

Vorlesungsverzeichnis

M.Sc. Human-Computer Interaction

WiSe 2023/24

Stand 18.10.2023

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M.Sc. Human-Computer Interaction

Faculty Welcome for Master's Students Human-Computer Interaction

Monday, 9th October 2023, 10 a.m., Schwannseestraße 143, room 3.31

Project fair

Monday, 9th October 2023, 5 p.m., Steubenstraße 6, Audimax

Advanced HCI

4345590 HCI Theory and Research Methods

E. Hornecker, R. Koningsbruggen, M. Osipova

Veranst. SWS: 4

Vorlesung

Di, wöch., 15:15 - 16:45, Karl-Haußknecht-Straße 7 - Hörsaal (IT-AP), ab 10.10.2023

Mo, wöch., 13:30 - 15:00, Karl-Haußknecht-Straße 7 - Hörsaal (IT-AP), lecture, ab 16.10.2023

Beschreibung

The course introduces students to the different types of research methods commonly used within HCI research, from quantitative experimental studies to qualitative research methods and mixed method strategies, and present case studies as examples illustrating the use of these methods. As these methods all come from different directions, it provides an overview of the different (interdisciplinary) perspectives within HCI. The focus of this course is on qualitative methodologies and what is important for these both on a practical and theoretical-conceptual level.

Students will get to know a variety of methodological approaches (interviews, observation, questionnaires, ethnography, field studies, diary studies, experience sampling) and gain practical experience in utilizing a selection of these methods through practical assignments and mini-projects, and through work with the research literature. They will further learn about different data analysis strategies, gain an understanding of the different quality criteria inherent to qualitative versus quantitative style research, and of how to productively combine qualitative and quantitative methods in a research strategy.

The course will furthermore show how the role of theory in HCI has expanded from the early days of human factors and mathematical modelling of behaviour to include explanatory and generative theories, which reflect influences from fields such as design, sociology, and ethnography.

Successful students should be able to

- appreciate the diversity of research methods and relate them to research paradigms and theory
- select research methods appropriate to the domain and research question, based on an understanding of the characteristics, strengths and weaknesses, and practical demands of methods
- reflect on ethical aspects of study design
- utilize a range of HCI research methods and approaches to investigate a research question
- design, plan, and organize user studies and interpret the data

- report and present user studies and findings properly
- relate the role of theory in HCI to the expanding range of methodical approaches utilized for HCI research

engl. Beschreibung/ Kurzkomentar

The course will introduce students to the different types of research methods commonly used within HCI research in order to study and understand people, from quantitative experimental studies to qualitative research methods and mixed method strategies, and will present example case studies illustrating the use of these methods. The focus of this course lies on qualitative methods (e.g. interviews and observation) and qualitative data analysis (that is, approaches which do not rely on statistical analysis). You will gain practical experience in utilizing a selection of these methods through practical assignments and mini-projects, and will work with the research literature.

The course will furthermore provide an overview of how the role of theory in HCI has expanded from the early days of human factors and mathematical modelling of behaviour to include explanatory and generative theories, which reflect influences from fields such as design, sociology, and ethnography.

Successful students should be able to

- appreciate the diversity of research methods and relate them to research paradigms and theory
- select research methods appropriate to the domain and research question, based on an understanding of the characteristics, strengths and weaknesses, and practical demands of methods
- utilize a range of HCI research methods and approaches to investigate a research question
- report and present user studies and findings properly
- relate the role of theory in HCI to the expanding range of methodical approaches utilized for HCI research

Due to the current situation, the course will be taught online, with a Moodle page as main entry point where you find all further details and access to contents and sessions. Please prepare for a mix of synchronous teaching (where you need to be online at specific times) and asynchronous delivery.

We will start with recorded lectures, but might switch to live-lectures (if this proves to work out). We plan to run the practical sessions in real-time via University online platforms. We also plan a half-hour real-time check-in session per week for discussion and questions. Provided in-person teaching may be allowed again, we may do a few in-presence sessions later in the semester, if this does not leave out any of the participants.

Students need to organize themselves into small groups for assignments and should thus be able to communicate, at least remotely, with each other.

Bemerkung

Zeit und Ort werden zu Projektbörse bekannt gegeben!

Leistungsnachweis

practical assignments in group work, individual short mini-essays, and final practical mini-project (individually) with report (at end of semester).

Electives

4256303 Photogrammetric Computer Vision

V. Rodehorst, M. Kaisheva

Veranst. SWS: 4

Vorlesung

Mo, Einzel, 15:15 - 16:45, Marienstraße 13 C - Hörsaal C, 1.Lecture, 09.10.2023 - 09.10.2023

Mo, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal D, Lecture, ab 16.10.2023

Mo, wöch., 11:00 - 12:30, Marienstraße 13 C - Hörsaal D, Lab class, ab 16.10.2023

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

Die Einschreibung für den Moodle-Kurs fängt am 25. September 2023 an.

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, Schwanseestraße 143 - Seminarraum 2.16, Lecture, ab 12.10.2023

Fr, wöch., 09:15 - 10:45, Übung Gruppe A VR-Lab, R.1.10, S143, ab 13.10.2023

Fr, Einzel, 09:15 - 12:30, Schwanseestraße 143 - Seminarraum 3.09, first lab class, 13.10.2023 - 13.10.2023

Fr, wöch., 11:00 - 12:30, Übung Gruppe B VR-Lab, R.1.10, S143, ab 13.10.2023

Beschreibung

Virtual Reality (VR) erfreut sich seit mehreren Jahren großer Beliebtheit in Forschung, Unterhaltung und Bildung. VR-Systeme ermöglichen die Interaktion einer oder mehrerer Benutzer*innen mit einer computersimulierten Umgebung, welche dreidimensional auf einem stereoskopischen Display dargestellt wird. In dieser Veranstaltung 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 Benutzer*innen.

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 für diese immersiven Displays sowie unter Nutzung von räumlichen Trackingsystemen und 3D-Eingabegeräten implementieren und auswerten. Je nach Situation können Sie auch von zu Hause aus an den Übungen arbeiten.

Wir planen, ausgewählte Vorlesungen und Übungen direkt in virtueller Realität durchzuführen, um das Konzept „Teaching VR in VR“ zu testen. Dazu werden wir nach Möglichkeit alle Teilnehmer*innen mit HMDs ausstatten.

Bemerkung

Zeit und Ort werden zu Projektbörse bekannt gegeben!

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 B, Übungen, ab 20.10.2023

Mi, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal B, 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: **spatial23**

Leistungsnachweis

Erfolgreiche Bearbeitung der Übungen und des Projektes mit abschließender Klausur

323230005 Digital Culture in Design, Media and Architecture (Part 1)

J. Willmann, M. Braun, KuG

Veranst. SWS: 2

Wissenschaftliches Modul

Mo, wöch., 15:15 - 16:45, Marienstraße 13 C - Hörsaal A, 16.10.2023 - 29.01.2024

Beschreibung

Die Veranstaltung findet auf Englisch statt. Über die Sprachumschaltflagge (oben rechts) gelangen Sie zur englischsprachigen Beschreibung.

Bemerkung

Bitte beachten Sie die entsprechende Studienordnung.

323230006 Digital Culture in Design, Media and Architecture (Part 1): Exercise**M. Braun, J. Willmann, KuG**

Veranst. SWS: 2

Wissenschaftliches Modul

Mo, wöch., 17:00 - 18:30, Marienstraße 13 C - Hörsaal A, 16.10.2023 - 29.01.2024

Beschreibung

Die Veranstaltung findet auf Englisch statt. Über die Sprachumschaltflagge (oben rechts) gelangen Sie zur englischsprachigen Beschreibung.

Bemerkung

Bitte beachten Sie die entsprechende Studienordnung.

418260002 Security Engineering**S. Lucks, N. Lang, J. Leuther**

Veranst. SWS: 3

Vorlesung

Do, gerade Wo, 11:00 - 13:00, Marienstraße 13 C - Hörsaal A, Lab class, ab 19.10.2023

Mi, wöch., 11:00 - 12:30, Coudraystraße 13 A - Hörsaal 2, lecture

Beschreibung

Die Entwicklung sicherer und vertraulicher Systeme ist eine Herausforderung für System-Architekten als auch für Software-Entwickler. Die IT-Sicherheit wird durch das immer größer werdende Bewusstsein in der Politik und den Massenmedien zu einem stetig wachsenden und wichtigen Aspekt in der IT-Industrie.

In dieser Vorlesung wird die Programmiersprache Ada'05 (bzw. Ada'12) eingeführt, welche heutzutage als geeignete Sprache für die Implementierung sicherer und vertraulicher Systeme betrachtet wird.

Desweiteren werden Methoden aus dem Feld des Software-Engineering präsentiert, welche es ermöglichen, Software-Systeme sicher, vertraulich und benutzbar zu gestalten.

engl. Beschreibung/ Kurzkomentar

Security Engineering

The development of safe and reliable systems is a challenging task for both system architects and software developer.

Due to the raising awareness of the politics and mass media, IT-security is becoming an increasingly important aspect of the IT industry.

The course introduces the programming language Ada'05, which is considered particularly suitable for implementing secure and reliable systems. In addition, methods from the field of software engineering are presented, which serve the safety, reliability and maintainability of software systems.

Bemerkung

Zeit und Ort werden zu Projektbörse bekannt gegeben!

Leistungsnachweis

Mündliche Prüfung
Beleg als Voraussetzung zur Prüfungszulassung.

422250037 Formal Methods for Software Engineering

J. Ringert, .. Soaibuzzaman

Veranst. SWS: 4

Vorlesung

Di, wöch., 09:15 - 10:45, Schwannseestraße 143 - Seminarraum 3.09, Vorlesung, ab 10.10.2023

Fr, wöch., 11:00 - 12:30, ab 13.10.2023

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

Leistungsnachweis

Participation in exercises

Marked homework project including a presentation

4345600 Computer Graphics II: Computer Animation

C. Wüthrich, G. Pandolfo

Veranst. SWS: 3

Vorlesung

Mo, wöch., 15:15 - 16:45, Schwannseestraße 143 - Seminarraum 2.16, Lecture

Fr, wöch., 15:15 - 16:45, Marienstraße 13 C - Hörsaal D, Lab class

Beschreibung

Das Ziel der Veranstaltungen ist die interdisziplinäre Vermittlung ästhetischer und technischer Aspekte der Computergrafik und -Animation von der Theorie bis in die Praxis.

Die Veranstaltung besteht aus einer eigens für Medienkünstler / Gestalter entwickelten Vorlesung und einer Übung, in der Künstler und Informatiker interdisziplinär zusammen arbeiten können.

In der Vorlesung werden die Studenten mit den nötigen technischen Details versorgt.

Die Übung wird von M.F.A Gianluca Pandolfo geleitet und deckt sowohl technische als auch ästhetische Grundlagen ab (Modellieren, Rendern, Animieren). Gearbeitet wird mit Blender 3D. Ziel der Übung ist die Fertigstellung eines einminütigen 3D-Animationsfilms als finale Abgabe.

engl. Beschreibung/ Kurzkomentar

Computer Animation

Three-dimensional Computer Graphics and Computer Animation are now widely used in the Arts and in Design. Aim of this is to allow students to understand the modelling and rendering techniques used in common high level animation programs.

Successful students in this course should be able to conceive and produce a 3D animation and should be able to cooperate with Computer Scientists on a common 3D animation project, which might at times involve the specification of requirements for programming plugins for the animation system. At the end of the course they should master the steps required for the conception, design and rendering of a 3D animation software.

Leistungsnachweis

Beleg, Klausur

4439110 Introduction to Machine Learning

B. Stein, J. Bevendorff, J. Kiesel, N. Mirzakhmedova

Veranst. SWS: 3

Vorlesung

Do, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal A, Lecture , ab 19.10.2023

Do, unger. Wo, 11:00 - 13:00, Marienstraße 13 C - Hörsaal A, Lab class, ab 26.10.2023

Beschreibung

In this course students will learn to understand machine learning as a guided 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.

The lecture covers hypothesis spaces, model bias, regression for classification, logistic regression, effectiveness computation, loss function derivation, gradient descent, regularization, neural networks, decision trees, impurity functions, Bayesian learning. The lecture introduces concepts, algorithms, and theoretical backgrounds.

The accompanying lab treats both theoretical and applied tasks to deepen the understanding and hands-on experience of the field. Team work (2-3 students) is appreciated.

Bemerkung

Zeit und Ort werden zu Projektbörse bekannt gegeben!

Leistungsnachweis

Klausur

4446631 Online Computation

R. Adejoh, A. Jakoby

Veranst. SWS: 4

Vorlesung

Di, wöch., 11:00 - 12:30, Lecture, ab 10.10.2023

Do, wöch., 13:30 - 15:00, lab class, ab 12.10.2023

Beschreibung

Online Berechnungen

Online-Berechnung beschreibt ein Modell für Algorithmen und Probleme, die Entscheidung unter Unsicherheit erfordern. In einem Online-Problem hat der Algorithmus nicht den Zugriff auf die gesamte Eingangs von Anfang

an: die Eingabe erfolgt in einer Folge von Schritten. Ein Online-Algorithmus kann seine Berechnungen nur auf die beobachtete Vergangenheit beziehen, ohne dass gesichertes Wissen über die bevorstehende Folge in der Zukunft vorhanden ist. Die Auswirkungen einer Entscheidung können nicht rückgängig gemacht werden. Online Problemen und Algorithmen finden ihre Anwendung in vielen Bereichen, wie zum Beispiel:

- Datenstrukturen,
- Optimierungsprobleme,
- Geometrische Algorithmen,
- Parallele und verteilte Systeme,
- Planungsprobleme.

In der Vorlesung Online Berechnung, werden wir einige Online-Probleme und Algorithmen vorstellen und analysieren. Ferner werden einige grundlegende Methoden aus einigen aus den obigen Bereichen vorgestellt.

engl. Beschreibung/ Kurzkomentar

Online Computation

Online computation is a model for algorithms and problems which require decision under uncertainty. In an online problem the algorithm does not know the entire input from the beginning: the input is revealed in a sequence of steps. An online algorithm should make its computation based only on the observed past and without any secure knowledge about the forthcoming sequence in the future. The effects of a decision taken cannot be undone.

We find online problems and online algorithms within many areas, such as

- data structures,
- optimization problems,
- geometric algorithms,
- parallel and distributed systems,
- scheduling problems.

In the lecture Online Computation, we will present and analyze online problems and algorithms as well as some basic methods from some of these areas.

Voraussetzungen

BSc in a relevant study field

Leistungsnachweis

oral or written examination (depending on the number of students)

4447556 Digital Watermarking and Steganography

A. Jakoby

Vorlesung

Di, wöch., 09:15 - 10:45, Lecture, ab 10.10.2023

Mo, wöch., 17:00 - 18:30, Lab class , ab 16.10.2023

Veranst. SWS:

4

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 - 16:45, Consultations, R.218, S143 (indiv.appointments), ab 01.11.2023

Mi, wöch., 17:00 - 18:30, Schwannseestraße 143 - Seminarraum 3.09, Academic English Part I+II (alternating), ab 01.11.2023

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.

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 01.11.2023

Mi, wöch., 17:00 - 18:30, Academic English Part I+II alternating, ab 01.11.2023

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.

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

Symmetric Cryptography Conference

S. Lucks, N. Lang, J. Leuther

Veranst. SWS: 2

Seminar

Do, wöch., 17:00 - 18:30, Schwannseestraße 143 - Seminarraum 3.09, ab 19.10.2023

Beschreibung

Studierende bekommen eine Sammlung aktueller Veröffentlichung zu einem Thema im Bereich der symmetrischen Kryptographie.

Nach einer gemeinsamen Einarbeitung erarbeiten die Studierenden ihre ausgewählte Veröffentlichung selbstständig und erstellen eine Zusammenfassung sowie Präsentation darüber.

In einer Zwischenpräsentation im Semester kann Feedback eingeholt werden und die Struktur der Präsentation geübt werden.

Am Ende des Semesters (vorlesungsfreie Zeit) werden die Studierenden ihre Beiträge in einer „Konferenz“ vorstellen. Diese Mini-Konferenz ist so modelliert, wie es im wissenschaftlichen Forschungskontext üblich ist (inklusive reichlicher Kaffeepausen).

Das Seminar gibt neben der thematischen Auseinandersetzung mit einem spezifischen Thema einen Einblick in die wissenschaftliche Arbeitswelt, in der auch Selbstorganisation und Vernetzungen eine Rolle spielen.

Leistungsnachweis

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

Information Proc. & Pres.**Mobile HCI**

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 B, Übungen, ab 20.10.2023

Mi, wöch., 09:15 - 10:45, Marienstraße 13 C - Hörsaal B, 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: **spatial23**

Leistungsnachweis

Erfolgreiche Bearbeitung der Übungen und des Projektes mit abschließender Klausur

Projects

AI-Assisted Argumentative Writing

B. Stein, K. Heinrich, J. Kiesel, N. Mirzakhmedova

Projekt

Beschreibung

The goal of this project is to develop an AI-assisted argumentative writing system that helps users write well-supported argumentations.

The system will utilize a comprehensive database of arguments to identify relevant arguments covering different aspects and suggest these to the user.

By leveraging a large language model, the system will provide accurate and coherent suggestions while using the database to avoid the pitfall of "hallucinations" often found in such models.

The project offers an excellent opportunity for students to delve into the fields of natural language processing, large language models, argumentation theory, and user interface design. It encourages the exploration of advanced AI techniques to create a valuable tool that facilitates persuasive writing and critical thinking.

Bemerkung

Zeit und Ort werden zu Projektbörse bekannt gegeben!

Leistungsnachweis

Abschlusspräsentation und Ausarbeitung

Algorithmen: Anwendungen in der Praxis

A. Jakoby, R. Adejoh

Projekt

Beschreibung

mal sehen, welches Unternehmen kooperieren möchte

Bemerkung

Zeit und Ort werden zu Projektbörse bekannt gegeben!

Voraussetzungen

Progammung

A Nutrition Label for Social Media Feeds

B. Stein, T. Gollub

Projekt

Beschreibung

How healthy is your social media diet? In this project, we are developing a machine learning application that monitors a user's social media consumption.

The questions we want to answer are: How much social media am I consuming? What are the ingredients and how are they distributed? Am I consuming mostly informative or entertaining content? What feelings are evoked by the posts? Are the political opinions expressed diverse or one-sided?

Our application aims to enable users to better reflect on their social media usage habits and the content they consume.

Bemerkung

Zeit und Ort werden zu Projektbörse bekannt gegeben!

Leistungsnachweis

Abschlusspräsentation und Ausarbeitung

Applying Eye-based Measures for Cognition-Aware Systems (EyeCog)

J. Ehlers, N.N.

Projekt

Veranst. SWS:

10

Beschreibung

Physiological data can be applied to determine individual conditions and enable computer systems to adapt to changes during cognitive or affective processing. The current project aims to assess cognitive workload during different tasks through eye-related measures, including pupil size changes, blink frequency and eye-lid distance. We will review the relevant literature, discuss experimental designs and carry out empirical studies to differentiate the sensitivity of all parameters.

The project is organized in close cooperation with our external partner Soma Reality.

Bemerkung

Patricia Garatva, M.Sc.

Zeit und Ort werden zu Projektbörse bekannt gegeben!

Voraussetzungen

We assume you are interested to work yourself into different eye-tracking devices and carry out an empirical study to explore the sensitivity of eye-related measures for the assessment of cognitive load.

Leistungsnachweis

Project members need to become familiar with technical equipment that enables eye-tracking and cognitive pupillometry via webcams and certified devices.

They will be asked to carry out an empirical study, analyse behavioural and physiological data and document their findings in a report.

Bauhaus Gamesfabrik III

C. Wüthrich, W. Kissel, G. Pandolfo

Projekt

Veranst. SWS:

10

Mi, wöch., 13:30 - 15:30, Raum 205, Marienstr. 7b, ab 18.10.2023

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.

Studierende der Medieninformatik sollten Programmierkenntnisse mitbringen. Studierende der Medienwissenschaft ein grundlegendes Interesse für Storytelling / Game Design

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.

Challenging the SPHINCS

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.

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)

Leistungsnachweis

Zwischenpräsentationen, Abschlusspräsentation, Abschlussbericht.

Hot Topics in Computer Vision WiSe 23/24

V. Rodehorst, M. Kaisheva
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

Immersive Recordings for Game Design in Social Virtual Reality

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

Veranst. SWS: 20

Projekt

Beschreibung

Traditional 2D video content is widely used for purposes such as entertainment, knowledge transfer, and communication. Despite the broad range of applications and numerous advantages offered by 2D video recordings, there is a limitation that recorded scenes cannot be viewed from arbitrary perspectives. In contrast, immersive recordings, which capture events and interactions in virtual environments, provide the viewer with the opportunity to explore recorded interactions both temporally and spatially and change the actual scenario and events in the recording. For the creation and playback of immersive recordings within immersive VR, we have developed a recording studio.

The goal of this project is to identify the most suitable tools for using immersive recordings for game design in social virtual reality. Our project will include the design of a recording-based VR game, an analysis of existing techniques for editing 2D videos as well as the development and implementation of novel tools that address the following research questions among others:

How can immersive recordings be altered e.g. to change the path of an object or the position of avatars?

How to remove a part of the recording and insert a cut instead?

Which techniques are necessary to manage such transitions in immersive recordings and ensure comprehensibility for the viewer?

Your project work contributes to the evolution of our immersive recording studio and helps to increase the relevance of immersive analytics tools for the virtual reality research and content creation community.

Bemerkung

Zeit und Ort werden zu Projektbörse bekannt gegeben!

Voraussetzungen

Solid software programming / scripting experience (e.g. C#, C++, Python).

Experience in Unity and C++ strongly recommended.

Kryptographie im Kopf -- Single-Page Crypto Challenge WISE

S. Lucks, J. Leuther, N. Lang

Projekt

Beschreibung

Does a cryptosystem need to be complex in order to be secure? No! We want to create a simple state-of-the-art cryptosystem whose source code can fit easily onto one single page in print, or even on two slides for a presentation -- without referring to a crypto library.

Simplicity does not mean that the computations will be trivial or that users have to make compromises about the security. Simplicity means that independent implementations "from memory" will be compatible with each other: when

a "sender" encrypts a message M under a key K and a "receiver" decrypts the ciphertext under the same key K , then the receiver will get M again, even when both sender and receiver are using their own implementation of the scheme they both memorized.

This essentially means that people can "smuggle" state-of-the-art crypto into secure computing environments, thereby bypassing any prohibition to carry or download any electronic or printed copies of software.

Bemerkung

time and place to be announced at the project fair.

room:S143 Medsec/Webis-Lab

Leistungsnachweis

Abschlusspräsentation, Abschlussbericht

Let's Talk to the Lecture Slides

B. Stein, M. Gohsen, T. Gollub, J. Kiesel

Projekt

Beschreibung

Teaching materials usually contain a lot of knowledge on various topics, but it is often difficult to find the relevant information when you need it, for example when you read about the latest developments in artificial intelligence in the news.

With this project, we want to open up and improve information access to our teaching material. In this project, we will develop an artificial assistant that will answer questions in natural language based on our lecture material and point you to the relevant slides for illustration.

Participants will learn about and apply technologies from Information Retrieval and Natural Language Processing (especially large language models like ChatGPT).

Bemerkung

Zeit und Ort werden zu Projektbörse bekannt gegeben!

Leistungsnachweis

Abschlusspräsentation und Ausarbeitung

LinuxDome 2.1 / Imaging Pipelines

G. Pandolfo, C. Wüthrich
Projekt

Veranst. SWS: 10

Beschreibung

In this project, we will work on two distinct tasks: on one side, the calibration of the new FullDome at S134, including a 3D soundsystem and multiple projectors running on a F.O.S.S. platform. On the other side, we will need to specify and build a Vulkan or Pipewire based System allowing to pipeline output from 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."

Bemerkung

time and place to be announced at the project fair.

Output-Sensitive Avatars for Everyone

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

Veranst. SWS: 20

Beschreibung

In immersive telepresence scenarios users are captured by RGBD cameras, reconstructed as volumetric avatar representations and transmitted over the internet in real-time. This method creates accurate representations of users instead of the often-used CG avatars. One can think of this approach as a videoconference in 3D which is why we call these avatars also 3D video avatars. Our promising previous approach [Kreskowski et al. 2022] introduced an effective method for real-time reconstruction, transmission and rendering of so-called output-sensitive volumetric avatars which works well for two groups of telepresence participants at different locations. Although the technique allows for large bandwidth reductions, based on spatial configurations between the two groups of users, it does not scale well for an increasing number of users. In this project, we will investigate, implement and evaluate techniques for the creation of output-sensitive avatars for scenarios with many distributed users (3..20).

Bemerkung

Zeit und Ort werden zu Projektbörse bekannt gegeben!

Voraussetzungen

Solid software programming skills in C++.

Experience with GPGPU programming or algorithm design is helpful, but not required.

Leistungsnachweis

active participation during the project meetings; design, implementation and evaluation of algorithms designed throughout the project intermediate and final project presentations; final project report

Queer(y)ing Data: Re-Imaging and Re-Designing Personal Data

E. Hornecker, R. Koningsbruggen
Projekt

Beschreibung

Our personal lives are increasingly becoming datified, were aspects which previously did not exist numerically are being counted and used to make predictions on how we can live "happier, fitter, and better" lives [1]. Using

quantification to simplify complex topics, and present them in attractive and easy to read visualizations, these data present themselves as clean, neutral, and objective—a perfect tool to give us control over our messy everyday lives.

However, these perceptions of data as well as common definitions such as "data are agglomerations of small, discrete signals, represented as 0s and 1s in computer memory" [2], do not match data's true nature, and how we encounter, live, and experience data in our daily lives. For example, when communicating how sleepy we are, saying 'I am 5 sleepy' does not make much sense.

Therefore, this project explores how we can queer data to challenge and resist current personal data norms and practices (such as the Quantified Self). Based on the idea that not all things can be meaningfully quantified, as they are non-fixed, fluid, and interconnected, this project explores how we can re-conceptualize what personal data are, how we track them, and how to represent them. To do so, we will draw on feminist, queer, intersectional, and more-than-human theories. By tracking our own personal data, we will use these theories to speculate about other ways of tracking and representing data (such as data sensification), and develop data artefacts (either a tracking technology or data representation) that borrow from speculative and/or critical design.

Following a Research through Design (RtD) approach, this project will challenge you to explore what personal data are, how they align and differ from common data perceptions, and how to design for our new perceptions of personal data.

This course is perfect for students who would like to be challenged to find problems, 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", "showroom research", "critical design", and "speculative design". We encourage students to participate that have a high interest in working from theory, coming up with speculative concepts, and learn how to realise those concepts as an artefact. The project is most suited for students who want 18 ECTS.

1. Chris Elsdén, Mark Selby, Abigail Durrant, and David Kirk. 2016. Fitter, happier, more productive. *Interactions* 23, 5: 45–45. <https://doi.org/10.1145/2975388>
2. Yanni Alexander Loukissas. 2019. *All data are local: thinking critically in a data-driven society*. MIT Press, London.

Bemerkung

The exact date and time of the project will be determined during the first project meeting (information will follow via email once places are distributed)

Voraussetzungen

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

PD and MA: Please register until 11.10.2023 by sending an email to eva.hornecker@uni-weimar.de and rosa.donna.van.koningsbruggen@uni-weimar.de (please include a description of your prior experience in relevant areas and/or a portfolio).

Social Engineering – das Abenteuer!

S. Lucks, A. Jakoby, J. Ehlers, N. Lang, J. Leuther

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

Technology, Material, Concept - Hands on HCI Prototyping

E. Hornecker, H. Waldschütz

Veranst. SWS: 10

Projekt

Beschreibung

Concepts and Designs mostly start as Ideas and sketches. But in order to understand if, how and why they work, the creation of prototypes is often the next logical step.

In this project, you will be challenged to bring some concepts and ideas to (real) life with different methods of prototyping.

We will introduce, use and discuss several approaches of prototyping and production methods in the context of HCI. From rather design oriented methods like storyboarding and video prototyping, to functional prototypes built with software, electronics and physical materials.

This project will be technology driven. We will have introductions and some deepening lessons about electronics, Arduino and rapid prototyping technologies to create and build prototypes for tangible interaction. To broaden our maker skills, we will address methods such as 3D Printing, soldering, the creation of inflatables and some other practical skills of material treatment.

The project will start with weekly exercises, which will eventually evolve to the creation of circuitry and physical objects using different materials and technologies. Through a designerly approach, we will explore the many variations how we can tackle the problem of dealing with materiality and functionality to make things work. Accompanied by literature we discuss the role of prototyping in the user centered design process.

This project is perfect for students who like to work hands-on with different materials and techniques and like to be challenged to find problems and come up with their own solutions and concepts. But we expect our students to work self-motivated and thoroughly on all of their exercises including the development of a larger group project as their final deliverable.

Bemerkung

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

Voraussetzungen

Interest in understanding concepts, designing interactive systems and creative thinking, interest in working with literature. Ideally, you have some prior experience with Arduino and electronics. You should be interested in developing novel interactive devices and interaction. Moreover, all participants should enjoy working in an interdisciplinary team and be able to converse in English.

Leistungsnachweis

Active participation and interim presentations, reading of literature, autonomous and self-initiated work mode, technical or design work, potentially also small user study, documentation as written (scientific) report

User Centered Design in practice: designing a digital product to encourage social interactions in hybrid workplaces

E. Hornecker, M. Osipova

Projekt

Veranst. SWS: 10

Beschreibung

This project focuses on applied HCI and offers students the unique opportunity to apply their skills and knowledge to find new ways to improve the everyday work life of tens of thousands of office workers. This project is run in collaboration with the B2B SaaS startup, "deskbird" (yes, it is officially written in a lowercase :)), a company that develops solutions for hybrid workspaces. Within the scope of this project, you will design new ways how deskbird could facilitate social interactions between office workers.

With the guidance of the HCI chair and the deskbird UX team, you will go through all the steps of the UCD process to design a prototype, and present recommendations, for the development of a hybrid office social feature.

Both deskbird and the HCI chair believe in the "designing for people" approach and the project is based on these values. Therefore, you will start with exploring and defining the requirements by employing UX research methods. Afterwards, based on these requirements you will be designing and testing prototypes, and then coming up with the final recommendations for the feature design and development.

The project is open for HCI Master students and has the prerequisite of completing the 'HCI Introduction or HCI Research Methods' course. Participants need to have profound knowledge of, and interest in, User Centered Design as well as a high level of dedication and ability to self-organize their work process (which we expect all masters students to be able to do). This project will be run in the style of a real industry project with tasks given in increments, yet with relatively strict deadlines within the semester in order to fulfill the goal of designing meaningful product features. The assistance and guidance from the chair and deskbird will be provided at every step, and asking for feedback from stakeholders will be an important part of the working process. However, a lot of exploration, reading and research should be done by students independently, and the project will fill all weekly working time expectations proportionate to the amount of credits you aim to gain from it (2 working days per week for 12 ECTS and 3 working days for 18 ECTS)

The project will run until the end of March (with Christmas and exam breaks) as a group work and will require time dedicated to it regularly. Please, bear in mind the workload and comfort of working in the team as well as trying out

yourself as a UX Researcher, which means interacting with people, when deciding to join. However, if for personal reasons someone will need to be away for one week or during the semester break, the work can be organized remotely for a short period of time upon request.

This project is a perfect option for you if you want to apply all your HCI knowledge to a real commercial product. You will have the possibility to use the results from this project, to say, publish as a case study in your portfolio. We hope to encourage you to learn to work independently and to be able to establish, and use, a feedback cycle with us. Not only will you get the enviable opportunity to see the UCD process in action, but you will also hone your soft skills in the process. We ultimately aim for this experience to equip you with the confidence to do whatever you want to in the future.

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

Bemerkung

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

Voraussetzungen

Students have completed at least one of the following courses offered by the HCI group: "HCI Introduction" (bachelor course), or "HCI Research Methods". Knowledge of Figma and practical experience in UX, research and design will be a bonus.

VR/AR

4556228 Virtual Reality

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 12.10.2023

Fr, wöch., 09:15 - 10:45, Übung Gruppe A VR-Lab, R.1.10, S143, ab 13.10.2023

Fr, Einzel, 09:15 - 12:30, Schwanseestraße 143 - Seminarraum 3.09, first lab class, 13.10.2023 - 13.10.2023

Fr, wöch., 11:00 - 12:30, Übung Gruppe B VR-Lab, R.1.10, S143, ab 13.10.2023

Beschreibung

Virtual Reality (VR) erfreut sich seit mehreren Jahren großer Beliebtheit in Forschung, Unterhaltung und Bildung. VR-Systeme ermöglichen die Interaktion einer oder mehrerer Benutzer*innen mit einer computersimulierten Umgebung, welche dreidimensional auf einem stereoskopischen Display dargestellt wird. In dieser Veranstaltung 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 Benutzer*innen.

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 für diese immersiven Displays sowie unter Nutzung von räumlichen Trackingsystemen und 3D-Eingabegeräten implementieren und auswerten. Je nach Situation können Sie auch von zu Hause aus an den Übungen arbeiten.

Wir planen, ausgewählte Vorlesungen und Übungen direkt in virtueller Realität durchzuführen, um das Konzept „Teaching VR in VR“ zu testen. Dazu werden wir nach Möglichkeit alle Teilnehmer*innen mit HMDs ausstatten.

Bemerkung

Zeit und Ort werden zu Projektbörse bekannt gegeben!

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.