

# **Vorlesungsverzeichnis**

M.Sc. Computer Science for Digital Media

Winter 2022/23

Stand 23.03.2023

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## M.Sc. Computer Science for Digital Media

### Faculty Welcome for Master's Students Computer Science for Digital Media

Monday, 10<sup>th</sup> October 2022, 10 a.m., Schwanseestraße 143, room 3.09

### Project fair

Monday, 10<sup>th</sup> October 2022, 5 p.m., Steubenstraße 6, Audimax

## Theses-Seminar HCI

### E. Hornecker

Seminar

#### Beschreibung

Vorträge zu aktuellen Dissertationen und Veröffentlichungen sowie laufenden Master- und Bachelorarbeiten werden im Rahmen des Seminars präsentiert und diskutiert.

#### Bemerkung

Für diese Veranstaltung werden keine ECTS-Punkte vergeben.

## Modeling

### Distributed and Secure Systems

#### 4447556 Digital Watermarking and Steganography

### A. Jakoby

Veranst. SWS: 4

Vorlesung

Di, wöch., 09:15 - 10:45, Lecture, ab 11.10.2022

Mo, wöch., 17:00 - 18:30, Schwanseestraße 143 - Seminarraum 2.16, Lab class , ab 17.10.2022

Mi, Einzel, 10:00 - 11:30, Schwanseestraße 143 - Seminarraum 3.09, oral exams (indiv. appointments), 22.02.2023 - 22.02.2023

Do, Einzel, 14:00 - 17:00, Schwanseestraße 143 - Seminarraum 3.09, oral exams (indiv. appointments), 23.02.2023 - 23.02.2023

Di, Einzel, 10:00 - 18:00, Schwanseestraße 143 - Seminarraum 3.09, oral exams (indiv. appointments), 21.03.2023 - 21.03.2023

Do, Einzel, 13:00 - 18:00, Schwanseestraße 143 - Seminarraum 3.09, oral exams (indiv. appointments), 23.03.2023 - 23.03.2023

#### Beschreibung

Digitale Wasserzeichen und Steganography

Digitale Wasserzeichen dienen dazu Nachrichten zu einer Bild-, Audio- oder Videodatei innerhalb dieser Datei selber abzulegen. Ein zentrales Ziel der hierzu verwendeten Verfahren ist es, sicherzustellen, dass die eingebetteten Informationen nicht wieder entfernt werden können. Solche Nachricht können dazu herangezogen werden, um zusätzliche Informationen über den Inhalt der Medien selbst zu liefern, so zum Beispiel bestehende Urheberrechte. Digitale Wasserzeichen sollen daher lesbarer oder zumindest nachweisbar sein. Jedoch sollen sie nur mit erheblichen Aufwand wieder zu entfernen sein.

In der Steganographie untersuchen wir Systeme, in denen die eingebetteten Informationen vollständig für Unbefugte versteckt werden soll. Selbst die Tatsache, dass eine Mediendatei eine versteckte Botschaft enthält, soll für Unbefugte nicht zu beobachten sein. Somit ist es durch Verwendung eines solchen Systems möglich, dass zwei Personen Informationen austauschen, ohne dass eine dritte Person die Kommunikation detektieren kann.

In dieser Vorlesung werden wir grundlegende Konzepte, Methoden und Anwendungen der digitalen Wasserzeichen und Steganographie vorstellen und analysieren.

#### engl. Beschreibung/ Kurzkomentar

##### Digital Watermarking and Steganography

Digital watermarking is the practice of hiding a message about an image, audio clip, video clip, or other work of media within that work itself. One goal of the used methods is to ensure that the message cannot be removed after it is embedded in the media. Thus, systems can use such a message to provide additional information of the content of the media itself, e.g. copyrights. Digital watermarks have to be readable or detectable, but they should be hard to remove from the content.

In steganography we investigate systems where the embedded information is completely hidden for unauthorized parties. Even the fact that a media file contains a hidden message should be hidden. Thus, by using such a system two parties can communicate in such a way that a third party cannot detect the communication.

In this lecture we will introduce some basic concepts, methods and applications of digital watermarking and steganography.

#### Voraussetzungen

BSc in a relevant study field

#### Leistungsnachweis

oral examination

## Intelligent Information Systems

### 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

### 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

## Graphical and Interactive Systems

### 4556216 Ubiquitous Computing

**E. Hornecker, B. Schulte**

Veranst. SWS: 4

Vorlesung

Di, wöch., 15:15 - 16:45, Karl-Haußknecht-Straße 7 - Hörsaal (IT-AP), Lab class / first lecture (October 11th, 2022) , ab 11.10.2022

Mo, wöch., 13:30 - 15:00, Schwannseestraße 143 - Seminarraum 2.16, Lecture, ab 17.10.2022

#### Beschreibung

The course explores advanced topics in HCI, presenting and reflecting on the concerns, perspectives and interdisciplinary nature of this area. We will look at new and emerging technologies and the issues they entail. These technologies move beyond 'traditional' computing concerns, in particular by going from the desktop into the world [ubiquitous computing], moving from the workplace to the home and other settings [e.g., domestic, public spaces], from purely functional to ludic concerns [e.g. home entertainment, pervasive games], and from digital to digital-physical systems [tangible computing, IoT].

The course covers technical aspects as well as user-centered design, concept prototyping and evaluation methods relevant for Ubiquitous Computing, and a discussion of broader societal and value-related concerns (e.g. privacy, security, user agency versus ambient intelligence).

Successful students should be able to

- discuss the diverse and emergent areas within UbiComp technologies and the issues they entail
- develop concepts for UbiComp applications that are appropriate for a given use context and illustrate these (sketching, video prototyping, Wizard of Oz) as well as determine their technical feasibility
- be able to reflect on practical experiences engaging with some of these technologies from a user-centred perspective
- understand the technical functioning of example UbiComp technologies
- choose and give a rationale for appropriate user-centered design methods for example application problems
- critically assess societal implications and discuss design trade-offs of UbiComp applications.
- understand complex issues from the HCI and UbiComp research literature, in particular, to summarize literature and to discuss it

Note: This course is offered biannually

Introductory Literature:

- Ubiquitous Computing Fundamentals. Ed. John Krumm. ISBN: 1420093606. Chapman & Hall/CRC 2009.
- Harper, Rodden, Rogers, Sellen (eds.). Being Human: Human-Computer Interaction in the Year 2020. Microsoft Research Ltd 2008

Rowland et al. Modern User Interfaces for Ubicomp Systems. O'Reilly 2015

#### **Bemerkung**

Takes place bi-annual / every 2 years

(can be used to replace the 'HCI Methods and Theory' in 'the Advanced HCI' module for the HCI Master)

#### **Voraussetzungen**

**Compulsory registration via Bison portal.**

**Registration period: October 6th - October 9th, 2022.**

You will be informed about the admission by email , on October 10th.

#### **Leistungsnachweis**

practical problem-based coursework, mostly done in group work. Final individual project-based report.

**B. Fröhlich, S. Mühlhaus, E. Schott, T. Zöppig**

Veranst. SWS: 4

Vorlesung

Do, wöch., 15:15 - 16:45, Schwanseestraße 143 - Seminarraum 2.16, Lecture, ab 13.10.2022

Fr, wöch., 09:15 - 10:45, Übung Gruppe A VR-Lab, R.1.10, S143, ab 14.10.2022

Fr, Einzel, 09:15 - 10:45, 14.10.2022 - 14.10.2022

Fr, wöch., 11:00 - 12:30, Übung Gruppe B VR-Lab, R.1.10, S143, ab 14.10.2022

Mi, Einzel, 10:00 - 12:30, Marienstraße 13 C - Hörsaal A, written exam, 10:00-12:00 a.m., 22.03.2023 - 22.03.2023

**Beschreibung**

Virtual Reality (VR) erfreut sich seit mehreren Jahren großer Beliebtheit in Forschung, Unterhaltung und Bildung. VR-Systeme ermöglichen die Interaktion einer oder mehrerer Benutzerinnen mit einer computersimulierten Umgebung, welche dreidimensional auf einem stereoskopischen Display dargestellt wird. In diesem Kurs lernen Sie die theoretischen, technischen und angewandten Grundlagen moderner Virtual Reality-Systeme genauer kennen.

Die Vorlesung beginnt mit den Grundlagen der Computergrafik und des stereoskopischen Sehens, welche zur Realisierung von VR-Anwendungen erforderlich sind. Danach werden Sie verschiedene 3D-Eingabegeräte und 3D-Interaktionstechniken wie Selektion, Manipulation und Navigation in virtuellen Umgebungen kennenlernen. Der letzte Teil des Kurses baut auf dem bereits erworbenen Wissen auf und konzentriert sich auf kollaborative VR-Systeme für mehrere am gleichen oder an verschiedenen Orten befindliche Benutzerinnen.

Die Vorlesung wird von Laborveranstaltungen begleitet, welche neueste Virtual Reality-Technologien wie Multi-Viewer-3D-Projektionssysteme und hochauflösende Head-Mounted Displays einsetzen. Im Rahmen der Übungsaufgaben werden Sie verschiedene 3D-Interaktionstechniken mit diesen immersiven Displays sowie räumlichen Trackingsystemen und 3D-Eingabegeräten implementieren und auswerten. Je nach Situation können Sie auch von zu Hause aus an den Übungen arbeiten. Wir versuchen ausreichend Hardware dafür zur Verfügung zu stellen.

**Bemerkung**

Digital Engineering or MediaArchitecture students may also attend this lecture if they have already acquired the necessary programming skills through successful completion of appropriate courses and are able to demonstrate their skills at the beginning of the lab course. If you are interested in attending this course, please contact Prof. Fröhlich or one of his staff members named above.

**Voraussetzungen**

Basic knowledge of computer graphics is recommended. Fundamental programming skills are required.

Digital Engineering or MediaArchitecture students may also attend this lecture if they have already acquired the necessary programming skills through successful completion of appropriate courses and are able to demonstrate their programming skills at the beginning of the lab course. If you are interested in attending this course, please contact Prof. Fröhlich or one of his teaching assistants named above.

**Leistungsnachweis**

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

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

**4556233 Computer Graphics II: Fundamentals of Imaging****C. Wüthrich, F. Andreussi**

Veranst. SWS: 4

Vorlesung

Do, wöch., 13:30 - 15:00, Vorlesung, ab 13.10.2022  
 Fr, wöch., 15:15 - 16:45, Marienstraße 13 C - Hörsaal A, Übung, ab 14.10.2022

### Beschreibung

Algorithmen und Datenstrukturen

### engl. Beschreibung/ Kurzkomentar

Computer Graphics II: Fundamentals of Imaging

In Computer Graphics, and also in Image processing and in Design, professionals are used to speak about "better" or "worse" quality for pictures. Contrary to popular belief, however, there is no general method for analyzing the quality of picture. The course will start with a wide introduction to light transport and reflection theory, continue with a trip through digital and analogue image capture and reproduction and a survey of image compression methods. In its last part the course will focus on methods for evaluating the quality of pictures and of animated sequences, revealing advantages and disadvantages of different display and printing techniques and of the different compression methods.

### Leistungsnachweis

Beleg, Klausur

oral exam, individual appointments via Moodle

## Electives

### 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



**4556228 Virtual Reality****B. Fröhlich, S. Mühlhaus, E. Schott, T. Zöppig**

Veranst. SWS: 4

Vorlesung

Do, wöch., 15:15 - 16:45, Schwannseestraße 143 - Seminarraum 2.16, Lecture, ab 13.10.2022

Fr, wöch., 09:15 - 10:45, Übung Gruppe A VR-Lab, R.1.10, S143, ab 14.10.2022

Fr, Einzel, 09:15 - 10:45, 14.10.2022 - 14.10.2022

Fr, wöch., 11:00 - 12:30, Übung Gruppe B VR-Lab, R.1.10, S143, ab 14.10.2022

Mi, Einzel, 10:00 - 12:30, Marienstraße 13 C - Hörsaal A, written exam, 10:00-12:00 a.m., 22.03.2023 - 22.03.2023

**Beschreibung**

Virtual Reality (VR) erfreut sich seit mehreren Jahren großer Beliebtheit in Forschung, Unterhaltung und Bildung. VR-Systeme ermöglichen die Interaktion einer oder mehrerer Benutzerinnen mit einer computersimulierten Umgebung, welche dreidimensional auf einem stereoskopischen Display dargestellt wird. In diesem Kurs lernen Sie die theoretischen, technischen und angewandten Grundlagen moderner Virtual Reality-Systeme genauer kennen.

Die Vorlesung beginnt mit den Grundlagen der Computergrafik und des stereoskopischen Sehens, welche zur Realisierung von VR-Anwendungen erforderlich sind. Danach werden Sie verschiedene 3D-Eingabegeräte und 3D-Interaktionstechniken wie Selektion, Manipulation und Navigation in virtuellen Umgebungen kennenlernen. Der letzte Teil des Kurses baut auf dem bereits erworbenen Wissen auf und konzentriert sich auf kollaborative VR-Systeme für mehrere am gleichen oder an verschiedenen Orten befindliche Benutzerinnen.

Die Vorlesung wird von Laborveranstaltungen begleitet, welche neueste Virtual Reality-Technologien wie Multi-Viewer-3D-Projektionssysteme und hochauflösende Head-Mounted Displays einsetzen. Im Rahmen der Übungsaufgaben werden Sie verschiedene 3D-Interaktionstechniken mit diesen immersiven Displays sowie räumlichen Trackingsystemen und 3D-Eingabegeräten implementieren und auswerten. Je nach Situation können Sie auch von zu Hause aus an den Übungen arbeiten. Wir versuchen ausreichend Hardware dafür zur Verfügung zu stellen.

**Bemerkung**

Digital Engineering or MediaArchitecture students may also attend this lecture if they have already acquired the necessary programming skills through successful completion of appropriate courses and are able to demonstrate their skills at the beginning of the lab course. If you are interested in attending this course, please contact Prof. Fröhlich or one of his staff members named above.

**Voraussetzungen**

Basic knowledge of computer graphics is recommended. Fundamental programming skills are required.

Digital Engineering or MediaArchitecture students may also attend this lecture if they have already acquired the necessary programming skills through successful completion of appropriate courses and are able to demonstrate their programming skills at the beginning of the lab course. If you are interested in attending this course, please contact Prof. Fröhlich or one of his teaching assistants named above.

**Leistungsnachweis**

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

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

## 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

## 422250025 Research Seminar: Affective Computing (Part 1)

**J. Ehlers**

Veranst. SWS: 3

Seminar

Di, wöch., 11:00 - 12:30, Schwanseestraße 143 - Seminarraum 3.09, ab 11.10.2022

### Beschreibung

Physiological computing (and its sub-discipline Affective Computing) applies data from the body's periphery (brain waves, skin conductance changes, pupil dynamics, heart rate variability etc.) to generate user-state representations and enable computer systems to dynamically adapt to changes in cognitive and/or affective processing. However, research usually focuses on controlled environments and certified measuring devices. The two-part research seminar aims to explore techniques to apply physiological/affective computing in daily scenarios via adapted instruments and to compare the results to findings from experimental lab studies. Students are asked to form small working groups and tackle (self-chosen) research questions by collecting and analysing physiological data from different experimental settings.

Part 1 of the seminar primarily addresses lab studies and established recording devices (e.g. eye-tracker) to understand principles of information processing in physiological systems. Part 2 (summer semester 2023) adapts prior research questions by carrying out data collection in noisy environments and on basis of customized instruments (e.g. smart phones, web cams).

Students are welcome to attend both parts of the research seminar, however, it is possible to participate only in either one of the courses.

### Voraussetzungen

The number of participants in the research seminar is limited to 25.

Please enroll via Email to Jan Ehlers (jan.ehlers@uni-weimar.de); **registration is open from Friday, 7th of October, 2pm and closes Monday, 10th of October, 2pm**. Applications will be considered in the order in which they are received. Registrations before or afterwards will not be taken into account.

**Leistungsnachweis**

Empirical report

**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

**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

### 4447556 Digital Watermarking and Steganography

#### A. Jakoby

Veranst. SWS: 4

Vorlesung

Di, wöch., 09:15 - 10:45, Lecture, ab 11.10.2022

Mo, wöch., 17:00 - 18:30, Schwanseestraße 143 - Seminarraum 2.16, Lab class , ab 17.10.2022

Mi, Einzel, 10:00 - 11:30, Schwanseestraße 143 - Seminarraum 3.09, oral exams (indiv. appointments), 22.02.2023 - 22.02.2023

Do, Einzel, 14:00 - 17:00, Schwanseestraße 143 - Seminarraum 3.09, oral exams (indiv. appointments), 23.02.2023 - 23.02.2023

Di, Einzel, 10:00 - 18:00, Schwanseestraße 143 - Seminarraum 3.09, oral exams (indiv. appointments), 21.03.2023 - 21.03.2023

Do, Einzel, 13:00 - 18:00, Schwanseestraße 143 - Seminarraum 3.09, oral exams (indiv. appointments), 23.03.2023 - 23.03.2023

#### Beschreibung

Digitale Wasserzeichen und Steganography

Digitale Wasserzeichen dienen dazu Nachrichten zu einer Bild-, Audio- oder Videodatei innerhalb dieser Datei selber abzulegen. Ein zentrales Ziel der hierzu verwendeten Verfahren ist es, sicherzustellen, dass die eingebetteten Informationen nicht wieder entfernt werden können. Solche Nachricht können dazu herangezogen werden, um zusätzliche Informationen über den Inhalt der Medien selbst zu liefern, so zum Beispiel bestehende Urheberrechte. Digitale Wasserzeichen sollen daher lesbarer oder zumindest nachweisbar sein. Jedoch sollen sie nur mit erheblichen Aufwand wieder zu entfernen sein.

In der Steganographie untersuchen wir Systeme, in denen die eingebetteten Informationen vollständig für Unbefugte versteckt werden soll. Selbst die Tatsache, dass eine Mediendatei eine versteckte Botschaft enthält, soll für Unbefugte nicht zu beobachten sein. Somit ist es durch Verwendung eines solchen Systems möglich, dass zwei Personen Informationen austauschen, ohne dass eine dritte Person die Kommunikation detektieren kann.

In dieser Vorlesung werden wir grundlegende Konzepte, Methoden und Anwendungen der digitalen Wasserzeichen und Steganographie vorstellen und analysieren.

#### engl. Beschreibung/ Kurzkomentar

Digital Watermarking and Steganography

Digital watermarking is the practice of hiding a message about an image, audio clip, video clip, or other work of media within that work itself. One goal of the used methods is to ensure that the message cannot be removed after it is embedded in the media. Thus, systems can use such a message to provide additional information of the content of the media itself, e.g. copyrights. Digital watermarks have to be readable or detectable, but they should be hard to remove from the content.

In steganography we investigate systems where the embedded information is completely hidden for unauthorized parties. Even the fact that a media file contains a hidden message should be hidden. Thus, by using such a system two parties can communicate in such a way that a third party cannot detect the communication.

In this lecture we will introduce some basic concepts, methods and applications of digital watermarking and steganography.

#### Voraussetzungen

BSc in a relevant study field

### Leistungsnachweis

oral examination

## 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 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 - 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 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.

**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

### **4556216 Ubiquitous Computing**

**E. Hornecker, B. Schulte**

Veranst. SWS: 4

Vorlesung

Di, wöch., 15:15 - 16:45, Karl-Haußknecht-Straße 7 - Hörsaal (IT-AP), Lab class / first lecture (October 11th, 2022) , ab 11.10.2022

Mo, wöch., 13:30 - 15:00, Schwanseestraße 143 - Seminarraum 2.16, Lecture, ab 17.10.2022

#### **Beschreibung**

The course explores advanced topics in HCI, presenting and reflecting on the concerns, perspectives and interdisciplinary nature of this area. We will look at new and emerging technologies and the issues they entail. These technologies move beyond 'traditional' computing concerns, in particular by going from the desktop into the world [ubiquitous computing], moving from the workplace to the home and other settings [e.g., domestic, public spaces], from purely functional to ludic concerns [e.g. home entertainment, pervasive games], and from digital to digital-physical systems [tangible computing, IoT].

The course covers technical aspects as well as user-centered design, concept prototyping and evaluation methods relevant for Ubiquitous Computing, and a discussion of broader societal and value-related concerns (e.g. privacy, security, user agency versus ambient intelligence).

Successful students should be able to

- discuss the diverse and emergent areas within UbiComp technologies and the issues they entail

- develop concepts for UbiComp applications that are appropriate for a given use context and illustrate these (sketching, video prototyping, Wizard of Oz) as well as determine their technical feasibility
- be able to reflect on practical experiences engaging with some of these technologies from a user-centred perspective
- understand the technical functioning of example UbiComp technologies
- choose and give a rationale for appropriate user-centered design methods for example application problems
- critically assess societal implications and discuss design trade-offs of UbiComp applications.
- understand complex issues from the HCI and UbiComp research literature, in particular, to summarize literature and to discuss it

Note: This course is offered biannually

#### Introductory Literature:

- Ubiquitous Computing Fundamentals. Ed. John Krumm. ISBN: 1420093606. Chapman & Hall/CRC 2009.
- Harper, Rodden, Rogers, Sellen (eds.). Being Human: Human-Computer Interaction in the Year 2020. Microsoft Research Ltd 2008

Rowland et al. Modern User Interfaces for Ubicomp Systems. O'Reilly 2015

#### Bemerkung

Takes place bi-annual / every 2 years

(can be used to replace the 'HCI Methods and Theory' in 'the Advanced HCI' module for the HCI Master)

#### Voraussetzungen

**Compulsory registration via Bison portal.**

**Registration period: October 6th - October 9th, 2022.**

You will be informed about the admission by email , on October 10th.

#### Leistungsnachweis

practical problem-based coursework, mostly done in group work. Final individual project-based report.

### 4556233 Computer Graphics II: Fundamentals of Imaging

**C. Wüthrich, F. Andreussi**

Veranst. SWS: 4

Vorlesung

Do, wöch., 13:30 - 15:00, Vorlesung, ab 13.10.2022

Fr, wöch., 15:15 - 16:45, Marienstraße 13 C - Hörsaal A, Übung, ab 14.10.2022

#### Beschreibung

Algorithmen und Datenstrukturen

**engl. Beschreibung/ Kurzkomentar**

## Computer Graphics II: Fundamentals of Imaging

In Computer Graphics, and also in Image processing and in Design, professionals are used to speak about "better" or "worse" quality for pictures. Contrary to popular belief, however, there is no general method for analyzing the quality of picture. The course will start with a wide introduction to light transport and reflection theory, continue with a trip through digital and analogue image capture and reproduction and a survey of image compression methods. In its last part the course will focus on methods for evaluating the quality of pictures and of animated sequences, revealing advantages and disadvantages of different display and printing techniques and of the different compression methods.

### Leistungsnachweis

Beleg, Klausur

oral exam, individual appointments via Moodle

## Project

### 422210005 A touch of data. Designing haptic data physicalisations of personal data.

**E. Hornecker, R. Koningsbruggen, H. Waldschütz**  
Projekt

Veranst. SWS: 10

### Beschreibung

Since the beginning of times, people have been generating data. From cave-paintings and books, to our current smart devices, data play and have played a quintessential role in our everyday lives. Similarly, people have been creating physical data representations –called data physicalisations– for thousands of years. Yet, despite the long and rich history of our data, we have a very one-dimensional view of what counts as data (mostly numerical values) and how to portray them (in easy-to-understand visualisations). However, does this focus on the quantitative and easy-to-understand suit our personal data?

In this project we will be exploring the personal data in our lives and how to represent them through data physicalisation. We especially focus on data physicalisations which need to be touched or interacted with, in order to 'get' the data (haptic data physicalisation). Using this type of data representation, we will be exploring the qualitative aspects of data and the user experience of interacting with them.

Following a Research through Design (RtD) approach, this project will challenge you to explore the haptic qualities of personal data. To do so, this project starts with Data Diaries, a series of hands-on exercises in which you have to collect personal data and represent them. From the Data Diaries, you will be challenged to create a haptic data physicalisation of personal data and develop this within a small team. This means conceptualising, designing, and building a physical prototype.

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. Students will focus on research topics such as "qualitative data representations", "data physicalisations", "data feminism", "affordances", "shape-changing interfaces", and "ambient/peripheral interfaces". We encourage students to participate that have a high interest in prototyping with hardware (e.g., Arduino), working with materials (e.g., wood or silicone), or using traditional fabrication techniques (e.g., origami-folding). The project is most suited for students who want 18 ECTS.

### Bemerkung

time and place to be announced at the project fair.

### Voraussetzungen

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



Students of Product Design, Media Architecture and Media Art and Design: Please apply until 10.10.2022 11h a.m. by sending an email to [eva.hornecker@uni-weimar.de](mailto:eva.hornecker@uni-weimar.de), [hannes.waldschuetz@uni-weimar.de](mailto:hannes.waldschuetz@uni-weimar.de), and [rosa.donna.van.koningsbruggen@unu-weimar.de](mailto:rosa.donna.van.koningsbruggen@unu-weimar.de) (please include a description of your prior experience in relevant areas or a portfolio). We'll let you know until Tuesday 11, if you can attend the project.

### Leistungsnachweis

Active participation and interim presentations, practical problem-based work (both individual and in groups), and a project-based report.

## 422210006 Automatic Image Captioning

**B. Stein, T. Gollub, J. Kiesel**  
Projekt

Veranst. SWS: 10

### 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

## 422210007 Bauhaus Gamesfabrik

**C. Wüthrich, W. Kissel, G. Pandolfo**  
Projekt

Veranst. SWS: 10

### Beschreibung

"Bauhaus Gamesfabrik" ist ein interdisziplinäres Projekt zwischen Studierende der Fakultät K&G und der Fakultät Medien, dass sich in diesem Jahr mit der praktischen Entwicklung von Computerspielen (auch analogen Spielformaten) befasst.

### 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.

### 422210008 Keep your eyes on the road: Comparing visual exploration behaviour in real-life scenarios and virtual reality

**J. Ehlers**

Projekt

Veranst. SWS: 10

#### Bemerkung

Time and place to be announced at the project fair.

#### Voraussetzungen

We assume you are interested in conducting empirical studies on visual exploration behaviour in traffic situations. (Basic) Programming skills, especially in Python, are a precondition; knowledge of quantitative research and the experimental method is helpful.

#### Leistungsnachweis

Project members are asked to implement experimental designs and carry out eye-tracking studies on basis of a wearable device as well as through built-in techniques of a VR-System . Results need to be statistically tested and documented in a lab report.

### 422210009 Non-Photorealistic Rendering for Volumetric Avatars

**B. Fröhlich, A. Kreskowski, A. Lammert, G. Rendle**

Projekt

Veranst. SWS: 10

#### Beschreibung

Volumetric avatars are real-time 3D reconstructions that allow users of Virtual Reality (VR) systems to be accurately represented in a virtual environment. By fusing colour and depth contributions from RGBD cameras, one can produce volumetric avatar streams that allow rich communication between users in the virtual environment, conveying fluid full-body motions and gestures and facial expressions.

While photo-realism is a desirable characteristic of volumetric avatars in many use cases, there are some contexts in which detailed reconstructions may be unsuitable or unnecessary. For example, virtual environments are often simplified versions of real rooms, where photo-realistic avatars may appear incongruent, making the VR experience less plausible. Moreover, high-resolution textures increase bandwidth requirements when transmitting avatar streams. To address this, parts of the avatar could be textured with a reduced, cartoon-like colour palette.

In these cases, a family of techniques known as Non-Photorealistic Rendering (NPR) techniques could prove useful. NPR techniques do not attempt to simulate the real world in as much detail as possible, but are instead designed to represent objects in an abstract manner. Depending on the context, their aim may be to improve understanding and recognition of surface features, to reveal hidden parts of an object, or to create visually consistent artistic styles. As part of the NPR4VR project in summer semester 2022, we investigated how different NPR effects can be applied to 3D geometry in stereoscopic viewing contexts.

In this project, we will:

- review NPR literature to find NPR techniques suitable for application to volumetric avatar streams
- implement a selection of NPR techniques in Unity, using hand-crafted shader pipelines and Unity's abstract graphics API, and apply them to real-time avatar data
- plan and execute a user study in VR to assess the perceived effect of the non-photorealistic volumetric avatar techniques

You will:

- Get hands-on experience with Unity
- Learn about NPR techniques
- Gain experience in carrying out user studies in VR

Do you want to create compelling NPR effects for application to volumetric avatars? Do you want to dive into illustrative rendering and graphics programming within Unity? Do you have at least a general understanding of rasterization-based rendering pipelines?

#### Bemerkung

time and place: t.b.a.

#### Voraussetzungen

Solide Programmierkenntnisse in C# oder C++, Erfahrung im Bereich der Echtzeit-Computergrafik und Shader-Programmierung ist hilfreich.

#### Leistungsnachweis

Produktive Teilnahme an den Projekttreffen, Implementierung und Evaluierung kleiner Softwaremodule, Zwischen- & Endpräsentation

### 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**  
Projekt

Veranst. SWS: 10

**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 questionnaire (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

### 422210013 Rearranging Pixels IX

**C. Wüthrich, F. Andreussi**  
Projekt

Veranst. SWS: 10

**Beschreibung**

Since the introduction of digital cameras, computer raster monitors and printing devices, the world of pixels has been ordered on a square based raster, limiting optimal signal sampling to two main directions, and creating collateral problems where the grid density causes undersampling of the light signal. This project will tackle the problem, exploring new and unconventional ways of sampling light signals. The focus will be set on the development of new robust methods and on their evaluation, and compare traditional square sampling to the new methods. The conception and development of new devices will be a major focus of the project.

**Bemerkung**

Time and place will be announced at the project fair.

### 422210014 So Tell Me Why - Investigating Personalized Argument Search

**B. Stein, J. Kiesel, N.N.**  
Projekt

Veranst. SWS: 10

**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

## **422210015 Squeezing Texts: Visual Analysis of the Manual Annotation Processes**

**B. Fröhlich, D. Kiesel, G. Rendle, P. Riehm**

Veranst. SWS: 10

Projekt

### **Beschreibung**

In this project, we are going to visualize and analyze ongoing text annotation processes conducted with students of the political sciences. Students will perform annotations during annotation scheme development and in a seminar at the European University Viadrina Frankfurt (Oder).

### **Who?**

Instructors and participants of the seminar at the European University Viadrina will use the developed system to analyze their manual annotation process and squeeze the most out of the given texts.

### **What?**

Starting from annotation data gathered already during annotation scheme development, we will design and implement new visualizations that aid in analyzing the annotations: their associated text and position, layers, categories, and relations as well as the annotators' uncertainty.

### **Why?**

The ultimate goal of the project would be:

- to support the supervisors of the annotation process in keeping track of the annotators' results by visually encoding typical measures like inter-annotator reliability or Cohen's Kappa
- to enhance the communication between supervisors and annotators about the general results, common mistakes and misconceptions, and best practices to improve the discourse quality overall
- to gain insights about the (temporal) meta-information captured during the annotation process itself in order to derive conclusions about working patterns and how they may be related to annotation quality

### **How?**

The derived visualization designs will use Python for data preparation and database access. The visual encoding and interface will be implemented in Javascript which allows the smooth integration into an existing web application.

**Bemerkung**

time and place: t.b.a.

**Voraussetzungen**

Solid programming skills in Javascript und Python, successful completion of the visualization lecture

**Leistungsnachweis**

Productive participation in project meetings, implementation of data flow and visualizations, mid-term & final presentations.

### 422210016 Text2Graph - Extracting Knowledge Graph Relations from Short Texts

**B. Stein, M. Gohsen, J. Kiesel, M. Wiegmann**  
Projekt

Veranst. SWS: 10

**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 knowledge. 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

### 422210024 BlueP II - The Truth behind Matrix II: The Blue Pill and Virtual Machines

**A. Jakoby, R. Adejoh**  
Projekt

**Bemerkung**

Time and place to be announced at the project fair.

### 422210025 Gigapixels of Perfectly Calibrated Vision

**V. Rodehorst, A. Frolov**  
Projekt

Mi, gerade Wo, 15:15 - 16:45, Schwannseestraße 143 - Seminarraum 3.09, ab 02.11.2022

Di, Einzel, 15:15 - 17:00, Schwannseestraße 143 - Seminarraum 3.09, 15.11.2022 - 15.11.2022

Fr, Einzel, 13:30 - 15:00, Schwannseestraße 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

## **422210026 Hidden Knowledge of Stammbücher**

**A. Jakoby, M. Wolska**

Projekt

### **Bemerkung**

Time and place to be announced at the project fair.

## **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

**422210029 Measurement and Optimization of Sustainability for Companies****A. Jakoby, J. Ehlers**

Projekt

**Bemerkung**

Time and place to be announced at the project fair.

**Specialization****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

### 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

### 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

**4447556 Digital Watermarking and Steganography****A. Jakoby**

Veranst. SWS: 4

Vorlesung

Di, wöch., 09:15 - 10:45, Lecture, ab 11.10.2022

Mo, wöch., 17:00 - 18:30, Schwanseestraße 143 - Seminarraum 2.16, Lab class , ab 17.10.2022

Mi, Einzel, 10:00 - 11:30, Schwanseestraße 143 - Seminarraum 3.09, oral exams (indiv. appointments), 22.02.2023 - 22.02.2023

Do, Einzel, 14:00 - 17:00, Schwanseestraße 143 - Seminarraum 3.09, oral exams (indiv. appointments), 23.02.2023 - 23.02.2023

Di, Einzel, 10:00 - 18:00, Schwanseestraße 143 - Seminarraum 3.09, oral exams (indiv. appointments), 21.03.2023 - 21.03.2023

Do, Einzel, 13:00 - 18:00, Schwanseestraße 143 - Seminarraum 3.09, oral exams (indiv. appointments), 23.03.2023 - 23.03.2023

**Beschreibung**

Digitale Wasserzeichen und Steganography

Digitale Wasserzeichen dienen dazu Nachrichten zu einer Bild-, Audio- oder Videodatei innerhalb dieser Datei selber abzulegen. Ein zentrales Ziel der hierzu verwendeten Verfahren ist es, sicherzustellen, dass die eingebetteten Informationen nicht wieder entfernt werden können. Solche Nachricht können dazu herangezogen werden, um zusätzliche Informationen über den Inhalt der Medien selbst zu liefern, so zum Beispiel bestehende Urheberrechte. Digitale Wasserzeichen sollen daher lesbarer oder zumindest nachweisbar sein. Jedoch sollen sie nur mit erheblichen Aufwand wieder zu entfernen sein.

In der Steganographie untersuchen wir Systeme, in denen die eingebetteten Informationen vollständig für Unbefugte versteckt werden soll. Selbst die Tatsache, dass eine Mediendatei eine versteckte Botschaft enthält, soll für Unbefugte nicht zu beobachten sein. Somit ist es durch Verwendung eines solchen Systems möglich, dass zwei Personen Informationen austauschen, ohne dass eine dritte Person die Kommunikation detektieren kann.

In dieser Vorlesung werden wir grundlegende Konzepte, Methoden und Anwendungen der digitalen Wasserzeichen und Steganographie vorstellen und analysieren.

**engl. Beschreibung/ Kurzkomentar**

Digital Watermarking and Steganography

Digital watermarking is the practice of hiding a message about an image, audio clip, video clip, or other work of media within that work itself. One goal of the used methods is to ensure that the message cannot be removed after it is embedded in the media. Thus, systems can use such a message to provide additional information of the content of the media itself, e.g. copyrights. Digital watermarks have to be readable or detectable, but they should be hard to remove from the content.

In steganography we investigate systems where the embedded information is completely hidden for unauthorized parties. Even the fact that a media file contains a hidden message should be hidden. Thus, by using such a system two parties can communicate in such a way that a third party cannot detect the communication.

In this lecture we will introduce some basic concepts, methods and applications of digital watermarking and steganography.

### Voraussetzungen

BSc in a relevant study field

### Leistungsnachweis

oral examination

## 4556216 Ubiquitous Computing

**E. Hornecker, B. Schulte**

Veranst. SWS: 4

Vorlesung

Di, wöch., 15:15 - 16:45, Karl-Haußknecht-Straße 7 - Hörsaal (IT-AP), Lab class / first lecture (October 11th, 2022) , ab 11.10.2022

Mo, wöch., 13:30 - 15:00, Schwanseestraße 143 - Seminarraum 2.16, Lecture, ab 17.10.2022

### Beschreibung

The course explores advanced topics in HCI, presenting and reflecting on the concerns, perspectives and interdisciplinary nature of this area. We will look at new and emerging technologies and the issues they entail. These technologies move beyond 'traditional' computing concerns, in particular by going from the desktop into the world [ubiquitous computing], moving from the workplace to the home and other settings [e.g., domestic, public spaces], from purely functional to ludic concerns [e.g. home entertainment, pervasive games], and from digital to digital-physical systems [tangible computing, IoT].

The course covers technical aspects as well as user-centered design, concept prototyping and evaluation methods relevant for Ubiquitous Computing, and a discussion of broader societal and value-related concerns (e.g. privacy, security, user agency versus ambient intelligence).

Successful students should be able to

- discuss the diverse and emergent areas within UbiComp technologies and the issues they entail
- develop concepts for UbiComp applications that are appropriate for a given use context and illustrate these (sketching, video prototyping, Wizard of Oz) as well as determine their technical feasibility
- be able to reflect on practical experiences engaging with some of these technologies from a user-centred perspective
- understand the technical functioning of example UbiComp technologies
- choose and give a rationale for appropriate user-centered design methods for example application problems
- critically assess societal implications and discuss design trade-offs of UbiComp applications.
- understand complex issues from the HCI and UbiComp research literature, in particular, to summarize literature and to discuss it

Note: This course is offered biannually

**Introductory Literature:**

- Ubiquitous Computing Fundamentals. Ed. John Krumm. ISBN: 1420093606. Chapman & Hall/CRC 2009.
- Harper, Rodden, Rogers, Sellen (eds.). Being Human: Human-Computer Interaction in the Year 2020. Microsoft Research Ltd 2008

Rowland et al. Modern User Interfaces for Ubicomp Systems. O'Reilly 2015

**Bemerkung**

Takes place bi-annual / every 2 years

(can be used to replace the 'HCI Methods and Theory' in 'the Advanced HCI' module for the HCI Master)

**Voraussetzungen**

**Compulsory registration via Bison portal.**

**Registration period: October 6th - October 9th, 2022.**

You will be informed about the admission by email , on October 10th.

**Leistungsnachweis**

practical problem-based coursework, mostly done in group work. Final individual project-based report.

## 4556233 Computer Graphics II: Fundamentals of Imaging

**C. Wüthrich, F. Andreussi**

Veranst. SWS: 4

Vorlesung

Do, wöch., 13:30 - 15:00, Vorlesung, ab 13.10.2022

Fr, wöch., 15:15 - 16:45, Marienstraße 13 C - Hörsaal A, Übung, ab 14.10.2022

**Beschreibung**

Algorithmen und Datenstrukturen

**engl. Beschreibung/ Kurzkomentar**

Computer Graphics II: Fundamentals of Imaging

In Computer Graphics, and also in Image processing and in Design, professionals are used to speak about "better" or "worse" quality for pictures. Contrary to popular belief, however, there is no general method for analyzing the quality of picture. The course will start with a wide introduction to light transport and reflection theory, continue with a trip through digital and analogue image capture and reproduction and a survey of image compression methods. In its last part the course will focus on methods for evaluating the quality of pictures and of animated sequences, revealing advantages and disadvantages of different display and printing techniques and of the different compression methods.

**Leistungsnachweis**

Beleg, Klausur

oral exam, individual appointments via Moodle