

# **Vorlesungsverzeichnis**

M.Sc. Computer Science and Media

SoSe 2024

Stand 23.04.2024

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## M.Sc. Computer Science and Media

### Project fair

Thursday, April 4, 2024, 5 p.m., Steubenstraße 6, Audimax

## Information Systems

### Distributed Secure IS

#### 419140050 Introduction to Modern Cryptography

**S. Lucks, N. Lang, J. Leuther**

Veranst. SWS: 3

Vorlesung

Mo, wöch., 13:30 - 15:00, Schwanseestraße 143 - Seminarraum 2.16, Lecture, ab 15.04.2024

Di, wöch., 17:00 - 18:30, Karl-Haußknecht-Straße 7 - Hörsaal (IT-AP), Übung/Tutorium, ab 16.04.2024

#### Beschreibung

Früher galt die Kryptographie als Werkzeug für Militärs, Geheimdienste und Diplomaten. Aus dieser Zeit stammt auch noch die berühmte Enigma-Chiffriermaschine.

Heute entwickelt sich die Kryptographie buchstäblich zu einer Schlüsseltechnologie für sichere Kommunikation und Mediennutzung. Von der Öffentlichkeit kaum bemerkt hat die Kryptographie schon längst Einzug gehalten in alltäglich genutzte Geräte wie Geldautomaten und Mobiltelefone.

Der Entwurf kryptographischer Komponenten ist schwierig, und in der Praxis trifft man oft auf erhebliche Entwurfsfehler.

(Dies kommentiert der IT-Sicherheitsexperte Bruce Schneier mit drastischen Worten: "Milliarden von Dollar werden für Computersicherheit ausgegeben, und das Meiste davon wird für unsichere Produkte verschwendet.")

Nicht nur der Entwurf kryptographischer Komponenten ist schwierig, auch der Einsatz von "an sich guten" Komponenten für sichere IT-systeme ist fehlerträchtig und erfordert ein genaues Verständnis der jeweiligen Bedingungen, unter denen eine kryptographische Komponente als "sicher" gelten kann.

Die Vorlesung gibt einen Einblick in Denkweise und Methodik der Mediensicherheit und der modernen Kryptographie und die Anwendung der Kryptographie, um Sicherheitsprobleme zu lösen.

#### engl. Beschreibung/ Kurzkomentar

#### Bemerkung

**Die Studierenden dürfen bisher keine Einführung in Kryptographie besucht haben. Zum Nachweis sind bei der Anmeldung zur Prüfung die "Transcript of Records" aus früheren Studien vorzulegen.**

**Für Studierende, die in ihrem früheren Bachelor-Studium keine Einführung in die Kryptographie besucht haben, ist die Veranstaltung ihrerseits Zulassungsvoraussetzung für fortgeschrittene Kryptographie-Vorlesungen.**

#### Voraussetzungen

Regelmäßige Bearbeitung der Übungsaufgaben und Teilnahme an den Übungen, Klausur.

#### Leistungsnachweis

M.Sc.: Mündliche Prüfung  
Beleg als Voraussetzung zur Klausurzulassung

### 420160003 Quantum Algorithms and Cryptanalysis

**S. Lucks, N. Lang, J. Leuther**

Veranst. SWS: 3

Vorlesung

Di, wöch., 09:15 - 10:45, Schwanseestraße 143 - Seminarraum 3.09, Lecture, ab 09.04.2024

Fr, wöch., 11:00 - 12:30, Lab class, ab 12.04.2024

#### Beschreibung

For many people, the term "quantum" resembles some complex term often referenced in science-fiction. In the world of cryptography, people tend to draw apocalyptic scenarios about how quantum computers will destroy all of our known cryptographic algorithms. But is that really the case? Let us together explore the world of quantum algorithms and cryptanalysis by learning how the quantum model of computation works, what its limitations are, and what conclusions we can draw from it for the field of cryptography.

#### Leistungsnachweis

Regelmäßige Bearbeitung der Übungsaufgaben und Teilnahme an den Übungen, Klausur

### Intelligent IS

### 420160000 Introduction to Natural Language Processing

**B. Stein, M. Wolska, N. Kolyada, N. Mirzakhmedova, M. Wiegmann**

Veranst. SWS: 3

Vorlesung

Do, wöch., 15:15 - 16:45, Schwanseestraße 143 - Seminarraum 2.16, Lab class, ab 11.04.2024

Do, Einzel, 15:00 - 17:00, written exam, 25.07.2024 - 25.07.2024

Do, wöch., 17:00 - 18:30, Schwanseestraße 143 - Seminarraum 2.16, Lecture

#### Beschreibung

This course gives an overview of basic techniques of working with language data. We will introduce basic linguistic notions, issues involved in building and working with language corpora, current standard techniques for preparing text for analysis, and methods of computational processing of a subset of language phenomena. By the end of the course students will

- (1) have an understanding of key word-level, syntactic, semantic, and discourse phenomena,
- (2) be aware of issues involved in building text corpora,
- (3) be familiar with typical language processing tasks addressed in the NLP community and methods of addressing them, and
- (4) will be able to perform tasks that are part of a standard NLP pipeline.

#### Leistungsnachweis

Klausur

### 423150021 Deep Learning for Computer Vision

**V. Rodehorst, C. Benz, J. Eick, A. Frolov, D. Tschirschwitz**    Verant. SWS:    4

Integrierte Vorlesung

Fr, wöch., 15:15 - 16:45, Schwanseestraße 143 - Seminarraum 2.16, ab 05.04.2024

Fr, wöch., 17:00 - 18:30, Schwanseestraße 143 - Seminarraum 2.16, ab 05.04.2024

Mo, Einzel, 11:00 - 13:00, schriftl. Prüfung / written exam, 29.07.2024 - 29.07.2024

### Beschreibung

In diesem Fortgeschrittenenkurs werden die Prinzipien, Techniken und Anwendungen des Deep Learning in der Computer Vision behandelt. Die Teilnehmer lernen, wie man neuronale Netze für die Bildklassifizierung, Objekterkennung, semantische Segmentierung und andere Computer-Vision- Aufgaben entwickelt, trainiert und validiert. Es werden auch Techniken zur Verbesserung der Leistung von Deep-Learning-Modellen und Veranschaulichungen studiert, um Anhaltspunkte für die weitere Modellentwicklung zu erhalten. Am Ende des Kurses werden die Studierenden in der Lage sein, Deep-Learning-Techniken anzuwenden, um reale Probleme in verschiedenen Bereichen zu lösen.

### Voraussetzungen

Successful completion of the course "Introduction to Machine Learning and Data Mining" or "Image Analysis and Object Recognition"

### Leistungsnachweis

Erfolgreiche Teilnahme an den Laborübungen und dem Projekt mit abschließender Klausur.

Gewichtung: 50% Projekt und 50% Klausur

## 4336010    Image Analysis and Object Recognition

**V. Rodehorst, M. Kaisheva**

Verant. SWS:    4

Vorlesung

Di, wöch., 15:15 - 16:45, Coudraystraße 9 A - Hörsaal 6, Lecture, ab 09.04.2024

Do, wöch., 11:00 - 12:30, Coudraystraße 9 A - Hörsaal 6, Lab class, ab 11.04.2024

### 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/ Kurzkomentar

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.

### Leistungsnachweis

Erfolgreiche Bearbeitung der Übungen sowie des Miniprojekts und Klausur

## Interactive IS

### 418260001 Physiological Computing

**J. Ehlers**

Veranst. SWS: 3

Vorlesung

Di, wöch., 13:30 - 15:00, Marienstraße 13 C - Hörsaal D, Lecture (in person)

Di, wöch., Exercise (online until further notice)

#### Beschreibung

Physiological computing applies physiological data (like brain waves, skin conductance changes, pupil dynamics or heart rate variability) to generate user-state representations and enable computer systems to dynamically adapt to changes in cognitive and/or affective processing. By connecting the brain/body to a machine, the boundaries of the nervous system are extended which enables us to communicate with machines directly via processes that underlie our thoughts and emotions.

The course will provide basic knowledge on the human nervous system and introduce to the concepts, theories and methods of physiological computing. We will discuss selected examples from the current research by putting special emphasis on eye-tracking and pupillometry but also on recent developments in the field of brain-computer interfaces. Given the opportunity to work in the lab, students will form small groups and learn how to collect and analyse data on gaze behaviour, pupil size changes and skin conductance.

#### Leistungsnachweis

Empirische Übungen und schriftliche Prüfung

### 4445203 Randomized Algorithms

**A. Jakoby, R. Adejoh**

Veranst. SWS: 4

Vorlesung

Di, wöch., 13:30 - 15:00, Lecture, ab 09.04.2024

Mi, wöch., 09:15 - 10:45, Karl-Haußknecht-Straße 7 - Seminarraum (IT-AP) 001, lab class, ab 10.04.2024

#### Beschreibung

Randomisierte Algorithmen

Für viele Probleme stellen randomisierte Algorithmen die einzigen bekannten effizienten Lösungsverfahren dar. Für manches andere Problem erhalten wir mit einem solchen Verfahren Algorithmen, die um vieles einfacher und verständlicher sind als alle bekannten deterministischen Verfahren. Es ist daher nicht verwunderlich, dass wir randomisierte Algorithmen in viele Anwendungsgebieten finden, wie z.B. in

- Datenstrukturen,
- Graphenalgorithmen,
- parallelen und verteilten Systemen,
- Online-Algorithmen,
- Zahlentheorie und
- geometrische Algorithmen.

In der Vorlesung *Randomisierte Algorithmen* werden wir Verfahren aus einigen dieser Gebiete und grundlegende Techniken für randomisierte Algorithmen vorstellen und analysieren.

Darüber hinaus werden grundlegende probabilistische Methoden zur Analyse von Algorithmen vorgestellt.

**engl. Beschreibung/ Kurzkomentar**

## Randomized Algorithms

For many problems randomized algorithms are the only known efficient solution method. For some other problem we can find randomized algorithms that are much simpler and more understandable than any known deterministic method. It is therefore not surprising that we find randomized algorithms in many areas, such as in

- data structures,
- graph algorithms,
- parallel and distributed systems,
- on-line algorithms,
- number theory, and
- geometric algorithms.

In the lecture Randomized Algorithms, we will present and analyze randomized algorithms and basic methods from some of these areas. Furthermore, basic probabilistic methods for the analysis of algorithms are presented.

**Bemerkung**

Gebäude: Coudraystraße 11C, Seminar Raum 202

**Voraussetzungen**

Bsc in a relevant study field

**Leistungsnachweis**

oral examination

**Modeling****Modeling****301016 Complex dynamics****B. Rüffer**

Veranst. SWS: 4

Vorlesung

Do, wöch., 07:30 - 10:45, Marienstraße 7 B - Seminarraum 206, Will start at 04.04.2024 9:00 am!

**Beschreibung**

After the course the students will be able to analyse mathematical models that describe dynamic behaviour, as they occur in engineering (e.g. mechanical coupling of building structures), in biology and in physics, but also in multi-agent systems in computer science, or as opinion dynamics in psychology. Based on examples from different disciplines, students learn to build simplified models that allow to answer questions on their long-term behaviour. Students will be able to apply methods of feedback design that help shape the dynamics of a given system, along with the relevant stability concepts. As several topics lend themselves for computer simulation, students of this course will develop a proficiency to both implement and analyse mathematical models using computational tools and software.

**Bemerkung**

Examples of complex dynamics. Models for dynamical systems in continuous and discrete time. Computer simulation. Control and Feedback. Stability, stabilization, and Lyapunov functions. Coupled systems: Disturbance or Cooperation? Networks of systems. Consensus. Synchronization.

The topics will be presented in a lecture, deepened by exercises. Some of the exercise include computer programming and simulation.

#### Voraussetzungen

B.Sc., knowledge in Matlab or Python

#### Leistungsnachweis

##### 1 written exam

"Complex dynamics"

120 min (100%) / **SuSe** + WiSe

### 301017 Mathematics for data science

**B. Ruffer, M. Schönlein**

Veranst. SWS: 4

Vorlesung

Mo, wöch., 09:15 - 12:30, Coudraystraße 13 B - Seminarraum 210

Mo, wöch., 09:15 - 12:30, Coudraystraße 13 A - Hörsaal 2

#### Beschreibung

After the course the students will be familiar with the fundamental concepts of data science. The participants can analyse given data sets with respect to dimensionality reduction and clustering. They also know the basic structure of neural networks and support vector machines to solve classification tasks. The participants know relevant methods from linear algebra and optimization and can apply these techniques. This embraces the design of appropriate algorithms and the implementation of different numerical methods to solve the corresponding problems.

#### Bemerkung

Examples of complex dynamics. Models for dynamical systems in continuous and discrete time. Computer simulation. Control and Feedback. Stability, stabilization, and Lyapunov functions. Coupled systems: Disturbance or Cooperation? Networks of systems. Consensus. Synchronization.

The topics will be presented in a lecture, deepened by exercises. Some of the exercise include computer programming and simulation.

#### Voraussetzungen

B. Sc.; Analysis and Linear Algebra at Bachelor level, knowledge of Matlab or Python

#### Leistungsnachweis

##### 1 written exam

"Complex dynamics"

120 min (100%) / **SuSe** + WiSe

### Projects

#### 424110001 Building an Observatory for Web Search Engines



**B. Stein, M. Wiegmann**

Projekt

**Beschreibung**

The quality and utility of the results you get from web search engines such as Google is concerning.

Many websites in the results have repetitive, wordy, uninformative, and highly commercialized content. With generative AI, we see the possibility that the synthetic web in which machines produce content for other machines will take over the human web.

We want to monitor the situation by building a tool: the search engine observatory. The tool will regularly scrape multiple search engines, measure the quality of the results, and display the results across time.

Students will learn how search engines work, define queries to monitor selected genres of websites (product reviews, recipes, tutorials, news, tech blogs, ...), measure the degree of generated content, commercialization, and search engine optimization, and render the results in an interactive web application.

**Bemerkung**

3. Lehrperson: Janek Bevendorff

Zeit und Ort werden zu Projektbörse bekannt gegeben!

**Leistungsnachweis**

Abschlusspräsentation und Ausarbeitung

**424110003 Digital Dreams: Bauhaus Gamesfabrik****C. Wüthrich, W. Kissel, G. Pandolfo**

Veranst. SWS: 10

Projekt

Mi, wöch., 13:30 - 15:30, Raum 205, Marienstr. 7b, ab 10.04.2024

**Beschreibung**

Herzlich willkommen bei Digital Dreams | Bauhaus Gamesfabrik, einem spannenden interdisziplinären Projekt, das die Fakultäten Kunst & Gestaltung und Medien an unserer Universität zusammenbringt. In diesem innovativen Projekt arbeiten Studierende unterschiedlicher Fachrichtungen in interdisziplinären Gruppen zusammen, um die dynamische Welt der Spieleentwicklung zu erkunden.

An der Schnittstelle von Kunst und Technologie dient Digital Dreams | Bauhaus Gamesfabrik als Spielwiese für Kreativität und Innovation. Studierende der Fakultät Kunst & Gestaltung bringen ihre Expertise in visueller Ästhetik, Erzählkunst und Konzeption ein, während diejenigen der Fakultät Medien ihre Fähigkeiten in Programmierung, Animation und interaktiven Medien einbringen.

In diesem gemeinschaftlichen Unterfangen werden interdisziplinäre Gruppen gebildet, die einen reichen Ideen- und Perspektivenaustausch fördern. Inspiriert vom Pioniergeist der Bauhaus-Bewegung, wo Kunst und Technologie zusammenkamen, um das moderne Design zu prägen, begeben sich unsere Studierenden auf eine Reise, um immersive und fesselnde Spielerlebnisse zu gestalten.

Im Laufe des Projekts vertiefen sich die Studierenden in verschiedene Aspekte der Spieleentwicklung, von der Ideenfindung und Prototypenerstellung bis hin zur Produktion und Präsentation. Unter der Anleitung eines erfahrenen Mentors beider Fakultäten lernen sie, die Komplexität interdisziplinärer Teamarbeit zu bewältigen und ihre einzigartigen Stärken zu nutzen, um Herausforderungen zu meistern und ihre kreative Vision zu verwirklichen.

Digital Dreams | Bauhaus Gamesfabrik ist mehr als nur ein Kurs; es ist eine transformative Erfahrung, die Studierenden ermöglicht, die Grenzen des traditionellen Spieldesigns zu überschreiten. Indem sie die Zusammenarbeit fördern und den Geist des Experimentierens annehmen, sind unsere Studierenden bereit, die nächste Generation visionärer Spieleentwickler zu werden und die Zukunft interaktiver Unterhaltung mitzugestalten.

Begleiten Sie uns auf dieser aufregenden Reise, auf der digitale Träume Wirklichkeit werden, und lassen Sie uns gemeinsam die Zukunft des Spielens an der Schnittstelle von Kunst und Technologie gestalten.

#### **Bemerkung**

Ort und Zeit werden zur Projektbörse bekanntgegeben.

#### **Voraussetzungen**

Studierende der Medieninformatik sollten Programmierkenntnisse mitbringen.

Studierende der Medienwissenschaft ein grundlegendes Interesse für Storytelling / Game Design

#### **Leistungsnachweis**

Abschlusspräsentation, fertiges Spiel.

### **424110004 Diving deep into Retrieval Augmented Generation**

**B. Stein, T. Gollub, M. Gohsen, M. Wiegmann**

Projekt

#### **Beschreibung**

Retrieval Augmented Generation (RAG) with agents is currently one of the hottest topics in generative AI.

The basic idea of RAG is to connect large language models with search technology. The search technologies are used to retrieve information that is relevant for a given conversation, which can then be exploited by a large language model when generating a natural language response. Though the idea is straight forward, many decisions have to be made when it comes to its implementation.

For research on RAG, it is hence critical to be able to measure the performance of a RAG system. In the project, we study the state-of-the-art in RAG evaluation, deploy RAG systems with different settings to our GPU-cluster, and compare their performance on various benchmark datasets and with respect to their user experience.

#### **Bemerkung**

Zeit und Ort werden zu Projektbörse bekannt gegeben!

#### **Leistungsnachweis**

Abschlusspräsentation und Ausarbeitung.

### **424110005 Futuring Machines. Developing an AI-Bot for Fiction Co-Writing**

**B. Stein, M. Gohsen, K. Heinrich, J. Kiesel**

Projekt

#### **Beschreibung**

Sustainable, resilient societies require a critical examination of possible futures. "Futuring Machines" is an interdisciplinary and practice-oriented project that explores the potential of large language models as thought-provoking tools for writing future scenarios.

In this student project, we are developing a web-based writing environment together with students from the Faculty of Art and Design as live testers.

You will develop various text operations that employ large language models (e.g., elaborating a scene, suggesting storylines). You can choose to focus on implementing operations or performing user testing.

The writing environment we develop will then be used in several workshops (e.g., at Futurium Berlin).

#### **engl. Beschreibung/ Kurzkomentar**

Zeit und Ort werden zu Projektbörse bekannt gegeben!

#### **Leistungsnachweis**

Abschlusspräsentation und Ausarbeitung

### **424110006 PKI from Scratch**

**S. Lucks, N. Lang, J. Leuther**  
Projekt

Veranst. SWS: 10

#### **Beschreibung**

A public key infrastructure (PKI) is a system which issues, distributes and validates digital certificates.

PKIs are a central component in today's digital infrastructure. For example, when you encounter a website secured by TLS (HTTPS), this site will have a digital certificate which was issued through a PKI and can therefore be trusted.

A PKI establishes a system of trust, which can also be used in closed-off environments where it facilitates the use of digital certificates for many usages like smartcards, digital signatures or many-factor authentication.

In this project, we will set up our own PKI from the ground up and explore the concepts that are utilized in such a system and how a PKI can be used to advance digitalisation.

#### **Voraussetzungen**

- Good Programming Skills
- Experience with Linux/Unix
- Cryptography knowledge not required but helpful

#### **Leistungsnachweis**

Zwischenpräsentationen, Abschlusspräsentation, Abschlussbericht

### **424110007 Social Engineering – das Abenteuer geht weiter!**

**A. Jakoby, S. Lucks, J. Ehlers, R. Adejoh, G. Pandolfo**  
Projekt

#### **Beschreibung**

Viele Cyber-Angriffe basieren auf Techniken des Social Engineering. Dazu gehören das Vortäuschen von Autorität, das Schreiben von Phishing-Mails, „Dumpster-Diving“ (das Durchsuchen von Abfällen nach nützlichen Informationen, die aus Leichtsinn weggeworfen wurden), usw.

Social Engineering nutzt menschliche Charakterzüge aus, zum Beispiel den Respekt für Autorität, die Bereitschaft anderen zu helfen, aber auch Leichtgläubigkeit und Faulheit. Ebenso setzt Social Engineering auf das Auslösen und Ausnutzen von menschlichen Emotionen, z.B. Furcht, Neugier, Hoffnung oder Schuldgefühle.

In dem Projekt geht es darum, Techniken des Social Engineering zunächst zu beschreiben und zu verstehen und nachfolgend ein (Computer-)spiel daraus zu entwickeln.

Der Spieler bzw. die Spielerin soll sich in eine Organisation „einhacken“. Dazu muss er oder sie nach und nach verschiedene Zugangsdaten in Erfahrung bringen und in verschiedene IT-Systeme einbrechen – natürlich unter Anwendung immer anderer Techniken des Social Engineering.

Das Spiel soll zunächst einmal als Text-Adventure gespielt werden. Bei einem erfolgreichen Projektverlauf könnte ein Folgeprojekt das Spiel zu einem graphischen Abenteuerspiel weiterentwickeln.

### Leistungsnachweis

Zwischenpräsentationen, Abschlusspräsentation, Abschlussbericht

## 424110008 Social Risks of Large Language Models: Audits and Experiments

### M. Jakesch

Projekt

Di, wöch., 09:00 - 11:00, Karl-Haußknecht-Straße 7 - Seminarraum (IT-AP) 001, ab 23.04.2024

### Beschreibung

Our communication is increasingly intermixed with language generated by AI. Across chat, email, and social media, AI systems suggest words, complete sentences, and produce entire articles. While the development and deployment of large language models is progressing expeditiously, the social consequences are hardly known.

In this project we will discuss potential social risks posed by large language models, drawing on multidisciplinary literature from computer science, linguistics, and social sciences. We will look at approaches that critically probe machine learning systems and examine the impact technology may have on users and society.

After initial engagement with the relevant literature and tools, participants will design and execute their audit and experiment, probing a social risk of a large language model in small groups. The project concludes with writing sessions, and the expected output will be an initial draft of an investigative report or scientific paper.

### engl. Beschreibung/ Kurzkomentar

Für B.Sc. I: Informatikprojekt, Medieninformatik- oder Gestaltungsprojekt, oder Data-Science-Projekt

### Bemerkung

Lehrende: Jun.-Prof. Maurice Jakesch

### Voraussetzungen

Basic programming knowledge is required. Prior exposure to data science tools, machine learning and experiments is useful, but not a requirement.

Most of all, participants should have a keen interest in interdisciplinary investigative work.

## 424110009 SPHINCS Safari: Giza Treasures and Manticore Myths

### S. Lucks, N. Lang, J. Leuther

Projekt

Veranst. SWS:

10

### Beschreibung

Hash-based signature algorithms are promising candidates for securing communication in the age of quantum computers. SPHINCS+ is an example of such a stateless signature algorithm that gained popularity from the recent „Post-Quantum Cryptography Standardisation Competition”.

A major downside of hash-based signature algorithms like SPHINCS+ is the size of the signature itself, which is magnitudes larger than what other algorithms provide. However, there are recent alternatives to SPHINCS+ that are being developed to reduce the downsides while still maintaining the benefits of the hash-based approach.

We will mainly (but not exclusively) focus on two such variants:

Giza and Manticore.

In this project, you will work with experts on this subject to get to know some of these alternatives. Your task is to implement prototypes of these algorithms and analyse them regarding some of their benefits or downsides.

#### **Bemerkung**

The time and place will be announced at the project fair!

#### **Voraussetzungen**

Introduction to Modern Cryptography (or equivalent)

Excellent Programming Skills

#### **Leistungsnachweis**

Zwischenpräsentationen, Abschlusspräsentation, Abschlussbericht.

### **424110011 Engineering of Building Information Models**

#### **J. Ringert, B. Burse**

Projekt

#### **Beschreibung**

We investigate the use of Building Information Models on the example of Industry Foundation Classes.

The Software Engineering methods we apply may range from domain-specific languages to model transformation systems.

#### **Bemerkung**

Zeit und Ort werden zu Projektbörse bekannt gegeben!

The time and place will be announced at the project fair!

#### **Voraussetzungen**

Digital Engineering students must have completed their foundations.

#### **Leistungsnachweis**

Projektbericht und Ergebnisse in Form von Software.

### **424110012 Formal Methods Playground**

**J. Ringert, .. Soaibuzzaman**

Projekt

**Beschreibung**

We will develop new technologies and applications to use formal methods.

**Voraussetzungen**

Digital Engineering students must have completed their foundations.

**Leistungsnachweis**

Projektbericht und Ergebnisse in Form von Software.

### 424110013 Hand(y) Movements: Defining Cognitive Load Through Smartphone Accelerometer Sensors (CoLA)

**J. Ehlers**

Projekt

Veranst. SWS:

10

**Beschreibung**

Exploring non-invasive ways to determine the level of mental processing is essential for human-computer applications as an all too low/high cognitive load is likely to cause human errors in critical tasks.

The present project aims to investigate a yet unexplored way to quantify the extent of cognitive load via smartphone accelerometer sensors in a controlled lab study. Students will be asked to implement a simple App that allows to vary the amount of load in two established cognitive tasks and that collects data on individual hand movement patterns. Results need to be analysed and documented in a lab report.

**Bemerkung**

Zeit und Ort werden zu Projektbörse bekannt gegeben!

The time and place will be announced at the project fair!

**Voraussetzungen**

Experiences in App programming as well as knowledge of experimental methods are beneficial

**Leistungsnachweis**

- 1) Implement an App that allows to vary the task load in two cognitive load assignments
- 2) Find a way to derive hand movement patterns from smartphone accelerometer sensors
- 3) Design an empirical study in order to correlate the shivering of the hand with different levels of cognitive load
- 4) Analyse and document your findings in a lab report

### 424110014 VR Groovy

**B. Fröhlich, E. Hornecker, A. Lammert, R.****Koningsbruggen, L. Simon**

Projekt

Veranst. SWS:

20

**Beschreibung**

Often, groups of friends live all over Germany, couples are in long-distance relationships, or grandparents live far away from their grandchildren. While it is possible to spend time together in video conferences, this is perceived as a shared experience only to a limited extent. Social virtual reality offers more extensive possibilities for this. But how can interaction that conveys social closeness be further improved in virtual space?

Although social VR allows for shared experiences, such experiences are often limited by not providing precise temporal synchronisation. As a result, activities such as singing, dancing or virtual games can be perceived as non-synchronous experiences and users can literally feel out of sync.

In this project, we will utilise different prototyping and development approaches to investigate what effects can occur when social interactions are out of sync and how the feeling of shared synchronous experiences can be increased. For this purpose, we would like to investigate, among other things, how responsive environments or avatar designs that motivate movement could be used for such purposes. Step by step, we will identify difficulties during social interactions in latency affected environments and develop concepts to foster a shared sense of synchrony, which will then be implemented and evaluated.

This course is perfect for students who would like to be challenged to find problems, who enjoy individual and (multi-disciplinary) group-work, and to come up with their own concepts. We encourage students to participate that have a high interest in working from theory, coming up with speculative concepts, and learning how to realise those concepts as an artefact.

### Voraussetzungen

Interest in interaction design and different types of prototyping.

or

Solid programming / scripting experience (C#, C++, Python o.Ä.). Experience in Unity and/or with VR recommended.

All participants should enjoy working in an interdisciplinary group, want to be creative, build prototypes, and be able to converse in English.

Product Design: Please register until 03.04.2024 by sending an email to:

[eva.hornecker@uni-weimar.de](mailto:eva.hornecker@uni-weimar.de),

[bernd.froehlich@uni-weimar.de](mailto:bernd.froehlich@uni-weimar.de),

[laura.simon@uni-weimar.de](mailto:laura.simon@uni-weimar.de),

[anton.benjamin.lammert@uni-weimar.de](mailto:anton.benjamin.lammert@uni-weimar.de)

[rosa.donna.van.koningsbruggen@uni-weimar.de](mailto:rosa.donna.van.koningsbruggen@uni-weimar.de)

(please include a description of your prior experience in relevant areas or a portfolio).

## 424110015 Hot Topics in Computer Vision SoSe24

**V. Rodehorst, C. Benz, J. Eick, A. Frolov, M. Kaisheva, D. Tschirschwitz**

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

## 424110017 Feminist Smart City: Exploring Technological Urban Futures through Speculative Design

**E. Hornecker, M. Osipova**

Projekt

**Beschreibung**

Smart Cities are a prominent trend in Urban Development globally. It is our duty as researchers and designers to ensure our designs will embody the values of equality, inclusivity and fairness. Smart Urban Technologies and Smart City concepts are both the subject and the root of challenges.

Designing futures is an interdisciplinary task with many degrees of freedom. Exploring these will be a focus of our project: how can we ensure that the Smart Cities we create will unfold for the benefit of all citizens and not for "Black Mirror" scenarios.

We will start by exploring various Urban Technologies and Smart City concepts and projects. Then, we will explore how to use speculative design to design futures and apply this method for urban challenges. We will further explore Feminist approaches to designing technological solutions (emphasizing standpoints of non-represented and marginalised user groups) and how it can be embedded in speculative methods and workshop planning. Finally, we will apply our knowledge to the design of speculative workshops on designing (and challenging) Smart City concepts from the perspective of embedded values. Our final outcome will consist of planning and executing speculative design workshops on the Smart City topic, with the outcomes analysed and summarised.

To bring in further expertise and perspectives, guest lectures and workshops are planned with invited researchers from the OFFIS research institute in Oldenburg, University of Tampere, Finland as well as other Labs in Bauhaus-Universität.

- This project is heavily research oriented, therefore, interest in academic work and experience with HCI or User-Centered Design research methods is a prerequisite for all participants.
- This project is an opportunity to learn more about urban technologies, Smart Cities, Value-Based Designed Futures and speculative design methodology. Upon successful completion you could use your results as a bridge for a thesis or Student Research publication.
- The project's active phase runs till the end of July and the expected workload is approximately 2 working days per week for 12 ECTs and 3 working days for 18 ECTs.

We encourage all students to email Margarita with your CV to check whether you qualify for the project. For students from other degrees than HCI/CS4DM this is a mandatory step for acceptance. Please feel free to reach out for more details or with any questions or clarifications to be sure that this project is a good fit for you.

margarita.osipova@uni-weimar.de

- This project is a part of "Feminist Smart Cities: Speculative Design Methodology for Creating Feminist Future for Smart Cities"

Projektnummer: 56-M-2023

Co-sponsored by Bauhaus-Universität Weimar und Frauenförderfond.

**Voraussetzungen**



- **Students from HCI Masters:** have successfully completed at least one of the following courses by HCI chair: "HCI Research Methods", "Ubiquitous Computing".
- **Students from CS4DM Masters:** have successfully completed at least one of the following courses by HCI chair: "HCI Introduction", "HCI Research Methods", "Ubiquitous Computing".
- **Student from Media Architecture:** in 2+ semester of the program.

Interested students from other programs can contact Margarita via email for details. Mind that you would be responsible for clarifying with your program lead how to include this project in your curriculum in terms of earned credits.

To avoid issues after the project selection algorithm, we encourage **all interested students** to write an email to Margarita to confirm eligibility for participation in the project and attach a CV and a short motivation statement.

## 424110018 HygieneVR: Medical Training in VR

**B. Fröhlich, M. Hartmann, T. Zöppig**  
Projekt

Veranst. SWS: 20

### Beschreibung

Virtual Reality has been used in many areas of education and training in recent years. One area where it is increasingly being used is in the training of medical students. Complex medical procedures can be represented in VR so that students can repeat and practice them repeatedly, independent of the availability of special training equipment and test patients.

In this project, we will develop a prototype in collaboration with the University Hospital of Jena, which will allow the demonstration, practice and monitoring of a hospital hygiene procedure. The aim is to carry out a study using this prototype to compare the learning success and error rates of students between a conventional training procedure and a training procedure using VR.

At the beginning of the project we will get an overview of related work in the field of medical training in VR and develop concepts for the prototype. We want to answer the following questions: What interaction techniques are appropriate in the given context? How can the correct execution of the processes be monitored and supported? How can students and teachers collaborate?

In the course of the project, you will gain further skills in developing interaction designs for VR applications, realizing them using Unity and have the opportunity to develop and implement your own concepts. The results of the project will then be used to conduct a study with medical students.

### Voraussetzungen

Solid software programming / scripting experience (C#, C++, Python o.Ä.)

Experience in Unity recommended.

Interest in Interaction Design and Studies.

## 424110019 An AV pipeline for the Linux Dome

**C. Wüthrich, N.N.**  
Projekt

**Beschreibung**

In this project, we will work on the finalization of the pipeline for the new FullDome at S134, which is a Linux based Dome with a 3D soundsystem and multiple projectors controlled by software.

This semester we will need to specify and build a Vulkan or Pipewire based System allowing to pipeline output from any video processing software into the input of a different video processing hardware, in a similar way that Syphon and Spout do it in the Mac and Windows environments.

**424110020 Field Takes for Immersive Dome Content****C. Wüthrich, N.N.**

Projekt

**Beschreibung**

In this project, we will explore the real world to record environments for their projection in a Fulldome. After planning what we want to take, we will make shootings with a 360 degree camera and an ambisonics 3D microphone so that they can be projected in a Fulldome environment such as the Linux Fulldome at the Schwanseeestrasse 143 in Weimar. Focus of the project will be the definition of the workflow - both from the devices as well as from the software pipeline point of view.

The project will be interdisciplinary, with also students from the Faculty of Arts and Design.

**424110021 BUWLense – AI-Powered Image-to-Image Search****D. Tschirschwitz**

Projekt

**Beschreibung**

Image retrieval systems such as Google Lens have become indispensable for everyday tasks like traveling and shopping. In this project, students will investigate how a resource-efficient retrieval pipeline can be expanded and further refined. A significant emphasis will be placed on enhancing the current network's performance using the full suite of machine learning tools. Additionally, the project may delve into domain-specific retrieval tasks, fine-tune a newly developed loss function, employ various techniques for embedding dimensionality reduction, extend the existing dataset for efficient training, or design a user platform to leverage the existing retrieval pipeline.

Participants in the project must have completed the course "Deep Learning for Computer Vision."

**424150000 Crypto Party****S. Lucks, N. Lang, J. Leuther**

Veranst. SWS: 2

Seminar

Mi, vierwöch., 12:30 - 14:00, Schwanseeestrasse 143 - Seminarraum 2.16, ab 17.04.2024

**Beschreibung**

"Eine Cryptoparty ist eine lockere, öffentliche Veranstaltung, auf der Teilnehmende z.B. lernen können, bestehende Verschlüsselungs- und Anonymisierungssoftware zu bedienen. Auf Cryptopartys geht es in erster Linie um den Abbau von Vorurteilen, wie z.B. dem, dass man ein Computerfreak sein muss, um diese spezielle Software

einzusetzen. Ist die Software einmal eingerichtet, fällt sie im Alltag kaum auf, schützt die Privatsphäre aber ungemein.

Aber auch Profis können die Veranstaltung nutzen, um sich mit Gleichgesinnten auszutauschen und z.B. gegenseitiges Keysigning zu betreiben (was das ist, wird vor Ort auch nochmal erklärt ;) )." (Chaos Computer Club (CCC) Mannheim)

Die Cryptoparty findet im Rahmen OpenLab Night der Summaery statt. Alle Teilnehmenden des Seminars präsentieren ein ausgewähltes Thema aus der Kryptographie, bzw eine thematisch passende Software, auf der OpenLab Night.

Die Prüfungsleistung besteht aus zwei Teilen: Einer Vorpräsentation im laufenden Semester und der Erstellung eines Posters und der eigentlichen Präsentation auf der OpenLab Night.

### Voraussetzungen

- Introduction to Modern Cryptography (or equivalent)
- Students who are participating in Introdcution to Modern Cryptography in the ongoing summer term 2024 are also admitted.

### Leistungsnachweis

Eigenständige Bearbeitung eines Themas, mündliche Präsentation zu einem Thema, Teilnahme an Diskussion zu den präsentierten Themen.

## Electives

### 4336010 Image Analysis and Object Recognition

**V. Rodehorst, M. Kaisheva**

Veranst. SWS: 4

Vorlesung

Di, wöch., 15:15 - 16:45, Coudraystraße 9 A - Hörsaal 6, Lecture, ab 09.04.2024

Do, wöch., 11:00 - 12:30, Coudraystraße 9 A - Hörsaal 6, Lab class, ab 11.04.2024

### 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/ Kurzkomentar

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.

### Leistungsnachweis

Erfolgreiche Bearbeitung der Übungen sowie des Miniprojekts und Klausur

**4555262 Visualisierung****B. Fröhlich, D. Kiesel, I. López García, G. Rendle, P. Riehm**

Veranst. SWS: 4

Vorlesung

Do, wöch., 13:30 - 15:00, Schwanseestraße 143 - Seminarraum 2.16, Lecture / Lab class , ab 04.04.2024

Mo, wöch., 17:00 - 18:30, Schwanseestraße 143 - Lintpool 2.17, Lab class, ab 08.04.2024

Mo, wöch., 17:00 - 18:30, Schwanseestraße 143 - Seminarraum 2.16, Lab class, ab 08.04.2024

**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 und mengenbasierte Daten. Der zweite Teil beschäftigt sich mit verschiedenen Ansätzen und Algorithmen zur Visualisierung volumetrischer und vektorieller Simulations- und Messdaten. Die Veranstaltung wird englischsprachig angeboten.

In den Übungen werden eine Auswahl der in den Vorlesungen vorgestellten Visualisierungsansätze umgesetzt, getestet und evaluiert. Die abschließende Übungsaufgabe ermöglicht es Ihnen, ein eigenes Visualisierungsprojekt zu entwerfen, implementieren, evaluieren und präsentieren.

**Voraussetzungen**

Programmierkenntnisse sowie gute Kenntnisse von Algorithmen und Datenstrukturen sind erforderlich, z.B. nachgewiesen durch den erfolgreichen Abschluss der entsprechenden Lehrveranstaltungen des Bachelor-Studiengangs Medieninformatik.

In den Laborveranstaltungen werden JavaScript- und grundlegende GLSL-Programmierung eingesetzt. Grundkenntnisse der Computergrafik sind hilfreich, z.B. erworben durch die Vorlesung Computergrafik im Bachelor-Studiengang Medieninformatik.

**Leistungsnachweis**

Vorlesungsbegleitende, bewertete Übungen, mündliche oder schriftliche Prüfung und ein abschließendes Projekt.

Participation in lab classes (graded), oral exam and a final project.

**301016 Complex dynamics****B. Ruffer**

Veranst. SWS: 4

Vorlesung

Do, wöch., 07:30 - 10:45, Marienstraße 7 B - Seminarraum 206, Will start at 04.04.2024 9:00 am!

**Beschreibung**

After the course the students will be able to analyse mathematical models that describe dynamic behaviour, as they occur in engineering (e.g. mechanical coupling of building structures), in biology and in physics, but also in multi-agent systems in computer science, or as opinion dynamics in psychology. Based on examples from different disciplines, students learn to build simplified models that allow to answer questions on their long-term behaviour. Students will be able to apply methods of feedback design that help shape the dynamics of a given system, along with the relevant stability concepts. As several topics lend themselves for computer simulation, students of this course will develop a proficiency to both implement and analyse mathematical models using computational tools and software.

**Bemerkung**

Examples of complex dynamics. Models for dynamical systems in continuous and discrete time. Computer simulation. Control and Feedback. Stability, stabilization, and Lyapunov functions. Coupled systems: Disturbance or Cooperation? Networks of systems. Consensus. Synchronization.

The topics will be presented in a lecture, deepened by exercises. Some of the exercise include computer programming and simulation.

#### Voraussetzungen

B.Sc., knowledge in Matlab or Python

#### Leistungsnachweis

##### 1 written exam

"Complex dynamics"

120 min (100%) / **SuSe** + WiSe

### 301017 Mathematics for data science

**B. Ruffer, M. Schönlein**

Veranst. SWS: 4

Vorlesung

Mo, wöch., 09:15 - 12:30, Coudraystraße 13 B - Seminarraum 210

Mo, wöch., 09:15 - 12:30, Coudraystraße 13 A - Hörsaal 2

#### Beschreibung

After the course the students will be familiar with the fundamental concepts of data science. The participants can analyse given data sets with respect to dimensionality reduction and clustering. They also know the basic structure of neural networks and support vector machines to solve classification tasks. The participants know relevant methods from linear algebra and optimization and can apply these techniques. This embraces the design of appropriate algorithms and the implementation of different numerical methods to solve the corresponding problems.

#### Bemerkung

Examples of complex dynamics. Models for dynamical systems in continuous and discrete time. Computer simulation. Control and Feedback. Stability, stabilization, and Lyapunov functions. Coupled systems: Disturbance or Cooperation? Networks of systems. Consensus. Synchronization.

The topics will be presented in a lecture, deepened by exercises. Some of the exercise include computer programming and simulation.

#### Voraussetzungen

B. Sc.; Analysis and Linear Algebra at Bachelor level, knowledge of Matlab or Python

#### Leistungsnachweis

##### 1 written exam

"Complex dynamics"

120 min (100%) / **SuSe** + WiSe

### 419140050 Introduction to Modern Cryptography

**S. Lucks, N. Lang, J. Leuther**

Veranst. SWS: 3

Vorlesung

Mo, wöch., 13:30 - 15:00, Schwanseestraße 143 - Seminarraum 2.16, Lecture, ab 15.04.2024  
 Di, wöch., 17:00 - 18:30, Karl-Haußknecht-Straße 7 - Hörsaal (IT-AP), Übung/Tutorium, ab 16.04.2024

### Beschreibung

Früher galt die Kryptographie als Werkzeug für Militärs, Geheimdienste und Diplomaten. Aus dieser Zeit stammt auch noch die berühmte Enigma-Chiffriermaschine.

Heute entwickelt sich die Kryptographie buchstäblich zu einer Schlüsseltechnologie für sichere Kommunikation und Mediennutzung. Von der Öffentlichkeit kaum bemerkt hat die Kryptographie schon längst Einzug gehalten in alltäglich genutzte Geräte wie Geldautomaten und Mobiltelefone.

Der Entwurf kryptographischer Komponenten ist schwierig, und in der Praxis trifft man oft auf erhebliche Entwurfsfehler.

(Dies kommentiert der IT-Sicherheitsexperte Bruce Schneier mit drastischen Worten: "Milliarden von Dollar werden für Computersicherheit ausgegeben, und das Meiste davon wird für unsichere Produkte verschwendet.")

Nicht nur der Entwurf kryptographischer Komponenten ist schwierig, auch der Einsatz von "an sich guten" Komponenten für sichere IT-systeme ist fehlerträchtig und erfordert ein genaues Verständnis der jeweiligen Bedingungen, unter denen eine kryptographische Komponente als "sicher" gelten kann.

Die Vorlesung gibt einen Einblick in Denkweise und Methodik der Mediensicherheit und der modernen Kryptographie und die Anwendung der Kryptographie, um Sicherheitsprobleme zu lösen.

### engl. Beschreibung/ Kurzkomentar

### Bemerkung

**Die Studierenden dürfen bisher keine Einführung in Kryptographie besucht haben. Zum Nachweis sind bei der Anmeldung zur Prüfung die "Transcript of Records" aus früheren Studien vorzulegen.**

**Für Studierende, die in ihrem früheren Bachelor-Studium keine Einführung in die Kryptographie besucht haben, ist die Veranstaltung ihrerseits Zulassungsvoraussetzung für fortgeschrittene Kryptographie-Vorlesungen.**

### Voraussetzungen

Regelmäßige Bearbeitung der Übungsaufgaben und Teilnahme an den Übungen, Klausur.

### Leistungsnachweis

M.Sc.: Mündliche Prüfung  
 Beleg als Voraussetzung zur Klausurzulassung

## 420160000 Introduction to Natural Language Processing

**B. Stein, M. Wolska, N. Kolyada, N. Mirzakhmedova, M. Wiegmann**      Veranst. SWS: 3  
 Vorlesung

Do, wöch., 15:15 - 16:45, Schwanseestraße 143 - Seminarraum 2.16, Lab class, ab 11.04.2024  
 Do, Einzel, 15:00 - 17:00, written exam, 25.07.2024 - 25.07.2024  
 Do, wöch., 17:00 - 18:30, Schwanseestraße 143 - Seminarraum 2.16, Lecture

### Beschreibung

This course gives an overview of basic techniques of working with language data. We will introduce basic linguistic notions, issues involved in building and working with language corpora, current standard techniques for preparing

text for analysis, and methods of computational processing of a subset of language phenomena. By the end of the course students will

- (1) have an understanding of key word-level, syntactic, semantic, and discourse phenomena,
- (2) be aware of issues involved in building text corpora,
- (3) be familiar with typical language processing tasks addressed in the NLP community and methods of addressing them, and
- (4) will be able to perform tasks that are part of a standard NLP pipeline.

### Leistungsnachweis

Klausur

## 422150031 Generative Softwareentwicklung

### J. Ringert

Veranst. SWS: 4

Vorlesung

Mo, Einzel, 09:00 - 11:00, written exam, 05.08.2024 - 05.08.2024  
 Mi, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D, Lecture  
 Fr, wöch., 13:30 - 15:00, Coudraystraße 13 B - Hörsaal 3, Lab class

### Beschreibung

We introduce main approaches and techniques to generative software development.

- Model Driven Engineering
- Software Modeling languages for structure and behavior
  - Class Diagrams, Object Diagrams, OCL
  - Sequence Diagrams and State Machines
- Software model consistency and semantics
- Code Generation from class diagrams
- Code generation from State Machines
- Reactive Synthesis from temporal specifications
- Software Product Lines
- Domain Specific Languages
- Model Transformations

After completion students will be able to

- Contrast different modelling languages and chose based on purpose
- Analyze model consistency
- Evaluate and apply code generators
- integrate generated code in software projects
- create and analyze temporal specifications
- synthesize software from temporal specifications
- understand domain specific languages and model transformations

### Bemerkung

Lecturer: Prof. Ringert

### Leistungsnachweis

Homework for admission to exam

Exam weighted 100% for final mark

### 423150021 Deep Learning for Computer Vision

**V. Rodehorst, C. Benz, J. Eick, A. Frolov, D. Tschirschwitz**      Verant. SWS:      4

Integrierte Vorlesung

Fr, wöch., 15:15 - 16:45, Schwanseestraße 143 - Seminarraum 2.16, ab 05.04.2024

Fr, wöch., 17:00 - 18:30, Schwanseestraße 143 - Seminarraum 2.16, ab 05.04.2024

Mo, Einzel, 11:00 - 13:00, schriftl. Prüfung / written exam, 29.07.2024 - 29.07.2024

#### Beschreibung

In diesem Fortgeschrittenenkurs werden die Prinzipien, Techniken und Anwendungen des Deep Learning in der Computer Vision behandelt. Die Teilnehmer lernen, wie man neuronale Netze für die Bildklassifizierung, Objekterkennung, semantische Segmentierung und andere Computer-Vision- Aufgaben entwickelt, trainiert und validiert. Es werden auch Techniken zur Verbesserung der Leistung von Deep-Learning-Modellen und Veranschaulichungen studiert, um Anhaltspunkte für die weitere Modellentwicklung zu erhalten. Am Ende des Kurses werden die Studierenden in der Lage sein, Deep-Learning-Techniken anzuwenden, um reale Probleme in verschiedenen Bereichen zu lösen.

#### Voraussetzungen

Successful completion of the course "Introduction to Machine Learning and Data Mining" or "Image Analysis and Object Recognition"

#### Leistungsnachweis

Erfolgreiche Teilnahme an den Laborübungen und dem Projekt mit abschließender Klausur.

Gewichtung: 50% Projekt und 50% Klausur

### 424150030 Advanced Topics in Software Engineering

**J. Ringert**      Verant. SWS:      2

Seminar

Fr, wöch., 15:15 - 16:45, Coudraystraße 13 B - Seminarraum 210

#### Beschreibung

This module is a seminar worth 3 ECTS.

The module focuses on a systematic literature review:

- finding a topic from Software Engineering,
- defining research questions for a literature review, and
- reviewing Software Engineering literature to answer your research questions.

Your mark will be determined by:

- intermediate submissions of your progress,
- presentations of your findings during the semester, and
- a final seminar paper and presentation (submitted at the end of the semester).

#### Leistungsnachweis

Presentations during the semester



Final seminar paper

**451002 Introduction to Optimization (L+E)****T. Lahmer**

Veranst. SWS: 3

Integrierte Vorlesung

Mo, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D, Lecture

Di, wöch., 07:30 - 09:00, Marienstraße 7 B - Projektraum 301, Exercise Dates by arrangement

**Beschreibung**

In engineering science, we are often faced with problems having potential for optimization. We learn how to formulate this in mathematical terms, and we will study techniques how to improve the situations, generally by involving numerical models. We will discuss classical optimization problems in the field of linear and nonlinear optimization, e.g. optimization of the use of resources, routing problems, calibration problems and structural optimization. In particular in structural optimization we learn techniques like dimensioning, shape and topology optimization. Optimized structures are discussed also in the context of additive manufacturing techniques.

**Bemerkung****Introduction to Optimization (summer semester):**

Definitions, Classification of Optimization Problems,

Linear Problems, Simplex Method, Nonlinear Problems: Constrained and unconstrained continuous problems, descent methods and variants. (Robust) Structural Optimization (including Shape and Topology Optimization)

**Voraussetzungen**

B.Sc.

**Leistungsnachweis****1 written or oral exam** (depending on the number of participants)"Introduction to Optimization" (3 credits) / **SuSe** + WiSe**451006 Optimization in Applications (P)****T. Lahmer**

Veranst. SWS: 3

Projektmodul/Projekt

**Beschreibung**

In engineering science, we are often faced with problems having potential for optimization. We learn how to formulate this in mathematical terms, and we will study techniques how to improve the situations, generally by involving numerical models. We will discuss classical optimization problems in the field of linear and nonlinear optimization, e.g. optimization of the use of resources, routing problems, calibration problems and structural optimization. In particular in structural optimization we learn techniques like dimensioning, shape and topology optimization. Optimized structures are discussed also in the context of additive manufacturing techniques.

**Bemerkung****Optimization in Applications (summer semester):**

Optimization in Applications is generally a project assigned to the students including own programming and modelling. E.g. innovative optimization strategies are to be implemented in Matlab, Python or similar. Alternatively, engineering models could be subjected to optimization software.

**Leistungsnachweis**

**1 project** "Optimization in Applications" (3 credits) / **SuSe + WiSe**

### 4526501 Academic English Part One

**G. Atkinson**

Veranst. SWS: 2

Kurs

Mi, wöch., 15:30 - 16:45, Consultations, R.218, S143 (indiv.appointments), ab 24.04.2024

Mi, wöch., 17:00 - 18:30, Schwanseestraße 143 - Seminarraum 3.09, Academic English Part I+II (alternating), ab 24.04.2024

#### 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.

#### 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 participants 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](mailto: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 - 16:45, Consultations, R.2.18, S143 (indiv.appointments), ab 24.04.2024

Mi, wöch., 17:00 - 18:30, Schwanseestraße 143 - Seminarraum 3.09, Academic English Part I+II alternating, ab 24.04.2024

#### 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.

#### 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 participants 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](mailto: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