Vorlesungsverzeichnis

M.Sc. Digital Engineering

Winter 2022/23

Stand 23.03.2023

M.Sc. Digital Engineering

Faculty Welcome for Master's Students Digital Engineering

Monday, 10th October 2022, 1 p.m., Schwanseestraße 143, room 2.16

Project fair

Monday, 10th October 2022, 5 p.m., Steubenstraße 6, Audimax

Fundamentals (F)

Advanced Numerical Mathematics

Algorithms and Datastructures

Applied Mathematics and Stochastics

2301012-1 Applied mathematics (Lecture)

B. Rüffer, N. Gorban Veranst. SWS: 2
Vorlesung
Mo, wöch., 15:15 - 16:45, Marienstraße 13 C - Hörsaal B, ab 10.10.2022

Beschreibung

Applied mathematics:

Fundamentals of linear algebra, eigenvalue problems, fixed point principles, solvers; Fourier series, convergence, Fourier transform, Laplace transform; Solution of initial value problems, boundary value problems and eigenvalue problems for ordinary differential equations; All topics are discussed from the mathematical point of view and their implementation will be studied.

Leistungsnachweis

1 written exam

"Applied mathematics and stochastics for risk assessment" / 180 min (100%) / **WiSe** + SuSe

2301012-2 Applied mathematics (Exercise)

B. Rüffer, N. Gorban Veranst. SWS: 1
Seminar
1-Gruppe Fr, gerade Wo, 07:30 - 09:00, Marienstraße 13 C - Hörsaal C, ab 21.10.2022
2-Gruppe Fr, unger. Wo, 07:30 - 09:00, Marienstraße 13 C - Hörsaal D, ab 21.10.2022

Beschreibung

Applied mathematics:

Fundamentals of linear algebra, eigenvalue problems, fixed point principles, solvers; Fourier series, convergence, Fourier transform, Laplace transform; Solution of initial value problems, boundary value problems and eigenvalue

problems for ordinary differential equations; All topics are discussed from the mathematical point of view and their implementation will be studied.

Leistungsnachweis

1 written exam

”Applied mathematics and stochastics for risk assessment” / 180 min (100%) / **WiSe** + SuSe

2301012-3 Stochastics for risk assessment (Lecture) / Mathematics for risk management (MBM)

T. Lahmer Veranst. SWS: 2

Vorlesung

Di, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal B, ab 11.10.2022

Beschreibung

Stochastics for risk assessment:

Introduction to probability theory with focus on situations characterized by low probabilities. Random events, discrete and continuous random variables and associated distributions. Descriptive statistics, parameter estimation. Risk Assessment by means of FORM and Monte Carlo Simulations. Introduction to reliability theory: Extreme value distributions; stochastic modeling with software tools e.g. MATLAB, Octave, Excel, R. Reliability Analysis of Systems. Catastrophic events + risk problems, Applications

Leistungsnachweis

1 written exam

”Applied mathematics and stochastics for risk assessment” / 180 min (100%) / **WiSe** + SuSe

2301012-4 Stochastics for risk assessment / Mathematics for risk management (MBM) (Exercise)

T. Lahmer, N. Butler, Z. Jaouadi Veranst. SWS: 1

Seminar

1-Gruppe Fr, unger. Wo, 07:30 - 09:00, Marienstraße 13 C - Hörsaal C, Exercise for NHRE (Group 1) and DE, ab 21.10.2022
1-Gruppe Do, wöch., 15:15 - 16:45, Marienstraße 7 B - Seminarraum 205, Tutorium for NHRE (Group 1) and DE, ab 24.11.2022
2-Gruppe Fr, gerade Wo, 07:30 - 09:00, Marienstraße 13 C - Hörsaal D, Exercise for NHRE (Group 2), ab 21.10.2022
2-Gruppe Do, wöch., 15:15 - 16:45, Marienstraße 7 B - Seminarraum 105, Tutorium for NHRE (Group 2) and DE, ab 24.11.2022

Beschreibung

Stochastics for risk assessment:

Introduction to probability theory with focus on situations characterized by low probabilities. Random events, discrete and continuous random variables and associated distributions. Descriptive statistics, parameter estimation. Risk Assessment by means of FORM and Monte Carlo Simulations. Introduction to reliability theory: Extreme value distributions; stochastic modeling with software tools e.g. MATLAB, Octave, Excel, R. Reliability Analysis of Systems. Catastrophic events + risk problems, Applications

Leistungsnachweis

1 written exam

”Applied mathematics and stochastics for risk assessment” / 180 min (100%) / **WiSe** + SuSe

301012-1 Applied mathematics (Exam)

B. Rüffer, N. Gorban
Prüfung
Mo, Einzel, 09:00 - 12:00, Marienstraße 13 C - Hörsaal B, Final exam, 20.02.2023 - 20.02.2023
Mo, Einzel, 09:00 - 12:00, Marienstraße 13 C - Hörsaal C, Final exam, 20.02.2023 - 20.02.2023

Leistungsnachweis

1 written exam

”Applied mathematics and stochastics for risk assessment” / 180 min (100%) / **WiSe** + SuSe

Introduction to Mechanics

420160001 Introduction to Mechanics

T. Rabczuk, S. Torres Achicanoy Veranst. SWS: 4
Vorlesung
Do, wöch., 13:30 - 15:00, Coudraystraße 9 A - Hörsaal 6, Lecture, ab 13.10.2022
Di, wöch., 09:15 - 10:45, Marienstraße 7 B - Seminarraum 206, Lab class, ab 18.10.2022
Do, Einzel, 09:00 - 11:30, Coudraystraße 11 C - Seminarraum/Hörsaal 001, written exam, 09.02.2023 - 09.02.2023

Beschreibung

Einführung in die Mechanik

1. Einführung in die Statik:
1.1 Kräfte und Momente
1.2 Auflagerkräfte statisch bestimmter Systeme
1.3 Schnittkräfte in Fachwerken und Balken
2. Einführung in die Elastostatik
2.1 Spannungszustand
2.2 Verzerrungszustand
2.3 Berechnung von Spannungen und Verschiebungen unter axialer und Biegebeanspruchung
2.4 Prinzip der virtuellen Arbeit

engl. Beschreibung/ Kurzkommentar

1. Introduction to statics:
1.1 Forces and moments
1.2 Reaction forces of statically determinate systems
1.3 Internal actions in pin-jointed frames and beams
2. Introduction to elastostatics
2.1 Stresses
2.2 Strains
2.3 Stresses and displacements under axial and bending loading.
2.4 Principle of Virtual Work

Leistungsnachweis

Schriftliche Klausur, 150 Minuten

Nonlinear Continuum Mechanics

Object-oriented Modeling and Programming in Engineering

303005 Object-oriented Modeling and Programming in Engineering

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

Vorlesung

Do, wöch., 15:15 - 16:45, Coudraystraße 9 A - Hörsaal 6, Lecture, ab 13.10.2022
Fr, wöch., 11:00 - 12:30, Marienstraße 7 B - Projektraum 301, Lab class, ab 14.10.2022
Fr, wöch., 11:00 - 12:30, Marienstraße 7 B - Projektraum 302, Lab class, ab 14.10.2022
Do, Einzel, 10:00 - 12:00, Coudraystraße 9 A - Hörsaal 6, written exam, 23.02.2023 - 23.02.2023

Beschreibung

Objektorientierte Modellierung und Programmierung für Ingenieure

In diesem Modul wird fundamentales Wissen vermittelt, um objektorientierte Softwarelösungen für Ingenieuraufgaben zu konzipieren und zu implementieren. Dies beinhaltet Fähigkeiten zur Analyse von Ingenieurproblemen, um entsprechende objektorientierte Modelle zu erzeugen und geeignete Algorithmen auszuwählen. Die verwendete Programmiersprache ist Java. Da die Basiskonzepte allgemeingültig beschrieben werden, werden die Studierenden in die Lage versetzt, auch andere modernen Programmiersprachen zu einzusetzen.

Inhalte:

- Kontrollstrukturen (alternatives, loops, sequences)
- Grundlegende Datenstrukturen und Algorithmen
- Prinzipien der objektorientierten Softwareentwicklung (Datenkapselung, Vererbung, Polymorphie)
- Unified Modeling Language als Werkzeug für Softwareentwurf und –dokumentation
- Entwicklung grafischer Nutzerschnittstellen mithilfe des Model-View-Controller-Entwurfsmusters

engl. Beschreibung/ Kurzkommentar

Object-oriented Modeling and Programming in Engineering

This module covers the basic knowledge needed to develop and implement object-oriented software solutions for engineering problems. This includes the ability to analyse an engineering problem, so that corresponding object-oriented models can be created and suitable algorithms can be selected. The programming language used in this module is Java. However, the since fundamental concepts are described in general, students will be able to program in other modern programming languages.

Content:

- Essential programming constructs (alternatives, loops, sequences)
- Fundamental data structures and algorithms
- Principles of object oriented software development (encapsulation, inheritance and polymorphism)
- The Unified Modeling Language as a tool for software design and documentation

Development of graphical user interfaces using the Model-View-Controller pattern

Leistungsnachweis

schriftliche Klausur

Software Engineering

Statistics

Structural Dynamics

2401014 Structural Dynamics (Lecture)

V. Zabel Veranst. SWS: 2

Vorlesung

Di, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D, bis 29.11.2022
Mi, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D, bis 30.11.2022

Beschreibung

Structural Dynamics: (50% of semester course time)

- SDOF systems:

- free vibrations, harmonic, impulse and general excitation for undamped and damped systems,
- Impulse response function, frequency response function, base excitation,
- Time step analysis: Duhamel integral, central difference and Newmark methods;

- MDOF systems: modal analysis, modal superposition, modal damping, Rayleigh damping, Frequency response functions

- Continuous systems

Voraussetzungen

Bachelor Civil Engineering

Leistungsnachweis

1 written exam: „Fundamentals of structural dynamics”/ 90 min (50%)

2401014 Structural Dynamics (Exercise)

V. Zabel, M. Ansari Veranst. SWS: 1

Seminar

1-Gruppe Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, Tutorium - Group A, bis 29.11.2022
1-Gruppe Do, wöch., 07:30 - 09:00, Marienstraße 13 C - Hörsaal D, Group 1 (Group A + Group B), bis 01.12.2022
2-Gruppe Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302, Tutorium - Group B, bis 29.11.2022
2-Gruppe Do, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal C, Group 2 (Group C + Group D), bis 01.12.2022
3-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, Tutorium - Group C, bis 30.11.2022
4-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302, Tutorium - Group D, bis 30.11.2022

Bemerkung

- Complementary to the lectures

401014 Structural Dynamics (Exam)

V. Zabel

Prüfung

Mi, Einzel, 09:00 - 10:30, Marienstraße 7 B - Seminarraum 205, Final exam, 15.02.2023 - 15.02.2023
Mi, Einzel, 09:00 - 10:30, Marienstraße 7 B - Seminarraum 206, Final exam, 15.02.2023 - 15.02.2023
Mi, Einzel, 09:00 - 10:30, Marienstraße 7 B - Seminarraum 104, Final exam, 15.02.2023 - 15.02.2023
Mi, Einzel, 09:00 - 10:30, Marienstraße 7 B - Seminarraum 105, Final exam, 15.02.2023 - 15.02.2023
Mi, Einzel, 09:00 - 10:30, Marienstraße 7 B - Seminarraum 106, Final exam, 15.02.2023 - 15.02.2023

Voraussetzungen

Bachelor Civil Engineering

Leistungsnachweis

1 written exam: „Fundamentals of structural dynamics”/ 90 min (50%)

2401011 Applied Structural Dynamics (Lecture)

V. Zabel Veranst. SWS: 2
Vorlesung
Di, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D, ab 06.12.2022
Mi, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D, ab 07.12.2022

Beschreibung

- Machinery induced vibrations
- Earthquake excitation
- Wind induced vibrations
- Human induced vibrations

2401011 Applied Structural Dynamics (Exercise)

V. Zabel, F. Tartaglione Garcia Veranst. SWS: 1
Seminar
1-Gruppe Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, Tutorium Group A, ab 06.12.2022
1-Gruppe Do, wöch., 07:30 - 09:00, Marienstraße 13 C - Hörsaal D, Group 1 (Group A + Group B), ab 08.12.2022
2-Gruppe Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302, Tutorium Group B, ab 06.12.2022
2-Gruppe Do, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal C, Group 2 (Group C + Group D), ab 08.12.2022
3-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, Tutorium Group C, ab 07.12.2022
4-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 302, Tutorium Group D, ab 07.12.2022

Bemerkung

- Complementary to the lectures

401011 Applied Structural Dynamics (Exam)

V. Zabel
Prüfung
Mi, Einzel, 11:00 - 12:30, Marienstraße 7 B - Seminarraum 104, Final exam, 15.02.2023 - 15.02.2023
Mi, Einzel, 11:00 - 12:30, Marienstraße 7 B - Seminarraum 105, Final exam, 15.02.2023 - 15.02.2023
Mi, Einzel, 11:00 - 12:30, Marienstraße 7 B - Seminarraum 106, Final exam, 15.02.2023 - 15.02.2023

Structural Engineering Models

Modelling (M)

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

Advanced Building Information Modeling

Advanced Modelling - Calculation

Collaborative Data Management

Computer models for physical processes - from observation to simulation

Introduction to Optimization

Macroscopic Transport Modelling

Modelling in the development process

Optimization in Applications

Raumbezogene Informationssysteme/ Spatial information systems (GIS)

904003/ 439100 Raumbezogene Informationssysteme/ Spatial information systems (GIS)

T. Gebhardt, V. Rodehorst Veranst. SWS: 4
Integrierte Vorlesung
Fr, wöch., 13:30 - 15:00, Marienstraße 13 C - Hörsaal A, Übungen, ab 28.10.2022
Mi, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal A, Vorlesungen

Beschreibung

Die Vorlesung vermittelt vertiefte Grundlagen raumbezogener Informationssysteme, wie z.B. die Aufnahme, Organisation, Analyse und Präsentation raumbezogener Daten. Die Themen umfassen geographische Daten und frei verfügbare Ressourcen, Referenzsysteme und Kartennetzentwürfe, Geo-Datenbanken und effiziente Datenstrukturen, geometrische und topologische Datenanalyse, kartographische Generalisierung und Visualisierung sowie GIS im Planungskontext.

Bemerkung

Für die Selbsteinschreibung in den zugehörigen MOODLE-Lernraum (Hyperlink siehe oben!) lautet das Passwort: **spatial22**

Leistungsnachweis

Erfolgreiche Bearbeitung der Übungen und des Projektes mit abschließender Klausur

Simulation and Validation (SaV)

Design and Interpretation of Experiments / Signal Processing

205014 Design and interpretation of experiments (Exam)

M. Kraus, T. Lahmer, F. Alkam, Z. Jaouadi, S. Mämpel
Prüfung
Do, Einzel, 13:00 - 15:00, Marienstraße 13 C - Hörsaal C, Final exam, 02.03.2023 - 02.03.2023

Leistungsnachweis

1 written exam / 120 min / **WiSe** + SuSe including

”Experiments in Structural Engineering” and

”Signal Processing, Design of Experiments and System Identification”

2205014 Design and interpretation of experiments: Signal Processing, Design of Experiments and System Identification

T. Lahmer, F. Alkam, Z. Jaouadi Veranst. SWS: 2

Integrierte Vorlesung

1-Gruppe Mi, unger. Wo, 09:15 - 10:45, Marienstraße 7 B - Projektraum 301, Exercise
2-Gruppe Mi, gerade Wo, 09:15 - 10:45, Marienstraße 7 B - Projektraum 301, Exercise
3-Gruppe Mi, unger. Wo, 11:00 - 12:30, Marienstraße 7 B - Projektraum 301, Exercise
4-Gruppe Mi, gerade Wo, 11:00 - 12:30, Marienstraße 7 B - Projektraum 301, Exercise
Di, wöch., 15:15 - 16:45, Marienstraße 13 C - Hörsaal D, Signal Processing, Design of Experiments and System Identification

Beschreibung

Students will be familiar with following: Design and setup as well as evaluation and interpretation of experimental testing in structural engineering. Provision of techniques linking experimental and mathematical / numerical modelling. Parallel assessment of steps being part of any verification and validation procedure. Discussion of common techniques of optimal experimental designs

Bemerkung

The course gives an overview on experiments and their evaluation regarding different tasks and scopes of structural engineering. Next to different testing techniques applied for diverse aims, the equipment and measuring devices employed for testing are treated as well.

Besides the experiment itself, it is an important question, how we can use the experimental data for the calibration and validation of models in engineering. In this course, we give insights to techniques called parameter and system identification.

As often signals are not useable directly, transforms are necessary, like filtering, Fourier Transform, Wavelet Transform and, in particular for signals with noise, averaging techniques. Having models at hand, the experiment can be designed virtually by means of nonlinear optimization.

Leistungsnachweis

1 written exam / 120 min / **WiSe** + SuSe including

”Experiments in Structural Engineering” and

”Signal Processing, Design of Experiments and System Identification”

Experimental Structural Dynamics

Extended Finite Elements and Mesh Free Methods

Finite Element Methods (FEM)

2401015 Finite element methods (Exercise)

T. Rabczuk, M. Bianco, J. Lopez Zermeño Veranst. SWS: 1

Seminar

1-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Seminarraum 205, Tutorium - Group A
1-Gruppe Do, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D, Group 1 (Group A + Group B)
2-Gruppe Mi, wöch., 07:30 - 09:00, Marienstraße 7 B - Seminarraum 206, Tutorium - Group B

2-Gruppe Do, wöch., 07:30 - 09:00, Marienstraße 13 C - Hörsaal C, Group 2 (Group C + Group D)
3-Gruppe Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Seminarraum 205, Tutorium - Group C
4-Gruppe Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Seminarraum 206, Tutorium - Group D

2401015 Finite element methods (Lecture)

T. Rabczuk
Vorlesung
Mi, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal B

Beschreibung

Finite element methods: (50% of semester course time)

strong and weak form of equilibrium equations in structural mechanics, Ritz and Galerkin principles, shape functions for 1D, 2D, 3D elements, stiffness matrix, numerical integration, Characteristics of stiffness matrices, solution methods for linear equation systems, post-processing and error estimates, defects of displacements based formulation, mixed finite element approaches,

Voraussetzungen

Bachelor Civil Engineering

Leistungsnachweis

1 written exam: „Fundamentals of finite element methods”/ 90 min (50%)

401012 Re-Examination: Applied Finite element methods

T. Rabczuk
Prüfung
Fr, Einzel, 11:00 - 12:30, Marienstraße 7 B - Seminarraum 205, Re-examination, 24.02.2023 - 24.02.2023

401015 Finite element methods (Exam)

T. Rabczuk
Prüfung
Fr, Einzel, 09:00 - 10:30, Marienstraße 13 C - Hörsaal B, Final exam, 24.02.2023 - 24.02.2023
Fr, Einzel, 09:00 - 10:30, Marienstraße 13 C - Hörsaal C, Final exam, 24.02.2023 - 24.02.2023

Voraussetzungen

Bachelor Civil Engineering

Leistungsnachweis

1 written exam: „Fundamentals of finite element methods”/ 90 min (50%)

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

Linear FEM

Modelling of Steel Structures and Numerical Simulation

Nonlinear FEM

Process modelling and simulation in logistics and construction

Simulation Methods in Engineering

Stochastic Simulation Techniques and Structural Reliability

Structural Health Monitoring

Visualization and Data Science (VaDS)

Image Analysis and Object Recognition

Introduction to Machine Learning

4439110 Introduction to Machine Learning

B. Stein, J. Bevendorff Veranst. SWS: 4

Vorlesung

Do, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal A, Lecture , ab 20.10.2022
Do, wöch., 11:00 - 13:00, Marienstraße 13 C - Hörsaal A, Lab class, ab 27.10.2022
Di, Einzel, 08:00 - 10:00, Marienstraße 13 C - Hörsaal A, written exam, 21.02.2023 - 21.02.2023
Di, Einzel, 08:00 - 10:00, Marienstraße 13 C - Hörsaal B, written exam, 21.02.2023 - 21.02.2023

Beschreibung

Students will learn to understand machine learning as an informed search in a space of possible hypotheses. The mathematical means to formulate a particular hypothesis class determines the learning paradigm, the discriminative power of a hypothesis, and the complexity of the learning process. Aside from foundations of supervised learning also an introduction to unsupervised learning is given. The lecture covers linear models, neural networks, decision trees and Bayesian learning. It introduces concepts, algorithms, and theoretical backgrounds. The accompanying lab treats both theoretical and applied tasks to deepen the understanding of the field. Team work (2-3 students) is appreciated.

Leistungsnachweis

Klausur

Mobile Information Systems

Photogrammetric Computer Vision

4256303 Photogrammetric Computer Vision

V. Rodehorst, C. Benz, M. Kaisheva Veranst. SWS: 4

Vorlesung

Mi, Einzel, 11:00 - 12:30, Marienstraße 13 C - Hörsaal A, erste Vorlesung, 12.10.2022 - 12.10.2022
Mo, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D, Lecture, ab 17.10.2022
Mo, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal D, Übung, ab 17.10.2022
Do, Einzel, 14:30 - 17:00, Marienstraße 13 C - Hörsaal A, written exam, 14:30-16:30, 16.02.2023 - 16.02.2023
Do, Einzel, 14:30 - 17:00, Marienstraße 13 C - Hörsaal B, written exam,14:30-16:30, 16.02.2023 - 16.02.2023

Beschreibung

Die Vorlesung gibt eine Einführung in die Grundlagen der Sensor-Orientierung und 3D-Rekonstruktion. Das Ziel ist ein Verständnis der Prinzipien, Methoden und Anwendungen der bildbasierten Vermessung. Behandelt werden unter anderem die algebraische projektive Geometrie, Abbildungsgeometrie, Kalibrierung, Orientierungsverfahren, Stereo-Bildzuordnung und weitere Verfahren zur Oberflächenrekonstruktion.

Bemerkung

Voraussetzungen

Einführung in die Informatik, Grundlagen Programmiersprachen

Leistungsnachweis

Erfolgreiche Bearbeitung der Übungen und des Projektes mit abschließender Klausur

Real-time Rendering

Search Algorithms

Search-Based Software Engineering

Software Product Line Engineering

Visualization

Elective Modules

422250037 Formal Methods for Software Engineering

J. Ringert, .. Soaibuzzaman Veranst. SWS: 4

Vorlesung

Fr, wöch., 11:00 - 12:30, ab 14.10.2022
Fr, wöch., 11:00 - 12:30, Schwanseestraße 143 - Lintpool 2.17, ab 14.10.2022
Mo, wöch., 15:15 - 16:45, Schwanseestraße 143 - Seminarraum 2.16, Vorlesung, ab 17.10.2022

Beschreibung

Formal methods are rigorous techniques for the mathematical analysis of software and hardware systems. This course introduces aspects of formal methods with applications to software engineering problems.

The topics covered in the course include:

- Introduction to Formal Methods
- Formal methods tools, e.g.,
  - SMT solvers on the example of Z3
  - Relational models and the Alloy Analyzer

  - Model Checking using SMV
- Applications of formal methods in practice

After completion students will be able to

- Model problems in different formalisms
- Analyze software models using formal method tools
- Evaluate formal methods for software engineering problems

Voraussetzungen

Digital Engineering students must have passed the Software Engineering course

Leistungsnachweis

Participation in exercises

Marked homework project including a presentation

4526501 Academic English Part One

G. Atkinson Veranst. SWS: 2

Kurs

Mi, wöch., 15:30 - 18:30, Online (Moodle) , ab 02.11.2022

Beschreibung

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.

This writing course will basically run as an online correspondence course using the university's Moodle platform. In addition, occasional consultations for groups of up to 10 students are offered in order to discuss written work. These will take place on pre-arranged Tuesdays at 17.00 and may take place either face-to-face
or using Big Blue Button.

Bemerkung

You are advised to take Part One first, although it is possible to take both parts in reverse order or concurrently (i.e. in the same semester). You may only do the latter on the authority of the course leader (Atkinson).

Voraussetzungen

Registration (compulsory)

All students must register. First time particpants are required to present a B2 English Level certificate along with their email registration. All students, **including those who have already taken Academic English Part Two and those who need to repeat Academic English Part One,** must register by contacting Howard Atkinson at: howard.atkinson@uni-weimar.de**.**

You will be informed by email when registration opens and when the deadline is. Please do not attempt to register until you have received this Email. Registration Emails should be given the subject heading: AE I Registration.

Leistungsnachweis

continuous assessment

4526502 Academic English Part Two

G. Atkinson Veranst. SWS: 2
Kurs
Mi, wöch., 15:30 - 18:30, Online (Moodle) , ab 02.11.2022

Beschreibung

Part Two of the Academic English course concentrates on improving and refining aspects of academic writing style. It includes sections on clause and sentence structure, punctuation rules and how to incorporate quotations, statistics and footnotes into academic texts.

This writing course will basically run as an online correspondence course using the university's Moodle platform. In addition, occasional consultations for groups of up to 10 students are offered in order to discuss written work. These will take place on pre-arranged Wednesdays at 17.00 and may take place either face-toface or using Big Blue Button.

Bemerkung

You are advised to take Part One first, although it is possible to take both parts in reverse order or concurrently (i.e. in the same semester). You may only do the latter on the authority of the course leader (Atkinson).

Voraussetzungen

Registration (compulsory)

All students must register. First time particpants are required to present a B2 English Level certificate along with their email registration. All students, **including those who have already taken Academic English Part One and those who need to repeat Academic English Part Two,** must register by contacting Howard Atkinson at: howard.atkinson@uni-weimar.de**.**

You will be informed by email when registration opens and when the deadline is. Please do not attempt to register until you have received this Email. Registration Emails should be given the subject heading: AE II Registration.

Leistungsnachweis

continuous assessment

Project

422210006 Automatic Image Captioning

B. Stein, T. Gollub, J. Kiesel Veranst. SWS: 10
Projekt

Beschreibung

In the project, we will take a look at the state of the art in automatic image caption generation with deep neural fitting and coherent sentences. Generating image captions is a prime multimodal learning task, which connects computer vision and natural language processing. Almost all image captioning models adopt the encoder-decoder framework with a visual attention mechanism. The encoder encodes input images into fixed-length vector features, and the decoder decodes image features into descriptions word by word. Based on a survey of image caption approaches

with available source code, our goal is to deploy the most promising image captioning approaches onto our GPU cluster and evaluate their performance using various benchmark datasets. The best performing approach is intended to be used in an upcoming digital humanities research project on the analysis of image feed curation algorithms in social networks.

Bemerkung

Time and place will be announced at the project fair.

Leistungsnachweis

Abschlusspräsentation und Ausarbeitung

422210010 Projekt MLOM: Machine learning models on Arduino

B. Burse, J. Ringert Veranst. SWS: 10
Projekt

Beschreibung

As part of the Software Engineering for Trusted Autonomous Systems we will develop a platform for an autonomous vehicle based on the Robot Operation System (ROS).

Bemerkung

Time and place will be announced at the project fair.

422210011 Projekt SETAV II-Software Engineering for Trusted Autonomous Systems (PartII)

J. Ringert, .. Soaibuzzaman Veranst. SWS: 10
Projekt

Beschreibung

As part of the Software Engineering for Trusted Autonomous Systems we will develop a platform for an autonomous vehicle based on the Robot Operation System (ROS).

Bemerkung

Time and place will be announced at the project fair.

422210012 Rating the Quality of Comparative Review Websites

B. Stein, J. Bevendorff, M. Wiegmann Veranst. SWS: 10
Projekt

Beschreibung

Let's be honest: Most (comparative) product review websites are utter rubbish (low effort, low quality, deceptive, fake, you name it) and commercial search engines fail to deal with it.

To fix this mess, we want to build a tool that rates the quality of review websites and helps users make better buying decisions. As a prerequisite for such a tool, we first need a lot of website quality annotations. We have already developed a questionnaire to assess a website's quality and collected screenshots of more than 200,000 potential review websites. We now want to develop a crowdsourcing task using Amazon Mechanical Turk (MTurk) to let paid

workers create the annotations for us. Creating this task involves (1) UX design to guide the untrained workers, (2) optimizing the questionaire (data-driven) to streamline the annotations, and (3) developing evaluation methods to weed out faulty annotations.

Bemerkung

Time and place will be announced at the project fair.

Leistungsnachweis

Abschlusspräsentation und Ausarbeitung

422210014 So Tell Me Why - Investigating Personalized Argument Search

B. Stein, J. Kiesel, N.N. Veranst. SWS: 10
Projekt

Beschreibung

Many questions of public interest do not have a single answer but come with a set of choices, each of which with its pros and cons. Search systems can help explore the underlying argument space. So far, research on such search systems has focused on an "objective" exploration. But people are different and thus also interested in different arguments. In this project you will investigate and learn to apply methods of personalization, recommendation, and of course argument search. We will extend https://args.me, the world-first argument search engine. Students with either a programming or a design background are welcome.

Bemerkung

Time and place will be announced at the project fair.

weitere Lehrpersonen:

Nailia Mirzakhmedova,

Maximilian Heinrich

Leistungsnachweis

Abschlusspräsentation und Ausarbeitung

422210016 Text2Graph - Extracting Knowledge Graph Relations from Short Texts

B. Stein, M. Gohsen, J. Kiesel, M. Wiegmann Veranst. SWS: 10
Projekt

Beschreibung

Modern automated text generators (like GPT-3) produce natural language sentences, but often these sentences make no sense or are just plain wrong, as these generators are still lacking knowledge about the world. The most promising model of world knowledge today to cope with this problem are knowledge graphs, with entities as nodes and named relations (is-a, has-occupation, ...) between them.

These knowledge graphs are often built by machines and have gaping holes in their actual knowlede. In this project we want to extract the missing knowledge from an abundant yet untapped source: internet short texts like microblogs or forum posts. Participants will investigate existing approaches and learn about both natural language processing and information representation.

Bemerkung

Time and place will be announced at the project fair.

Leistungsnachweis

Abschlusspräsentation und Ausarbeitung

422210022 BIM Integration for Automated Identification of Relevant Geo-Contexts via Point Cloud Segmentation

M. Alabassy, C. Koch
Projekt

Beschreibung

The project is mainly focused on processing and segmentation of synthetic point clouds generated from digital terrain and surface models via a neural Network into relevant classes relating to the early phase planning of railways.

Bemerkung

Time and place will be announced at the project fair.

422210023 Visualization of Heterogeneous Building Data

M. Artus Veranst. SWS: 10
Projekt

Beschreibung

The project aims to visualize heterogeneous building related data. This data is from different sources as CAD programs, non-destructive testing or monitoring.

422210025 Gigapixels of Perfectly Calibrated Vision

V. Rodehorst, A. Frolov
Projekt
Mi, gerade Wo, 15:15 - 16:45, Schwanseestraße 143 - Seminarraum 3.09, ab 02.11.2022
Di, Einzel, 15:15 - 17:00, Schwanseestraße 143 - Seminarraum 3.09, 15.11.2022 - 15.11.2022
Fr, Einzel, 13:30 - 15:00, Schwanseestraße 143 - Seminarraum 3.09, 16.12.2022 - 16.12.2022
Fr, Einzel, 13:30 - 15:00, Schwanseestraße 143 - Seminarraum 3.09, 20.01.2023 - 20.01.2023

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.

Bemerkung

Ort und Zeit werden zur Projektbörse bekanntgegeben.

Voraussetzungen

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

Leistungsnachweis

Aktive Mitarbeit, Einführungsvortrag, Abschlusspräsentation, Dokumentation

422210027 Hot Topics in Computer Vision: Neural Radiance Fields (NeRF) for 3reCapSL

V. Rodehorst, C. Benz, P. Debus, J. Eick
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.

Bemerkung

Ort und Zeit werden zur Projektbörse bekanntgegeben.

Voraussetzungen

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

Leistungsnachweis

Aktive Mitarbeit, Einführungsvortrag, Abschlusspräsentation, Dokumentation

422210028 Learning Robust Object Detection with Soft-Labels from Multiple Annotators

V. Rodehorst, D. Tschirschwitz
Projekt
Fr, wöch., 09:00 - 11:00, 25.11.2022 - 24.02.2023
Fr, Einzel, 15:30 - 17:30, Schwanseestraße 143 - Seminarraum 3.09, 09.12.2022 - 09.12.2022
Fr, Einzel, 14:00 - 17:00, Schwanseestraße 143 - Seminarraum 3.09, 10.02.2023 - 10.02.2023

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.

Bemerkung

Ort und Zeit werden zur Projektbörse bekanntgegeben.

Voraussetzungen

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

Leistungsnachweis

Aktive Mitarbeit, Einführungsvortrag, Abschlusspräsentation, Dokumentation