, Lecture, ab 08.04.2019
Mo, Einzel, 09:00 - 11:00, Marienstraße 13 C - Hörsaal D, exam, 22.07.2019 - 22.07.2019

engl. Beschreibung/ Kurzkommentar

Search-Based Software Engineering

Search-Based Software Engineering is about learning and optimizing complex tasks that are computationally intractable for exact methods. The goal of this course is to understand the principles of meta-heuristics in optimization as well as on handling constraints and dimensionality.

Students should understand the following techniques and theories:

- Problem space exploration and search-based optimization
- Meta-heuristics for single and multiple objective optimization
- Relationship between biological learning and optimization with algorithms
- Dimensionality-reduction techniques
- Constraint resolution

Students should be able to apply the above theories for solving concrete learning and optimization problems. Furthermore, they should appreciate the limits and constraints of the individual methods above.

Students should be able formalize and generalize their own solutions using the above concepts and implement them in a specified language (preferable in Python).

Students should master concepts and approaches such as

- Simulated annealing
- Swarm optimization
- Ant colonization
- Evolutionary algorithms
- Dimensionality Reduction (PCA + Feature Subset Selection)
- Constraint Satisfaction Problem Solving

in order to tackle problems learning and optimizing huge problems, which are inherent to Digital Media. They should also be able to implement the algorithms and techniques in Python and be able to understand a proposed problem, to compare different approaches and techniques regarding applicability and accuracy, to make well-informed decisions about the preferred solution and, if necessary, to find their own solutions.

Students should develop an understanding of the current state of research in optimization and learning. With appropriate supervision, students should be able to tackle new research problems, especially in the area of search-based software engineering.

Bemerkung

Ehemals "Machine Learning for Software Engineering". Dieser Kurs kann daher nur belegt werden, wenn der Kurs "Machine Learning for Software Engineering (417130002)" noch nicht erfolgreich abgeschlossen wurde.

Formely known as "Machine Learning for Software Engineering". Therefore the class can only be taken, if the class "Machine Learning for Software Engineering (417130002)" has not yet been sucessfully completed.

Voraussetzungen

BSc in a relevant study field

Leistungsnachweis

Written or oral examination. Participation requires the successful completion of the course labs (tasks over the semester). Digital Engineering students will be required to successfully complete an additional project.

418260009 Java Programming

N. Dittrich, S. Lucks Veranst. SWS: 3

Blockveranstaltung

Block, 09:15 - 16:45, Bauhausstraße 11 - Pool-Raum 128, 23.09.2019 - 27.09.2019
Mo, Einzel, 09:15 - 16:45, Bauhausstraße 11 - Pool-Raum 128, weitere Termine: Di 01.10.2019 0915:-16:45 Uhr Mi 02.10.2019 0915:-16:45 Uhr Fr 04.10.2019 0915:-16:45 Uhr, 30.09.2019 - 30.09.2019

Beschreibung

Diese Blockveranstaltung bietet Studierenden die Möglichkeit Java von Grund auf zu erlernen. Im Zuge dessen werden generelle Grundlagen zum Thema Programmieren vermittelt, wie z.B.: - Variablen - Anweisungen - Schleifen - Methoden - Arrays und Listen - Strings - Objektorientierte Programmierung - ... Da diese Veranstaltung sehr viele praktische Aufgaben beinhalten wird, werden die Studierenden gebeten stets Laptops mitzubringen oder aber sich einen Partner mit Laptop zu suchen. Die Zielgruppe sind vor allem Master-Studierende, die noch wenig programmiererfahrung haben, die ihre Programmierkenntnisse wieder auffrischen wollen, oder die interessiert daran sind Java zu erlernen. Nach beendigung der Blockveranstaltung müssen die Studierenden in Gruppen ein Miniprojekt bearbeiten. Als Prüfungsleistung gilt die Präsentation dieses Miniprojekts sowie eine kurze Dokumentation (~3-10 Seiten).

engl. Beschreibung/ Kurzkommentar

This block seminar gives students the possibility to learn Java from the very beginning. In this context general concepts of programming will be tought such as: - variables - conditions - loops - methods - arrays and lists - strings - object-oriented programming - ... Because many practical tasks have to be solved, students are asked to bring their Laptop. If they cannot bring one with them, they should search for a partner having one to work with. The target group consists mainly of master's students who have just basic programming skills, who need to refresh their skills, or who are just interested in learning Java. After completing the block seminar, students have to solve one mini project. The final grade will be based on the presentation of this mini project in combination with a short documentation (~3-10 pages).

Leistungsnachweis

Miniprojekt

4336010 Image analysis and object recognition

V. Rodehorst, M. Kaisheva Veranst. SWS: 3

Vorlesung

Di, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal C, Lecture, ab 02.04.2019
Do, unger. Wo, 11:00 - 12:30, Marienstraße 13 C - Hörsaal A, Lab, ab 11.04.2019
Do, Einzel, 11:00 - 12:30, Karl-Haußknecht-Straße 7 - Hörsaal (IT-AP), lab class, 11.07.2019 - 11.07.2019
Di, Einzel, 11:00 - 13:00, Marienstraße 13 C - Hörsaal A, exam , 23.07.2019 - 23.07.2019

Beschreibung

Bildanalyse und Objekterkennung

Die Vorlesung gibt eine Einführung in die Grundlagen der Mustererkennung und Bildanalyse. Behandelt werden unter anderem die Bildverbesserung, lokale und morphologische Operatoren, Kantenerkennung, Bilddarstellung im Frequenzraum, Fourier-Transformation, Hough-Transformation, Segmentierung, Skelettierung, Objektklassifizierung und maschinelles Lernen zur visuellen Objekterkennung.

engl. Beschreibung/ Kurzkommentar

Image analysis and object recognition

The lecture gives an introduction to the basic concepts of pattern recognition and image analysis. It covers topics as image enhancement, local and morphological operators, edge detection, image representation in frequency domain,

Fourier transform, Hough transform, segmentation, thinning, object categorization and machine learning for visual object recognition.

Bemerkung

Digital Engineering: 4 SWS

Leistungsnachweis

Erfolgreiche Bearbeitung der Übungen (sowie des Projekts) und Klausur

451002+45 Introduction to Optimization / Optimization in Applications

T. Lahmer Veranst. SWS: 4

Vorlesung

Fr, Einzel, 09:00 - 11:00, Coudraystraße 13 B - Hörsaal 3, Final examination, 19.07.2019 - 19.07.2019
Fr, Einzel, 09:00 - 11:00, Coudraystraße 13 A - Hörsaal 2, Final examination, 19.07.2019 - 19.07.2019
Mo, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D
Mi, wöch., 17:00 - 18:30, Marienstraße 7 B - Projektraum 301
Mi, wöch., 17:00 - 18:30, Marienstraße 7 B - Projektraum 302

Beschreibung

Introduction to Optimization (451002 - 3ECTS):

Definitions, Classification of Optimization Problems, Linear Problems, Simplex Method, Duality, Optimization on Graphs Nonlinear Problems: Constrained and unconstrained continuous problems, descent methods and variants

Optimization in Applications (451006 - 3 ECTS):

This course treats topics concerned with the combination of optimization methods and (numerical) models. Typical problems, where such combinations arise, are Calibration of Models, Inverse Problems; (Robust) Structural Optimization (including Shape and Topologyoptimization); Design of Experiments

Bemerkung

The course can be regarded as a continuation of „Introduction to Optimization“, however a visit of that course is not mandatory.

Leistungsnachweis

1 written or oral exam (depending on the number of participants)
„Introduction to Optimization”/ (50%)

1 written or oral exam (depending on the number of participants)
„Optimization in Applications”/ (50%)

4526501 Academic English Part One

H. Atkinson Veranst. SWS: 2

Kurs

Mi, wöch., 17:00 - 18:30, Bauhausstraße 11 - Seminarraum 015, ab 24.04.2019
Mi, Einzel, 17:00 - 18:30, Bauhausstraße 11 - Seminarraum 015, written exam, 10.07.2019 - 10.07.2019

engl. Beschreibung/ Kurzkommentar

Academic English Part One

This is the first part of a two-part course which aims to improve your ability to express yourself clearly in written English and to develop a suitably coherent academic writing style. Part One concentrates mainly on structure in writing academic articles, essays and reports. We begin by examining the structure of individual paragraphs and move on to extended texts of various types (e.g. process essays, cause/effect, comparison/contrast, etc.). Particular attention is paid to connectives, i.e. transitional phrases and constructions which help you link ideas and paragraphs in a logical, systematic way.

Bemerkung

You are advised to take Part One first, although it is possible to take both parts concurrently (i.e. in the same semester) or in reverse order.

Voraussetzungen

Registration

All students must register. First time particpants are required to present the B2 English Level Certificate before the beginning of the course.

Howard Atkinson therefore offers the following consultation hours:

17. April 2019, 16:00-18:00 p.m., room 001, Bauhausstraße 11

18. April 2019, 10:00-12:00 a.m., room 001, Bauhausstraße 11

Leistungsnachweis

written examination

4526502 Academic English Part Two

H. Atkinson Veranst. SWS: 2

Kurs

Do, wöch., 17:00 - 18:30, Bauhausstraße 11 - Seminarraum 015, ab 25.04.2019
Do, Einzel, 17:00 - 18:30, Bauhausstraße 11 - Seminarraum 015, wirtten exam, 11.07.2019 - 11.07.2019

engl. Beschreibung/ Kurzkommentar

Academin English Part Two

Part Two of the Academic English course concentrates on improving and refining aspects of academic style. It includes sections on clause and sentence structure, punctuation rules and how to incorporate quotations, statistics and footnotes into academic texts. Students will be encouraged to bring along examples of their own written work, which the class can then correct and improve together in a constructive, mutually supportive atmosphere.

Bemerkung

You are advised to take Part One first, although it is possible to take both parts concurrently (i.e. in the same semester) or in reverse order.
If you wish to take Part Two first, it is necessary to take a placement test.

Voraussetzungen

Registration

All students must register. First time particpants are required to present the B2 English Level Certificate before the beginning of the course.

Howard Atkinson therefore offers the following consultation hours:

17. April 2019, 16:00-18:00 p.m., room 001, Bauhausstraße 11

18. April 2019, 10:00-12:00 a.m., room 001, Bauhausstraße 11

Leistungsnachweis

written examination

4555211 Algorithmen und Datenstrukturen

C. Wüthrich, G. Pandolfo Veranst. SWS: 4

Vorlesung

Do, wöch., 11:00 - 12:30, Bauhausstraße 11 - Seminarraum 015, Vorlesung, ab 11.04.2019
Fr, wöch., 15:15 - 16:45, Bauhausstraße 11 - Seminarraum 015, Übung, ab 26.04.2019
Do, Einzel, 10:00 - 12:00, Coudraystraße 9 A - Hörsaal 6, Klausur / exam, 18.07.2019 - 18.07.2019

Beschreibung

Das Lernziel dieser Veranstaltung soll zum einen der generelle Umgang und die selbstständige Entwicklung, Analyse, und Optimierung von Algorithmen und Datenstrukturen sein. Zum anderen soll ein Überblick über gängige problemspezifische Verfahren und deren Anwendung in der Praxis vermittelt werden.

engl. Beschreibung/ Kurzkommentar

Algorithms and Data Structures

The lecture deals with the principle and the implementation of basic algorithms and data structures. The course teaches among all, the Strings, geometric problems, graphs, mathematical algorithms and NP-complete problems.

Leistungsnachweis

Beleg, Klausur

4555262 Visualisierung

B. Fröhlich, P. Riehmann, C. Matthes Veranst. SWS: 3

Vorlesung

Do, wöch., 13:30 - 15:00, Marienstraße 13 C - Hörsaal C, Vorlesung/Lecture, ab 04.04.2019
Di, wöch., 11:00 - 12:30, Bauhausstraße 11 - Pool-Raum 128, Übung (Bachelor), ab 09.04.2019
Di, wöch., 17:00 - 20:00, Bauhausstraße 11 - Pool-Raum 128, Übung /Lab class (Master), ab 09.04.2019
Mi, Einzel, 10:00 - 13:00, Bauhausstraße 9a - Meeting-/Präsentationsbereich 301/302, 04.09.2019 - 04.09.2019
Mo, Einzel, 10:00 - 12:00, Bauhausstraße 11 - Seminarraum 015, Vorbesprechung Klausur, 16.09.2019 - 16.09.2019
Di, Einzel, 10:00 - 12:00, Bauhausstraße 11 - Seminarraum 015, Vorbesprechung Klausur, 17.09.2019 - 17.09.2019
Mo, Einzel, 10:00 - 13:00, Steubenstraße 6, Haus F - Hörsaal K20, Klausur, 23.09.2019 - 23.09.2019

Beschreibung

Im ersten Teil der Veranstaltung werden die wichtigsten Verfahren und Techniken aus dem Bereich der Informationsvisualisierung für folgende Datentypen vorgestellt: multi-dimensionale und hierarchische Daten, Graphen, Zeitreihen, kartographische und kategorische Daten. Der zweite Teil beschäftigt sich mit verschiedenen Ansätzen und Algorithmen zur Visualisierung volumetrischer und vektorieller Simulations- und Messdaten. Die Veranstaltung wird englischsprachig angeboten.

engl. Beschreibung/ Kurzkommentar

Visualization

The first part of this course presents fundamental and advanced information visualization techniques for multi-dimensional and hierarchical data, graphs, time-series data, cartographic and categorical data. During the second half, algorithms and models for the scientific visualization of volumetric and vector-based data as well as corresponding out-of-core and level-of-detail techniques for handling very large datasets are introduced.

Various approaches presented in lectures will be studied, in part practically through labs and assignments, and with case studies. Lab classes focus on implementing, testing and evaluating the visualization approaches presented during the lectures. This course will be taught in English.

Bemerkung

Die Veranstaltung wird englischsprachig angeboten.

Voraussetzungen

Fundamental programming skills are required. Java and basic GLSL programming will be used in the lab classes. Basic computer graphics knowledge is helpful, e.g. the computer graphics course of the Medieninformatik Bachelor programme.

Leistungsnachweis

Vorlesungsbegleitende Übungen, Abschlussprojekt, mündliche oder schriftliche Prüfung

4556105 Advanced Numerical Mathematics

K. Gürlebeck, D. Legatiuk, S. Bock Veranst. SWS: 4

Vorlesung

Mo, wöch., 11:00 - 12:30, Coudraystraße 13 A - Hörsaal 2, ab 08.04.2019
Mo, wöch., 15:15 - 16:45, Coudraystraße 13 A - Hörsaal 2, ab 08.04.2019
Mo, wöch., 15:15 - 16:45, Coudraystraße 13 D - Pool Fak. B 009, ab 29.04.2019

Beschreibung

Höhere Numerik

Effiziente Lösung linearer und nichtlinearer Gleichungssysteme;
• Diskretisierungsmethoden für verschiedene Typen partieller Differentialgleichungen
• Projektionsverfahren, Stabilität, Konvergenz und Konditionszahl
• Direkte Löser für schwach besetzte Systemmatrizen
• Fixpunktsatz, iterative Löser, Gesamtschrittverfahren, Einzelschrittverfahren, Gradientenverfahren, Relaxationsverfahren, Multiskalenmethoden und Überblick über andere Zugänge
• Eigenwertprobleme, iterative Löser
• Gebietszerlegungsverfahren

engl. Beschreibung/ Kurzkommentar

Advanced Numerical Mathematics

Efficient solution of linear and non-linear systems of algebraic equations;
• Discretization methods for different types of partial differential equations
• Projection methods, stability and convergence, condition number
• Direct solvers for sparse systems
• Fixed-point theorem, iterative solvers: Total step method, single step method, gradient methods, relaxation methods, multiscale methods and a survey on other approaches
• Eigenvalue problems, iterative solvers
• Domain decomposition methods

Voraussetzungen

Courses in Linear Algebra, Analysis

Leistungsnachweis

Project

Project

302008 The Climate Chamber Digital Twin

C. Völker, A. Osman Veranst. SWS: 8
Projekt

303006 Damage Information Modeling

C. Koch, M. Artus Veranst. SWS: 8
Projekt

303007 Virtual evacuation

C. Koch, M. Artus Veranst. SWS: 8
Projekt

401019 Finite Element Simulation of structural components taking into account different damping effects

C. Könke, C. Zacharias Veranst. SWS: 8
Projekt

419110016 Augmented Writing Platform for Blog Posts

B. Stein, K. Al Khatib, R. El Baff, M. Wolska Veranst. SWS: 10
Projekt

Beschreibung

"it's easy to forget that the words we choose can change how people react... and change the future" - textio. This project aims at developing a working prototype for an intelligent writing assistant platform. The platform targets blog writers who are eager to attract various types of readers by writing engaging and interesting content. The platform helps writers to see how their text will affect people with different profiles (e.g. different personalities, political orientations, ?). In addition, it provides several suggestions to the writer in order to boost the content impact on the target readers (e.g., replacing or adding powerful words) . The project will concentrate on (1) developing an effective and easy to use GUI, and (2) integrating different related approaches that the group already has successfully developed. Examples for augmented writing

tools: https://textio.com, https://www.boostlinguistics.com, https://www.grammarly.com.

Bemerkung

Ort und Zeit werden zur Projektbörse bekannt gegeben.

Voraussetzungen

Programming: Golang, Java or Python. At least basic knowledge in WebApp development

Leistungsnachweis

Abschlusspräsentation und Ausarbeitung

419110017 Automated Software Engineering

N. Siegmund, A. Karge Veranst. SWS: 10
Projekt

Beschreibung
<h4 style="margin: 0cm 0cm 10pt;">Automatisiertes Software Engineering </h4><p>Software Engineering wird zunehmend automatisiert. In diesem Projekt werden Verfahren entwickelt, die dieser Automatisierung Rechnung tragen. Insbesondere ist der Bereich der automatisierten Code-Vervollständigung, das automatisierte Bug Fixen oder die automatisierte Performance-Verbesserung von Interesse. <p> <p>Die Studierenden werden sich in ein komplexes Themengebiet im Schnittstellenbereich des Software Engineerings, maschinellen Lernens und Information Retrieval einarbeiten und den Stand der Forschung aufarbeiten. Darauf ableitend wird ein neuer, innovativerer Ansatz der Automatisierung entworfen und implementiert. Schließlich wird mittels wissenschaftlich akkuraten Methoden das Verfahren evaluiert, dokumentiert und verteidigt.

engl. Beschreibung/ Kurzkommentar

Software Engineering becomes increasingly automated. In this project, we will address this automation in the area of code completion, automated bug fixing, or automated performance improvement.

Students will learn how to acquire in depth knowledge in a complex topic on the interface of software engineering, machine learning, and information retrieval. They will learn how to asses the state of the art, develop novel techniques on top of it, and implement and evaluate them in a scientific accurate manner.

Bemerkung

Ort und Zeit werden zur Projekbörse bekannt gegeben.

Time and place will be announced at the project fair.

Voraussetzungen

Lecture: Software Engineering, Information Retrieval or Introduction to Machine Learning

Leistungsnachweis

Presentation of project phases, literature analysis, implemented software, written summary of the project

419110018 Conversational News

B. Stein, Y. Ajjour, R. El Baff, J. Kiesel, M. Wolska Veranst. SWS: 10

Projekt

Beschreibung

Smart speakers like Google Home and Amazon Alexa already made their way into millions of households and present themselves as a new medium for news consumption. For example, big news publishers like the New York Times or CNN already produce daily flash briefings just for such devices. This project wants to develop a system to enable even small publishers to publish their written news articles on smart speakers in an engaging manner. The system will tackle these three main problems: the article structure has to be simplified to be more understandable through listening; the output of the speech synthesizer has to sound more natural and less boring; the possibility to ask for more information (like links to related articles or encyclopedic knowledge of mentioned person, places, or organizations) has to be added. The system will allow publishers to bootstrap their own smart speaker application and to quickly add articles to it.

Bemerkung

Ort und Zeit werden zur Projektbörse bekannt gegeben.

Voraussetzungen

Programming: Java.

Leistungsnachweis

Abschlusspräsentation und Ausarbeitung

419110022 Image-based anomaly detection

V. Rodehorst, C. Benz Veranst. SWS: 10
Projekt

Beschreibung

Die Teilnehmer werden an ein aktuelles forschungs- oder industrierelevantes Thema herangeführt. Es ist nicht beabsichtigt einen festgelegten Bereich in voller Breite zu explorieren. Stattdessen werden die Teilnehmer mit der vollen Komplexität eines begrenzten Themas konfrontiert und die Eigeninitiative gefördert. Es ermöglicht einen Einblick in die Forschungs- und Entwicklungsprojekte des Fachgebiets.

engl. Beschreibung/ Kurzkommentar

Detecting cracks and other anomalies in images of concrete surfaces for building survey

Bemerkung

Ort und Zeit werden zur Projektbörse bekannt gegeben.

Time and place will be announced at the project fair.

Voraussetzungen

Gute Programmierkenntnisse (z.B. C/C++, MATLAB, OpenCL)

Leistungsnachweis

Aktive Mitarbeit, Einführungsvortrag, Abschlusspräsentation, Dokumentation

419110023 Linguistic Geolocalization

B. Stein, M. Wiegmann, M. Wolska Veranst. SWS: 10
Projekt

engl. Beschreibung/ Kurzkommentar

The location of an information source is of major interest in forensics, disaster relief and social, economic and political sciences. However, unstructured sources like text or social media posts rarely provide precise positions. In this project we want to collect, review and reproduce strategies for geolocalization of people from text. We will apply these strategies to (i) reconstruct path of fictional characters, i.e. Game of Thrones character?s movements throughout the first book and (ii) locate where tweets have been sent from.

Bemerkung

Ort und Zeit werden zur Projektbörse bekannt gegeben.

Leistungsnachweis

Abschlusspräsentation und Ausarbeitung

419110024 Optimization Problems with Constraints

A. Jakoby Veranst. SWS: 10
Projekt
Mo, wöch., 19:00 - 20:30, Bauhausstraße 11 - Seminarraum 013, ab 13.05.2019

Bemerkung

Ort und Zeit werden zur Projektbörse bekannt gegeben.

Time and place will be announced at the project fair.

419110026 Realtime Stereo Matching

V. Rodehorst, M. Kaisheva Veranst. SWS: 10
Projekt

Beschreibung

Die Teilnehmer werden an ein aktuelles forschungs- oder industrierelevantes Thema herangeführt. Es ist nicht beabsichtigt einen festgelegten Bereich in voller Breite zu explorieren. Stattdessen werden die Teilnehmer mit der vollen Komplexität eines begrenzten Themas konfrontiert und die Eigeninitiative gefördert. Es ermöglicht einen Einblick in die Forschungs- und Entwicklungsprojekte des Fachgebiets.

engl. Beschreibung/ Kurzkommentar

Realtime pixel matching using GPGPU programming in Computer Vision

Bemerkung

Ort und Zeit werden zur Projektbörse bekannt gegeben.

Time and place will be announced at the project fair.

Voraussetzungen

Gute Programmierkenntnisse (z.B. C/C++, MATLAB, OpenCL)

Leistungsnachweis

Aktive Mitarbeit, Einführungsvortrag, Abschlusspräsentation, Dokumentation

419110028 UAS Flightpath Planning

V. Rodehorst, P. Debus Veranst. SWS: 10
Projekt

Beschreibung

Die Teilnehmer werden an ein aktuelles forschungs- oder industrierelevantes Thema herangeführt. Es ist nicht beabsichtigt einen festgelegten Bereich in voller Breite zu explorieren. Stattdessen werden die Teilnehmer mit der vollen Komplexität eines begrenzten Themas konfrontiert und die Eigeninitiative gefördert. Es ermöglicht einen Einblick in die Forschungs- und Entwicklungsprojekte des Fachgebiets.

engl. Beschreibung/ Kurzkommentar

Computing efficient full coverage flight paths for UAS in building survey

Bemerkung

Ort und Zeit werden zur Projektbörse bekannt gegeben.

Time and place will be announced at the project fair.

Voraussetzungen

Gute Programmierkenntnisse (z.B. C/C++, MATLAB, OpenCL)

Leistungsnachweis

Aktive Mitarbeit, Einführungsvortrag, Abschlusspräsentation, Dokumentation

419110029 Mining Arguments in Parliamentary Debates

B. Stein, Y. Ajjour, W. Chen, R. El Baff, M. Wolska Veranst. SWS: 10
Projekt

Beschreibung

The project aims at the simplification and extraction of arguments in parliamentary debates for the public. Politicians discuss societal issues in parliamentary debates to enact new laws. E-government is an ongoing effort to engage users in taking such decisions. For this goal, countries like UK, Canada, and Germany make parliamentary debates available to the public on the internet. Despite their importance to people, such debates and their issues are largely not studied and analyzed. In this project, we will take the first step to extract issues and arguments in these debates and to present them to the public in a simplified way. After extraction, we will index them in an argument search engine that allows users to find arguments and interact with them

Bemerkung

Ort und Zeit werden zur Projektbörse bekannt gegeben.

Voraussetzungen

Programming: Python or Java

Leistungsnachweis

Abschlusspräsentation und Ausarbeitung

419110033 Green Configurator II

N. Siegmund, M. Weber Veranst. SWS: 10

Projekt

Mo, Einzel, 11:00 - 12:30, Bauhausstraße 9a - Meeting-/Präsentationsbereich 301/302, 24.06.2019 - 24.06.2019
Di, Einzel, 08:45 - 11:15, Bauhausstraße 9a - Meeting-/Präsentationsbereich 301/302, 25.06.2019 - 25.06.2019

engl. Beschreibung/ Kurzkommentar

Reducing energy consumption of software and hardware systems becomes increasingly important. This project focuses on developing and implementing tools and technologies that help understanding and reducing energy consumption while guaranteeing the performance.

Students will work on a fine grained energy measurement system that is able to provide accurate measurements for each hardware component of the Computer. Furthermore, they will measure and analyze energy and performance properties of realistic software and hardware setups.

Finally, they will design and implement the 'Green Configurator', a tool that visualizes energy and performance models to the end user.

Bemerkung

Ort und Zeit werden zur Projektbörse bekannt gegeben.

419110040 Applications of deep learning algorithms for solutions boundary value problems in linear elasticity

K. Gürlebeck, D. Legatiuk

Projekt

Beschreibung

Modern problems of engineering require advanced and efficient computational methods. With the recent developments in the field of machine learning, the classical algorithms, such as finite element method and boundary element method, are actively substituted by machine learning-based algorithms. In this project, the so-called deep energy algorithms will be studied. The main objective of the project is to study the influence of different parameters in the configuration of neural networks on the quality of approximation. Specific interest will be devoted to the study of existing rigorous results related to approximation with deep learning algorithms and convolutional neural networks.

Voraussetzungen

For M.Sc. Digital Engineering: Successful completion of 18 ECTS within the subject area ”Fundamentals”; See course descriptions for further requirements, if any.

Basic knowledge of numerical mathematics, basic knowledge of partial differential equations, good programming skills.

451008 Methods of linearized tomography Regularization techniques and parametrization for methods of machine learning

T. Lahmer, S. Marwitz Veranst. SWS: 8
Projekt

451009 Optimisation and Sensitivity Analysis as Bases for the Control of Dynamic Systems

T. Lahmer Veranst. SWS: 8
Projekt

Beschreibung

Optimisation and Sensitivity analysis studies the sensitivity of the model by how much and/or what will be the proportion (or role) of the input parameters (reduced set of important variables) that cause significant influence on the output of the model. In short, analysing the contribution of input parameters on the output variability of the model. Generally (mathematically), it is used to determine the effect on optimal solutions of changes in parameter values of the objective function. They are computationally in-depth in the application of high dimensional functions. Optimisation algorithm can greatly improve the dynamic performance of the control system. A model is designed for its effective usefulness, so that its outcome will be efficient. Identifying the parameters, analysing the model and applying various optimisation algorithms and sensitivity algorithms on a model for increase of its efficiency is the prime motto of the project. These algorithms can be applied in various fields such as engineering, medical, economics etc., Structuring the project tasks into analytical (mathematical formulation), parameterization, applying optimisation and sensitivity algorithms by using the sofware OptiSlang (Software for Optimisation and Sensitivity Analysis) will be work flow of the project. The analysis will be applied either on vertically inverted oscillating pendulum or on the control of spring-mass systems.

907014 Monitoring and cyber-physical control strategies for smart structures

K. Smarsly, M. Mthunzi Veranst. SWS: 8
Projekt