Modulhandbuch

für den Master-Studiengang
Language Science and Technology

(30.4.2020)

Foundations of Linguistics					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
1	1	jährlich / WS	1 Semester	4	6

Modulverantwortliche/r	Jun.-Prof. Dr. Annemarie Verkerk
Dozent/inn/en	Jun.-Prof. Dr. Annemarie Verkerk
	Dr. Noortje Venhuizen
	Prof. Dr. Bernd Möbius
	Prof. Dr. Vera Demberg
Zuordnung zum Curriculum	Master Language Science and Technology, Wahl
Zulassungsvoraussetzungen	keine
Leistungskontrollen / Prüfungen	Abschlussklausur with regular take-home assignments during the semester. Successful completion of the assignments is required for admission to the final exam.
Lehrveranstaltungen / SWS	Vorlesung: 2 SWS
	Übung: 2 SWS
	Übungsgruppen mit bis zu 20 Studierenden
Arbeitsaufwand	180h = 60h Präsenz- und 120h Eigenstudium
Modulnote	Die Note entspricht der Note der Abschlussklausur.
	Die Klausur kann bei Nichtbestehen zweimal wiederholt werden. Die erste Wiederholungsprüfung findet zu Ende der auf die Veranstaltung folgenden vorlesungsfreien Zeit statt.

Lernziele / Kompetenzen

The goal of the course is to introduce the students to basic notions, terminology, problems and ideas from the different areas of linguistics that are covered in the course: morphology and syntax, semantics, pragmatics, and phonetics.

Inhalt

Morphology and syntax: Morphology and syntax is what makes a sentence different from a random collection of words. We study the structure that they impose on utterances by focusing on common types of inflection in the nominal and verbal domain, parts of speech, the distinction between heads, arguments, and adjuncts, and argument types and semantic roles, taking a cross-linguistic perspective.

Semantics: The study of linguistic meaning has a long history, going back centuries. In this section of the course, we will study the fundamentals of semantic theory, including predicate logic and lambda calculus, various applications in computational semantics, as well as recent vector-based approaches to distributional semantics.

Pragmatics: We will cover basic notions in pragmatics (starting from Paul Grice) up to current models for pragmatic reasoning such as the rational speech act model. Furthermore, we will cover basic notions of textual coherence and cohesion, including Centering Theory as well as modern neural implementations thereof, and models for coherence relation classification.

Phonetics: This section of the course introduces the principles underlying the classification of speech sounds and how they are organized in sound systems. It will emphasize the properties of spoken (as opposed to written) language in connected speech and discuss the basic conditions and constraints of human speech production and perception.

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Foundations of Empirical Methods					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
1	1	jährlich / WS	1 Semester	2	3

Modulverantwortliche/r	Prof. Dr. Matthew Crocker
Dozent/inn/en	Mitarbeiter des Lehrstuhls
Zuordnung zum Curriculum	Master Language Science and Technology, Wahl
Zulassungsvoraussetzungen	keine
Leistungskontrollen / Prüfungen	Abschlussklausur
Lehrveranstaltungen / SWS	Vorlesung: 2 SWS
	Übungsgruppen mit bis zu 20 Studierenden
Arbeitsaufwand	180h = 60h Präsenz- und 120h Eigenstudium
Modulnote	Die Note entspricht der Note der Abschlussklausur.
	Die Klausur kann bei Nichtbestehen zweimal wiederholt werden. Die erste Wiederholungsprüfung findet zu Ende der auf die Veranstaltung folgenden vorlesungsfreien Zeit statt.

Lernziele / Kompetenzen

To introduce students to the use of psycholinguistic and corpus-based empirical research methods in the language sciences.

Inhalt

• The role of empirical data in cognitive and linguistic research

• Online psycholinguistic methods

• Experimental design and hypothesis testing

• Basics of descriptive and inferential statistics

• Corpora and quantitative linguistics

• Design of corpus-based studies

• Exploratory data-driven methods

• Crowd sourcing methods for language science

• Current directions in empirical research

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Foundations of Mathematics					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
1	1	jährlich / WS	1 Semester	4	6

Modulverantwortliche/r   Prof. Dr. Alexander Koller

Dozent/inn/en   Prof. Dr. Alexander Koller

Zuordnung zum Curriculum   Master Language Science and Technology, Wahl

Zulassungsvoraussetzungen   keine

Leistungskontrollen / Prüfungen   Abschlussklausur

Lehrveranstaltungen / SWS   Vorlesung: 2 SWS

Übung: 2 SWS

Übungsgruppen mit bis zu 20 Studierenden

Arbeitsaufwand   180h = 60h Präsenz- und 120h Eigenstudium

Modulnote   Die Note entspricht der Note der Abschlussklausur.

Die Klausur kann bei Nichtbestehen zweimal wiederholt werden. Die erste Wiederholungsprüfung findet zu Ende der auf die Veranstaltung folgenden vorlesungsfreien Zeit statt.

Lernziele / Kompetenzen

The goal of the course is to familiarize the students with basic mathematical concepts from linear algebra and calculus, as a foundation for understanding neural networks and other machine learning methods. In particular, the students will be enabled to understand the technical sections of current research papers in computational linguistics.

Inhalt

Linear algebra:

- vectors, matrices, linear maps; addition and multiplication of vectors and matrices
- vector spaces, linear spans, and bases
- vector distances and angles
- inverse matrices and determinants

Calculus:

- derivatives, partial derivatives, gradients
- derivatives of common functions (polynomials, logarithms, exponentials); sum, product, and chain rule
- integrals

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise

keine

Computational Linguistics					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
1–3	1–3	jährlich / WS	1 Semester	4	6

Modulverantwortliche/r   Prof. Dr. Alexander Koller

Dozent/inn/en   Prof. Dr. Alexander Koller
Dozenten der Fachrichtung

Zuordnung zum Curriculum   MSc Language Science and Technology

Core Lecture, Mandatory Elective

Zulassungsvoraussetzungen   –

Leistungskontrollen / Prüfungen   Final project.

Regular take-home assignments during the semester. Successful completion of the assignments is required for admission to the final project.

Lehrveranstaltungen / SWS   Lecture: 2 SWS

Tutorial : 2 SWS

Tutorials in groups of up to 20 students

Arbeitsaufwand   180 h = 60 h of classes and 120 h private study

Modulnote   The grade corresponds to the grade obtained in the final project.

Lernziele / Kompetenzen

The goal of the course is to introduce the students to various standard algorithms in computational linguistics. The focus is on the structure of the algorithms, i.e. their data structures and mechanisms.

Inhalt

The course discusses standard algorithms used for various types of linguistic processing in computational linguistics. The algorithms discussed in the course range from shallow methods, such as n-gram models, Hidden Markov Models, and topic models, to deeper methods, such as probabilistic parsing for context-free grammars and more expressive grammar formalisms, as well as elementary methods in semantic analysis and machine translation.

The students will gain hands-on experience with the algorithms through regular assignments, in which algorithms discussed in class are implemented and/or evaluated on data.

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise:

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Computational Psycholinguistics					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
1–3	1–3	jährlich / WS	1 Semester	4	6

Modulverantwortliche/r   Prof. Dr. Matthew Crocker

Dozent/inn/en   Prof. Dr. Matthew Crocker

Zuordnung zum Curriculum   MSc Language Science and Technology

Core Lecture, Mandatory Elective

Zulassungsvoraussetzungen   –

Leistungskontrollen / Prüfungen   Written exam at the end of the course

Lehrveranstaltungen / SWS   Lecture: 2 SWS

Tutorial : 2 SWS

Tutorials in groups of up to 20 students

Arbeitsaufwand   180 h = 60 h of classes and 120 h private study

Modulnote   The Grade is determined by result of the final exam. A re-exam takes place at the beginning of the lecture period of the following semester.

Lernziele / Kompetenzen

- Grasp of current issues and theories in psycholinguistics
- Principles of developing and evaluating cognitive models
- Ability to implement, validate and compare computational cognitive models
- Familiarity with probabilistic methods, models, and simulations
- Understanding of experimental design, and the interpretation of experimental findings with respect to computational models

Inhalt

- Introduction: modularity, competence-performance, incrementality, ambiguity resolution and garden-path phenomena.
- Parsing and psychological reality: parallel-serial parsers, incrementality, memory load, and disambiguation techniques.
- Parsing Algorithms: Implementing top-down, shift-reduce, and left-corner models.
- Principles of Parsing: The Garden Path model, grammar based accounts of parsing.
- Computational models of reanalysis
- Complexity, memory load and The DLT/SPLT models.
- Probabilistic Modelling: Statistical mechanisms and lexical category disambiguation and syntactic processing
- Surprisal based models of language comprehension
- Interactive Models: General issues, the interactive-activation model, and the competition-integration model.

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise: Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Semantic Theory					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
2–4	2–4	jährlich / SS	1 Semester	4	6

Modulverantwortliche/r	Prof. Dr. Alexander Koller
Dozent/inn/en	Prof. Dr. Alexander Koller Dozenten der Fachrichtung
Zuordnung zum Curriculum	MSc Language Science and Technology Core Lecture, Mandatory Elective
Zulassungsvoraussetzungen	Successful completion of Foundations of Language Science and Technology, or an equivalent level of background knowledge on logic and semantics, is recommended.
Leistungskontrollen / Prüfungen	Written exam at the end of the course Regular take-home assignments during the semester. Successful completion of the assignments is required for admission to the final exam.
Lehrveranstaltungen / SWS	Lecture: 2 SWS Tutorial : 2 SWS Tutorials in groups of up to 20 students
Arbeitsaufwand	180 h = 60 h of classes and 120 h private study
Modulnote	The grade is determined by result of the final exam. A re-exam takes place at the beginning of the lecture period of the following semester.

Lernziele / Kompetenzen

The students are familiarized with the prevalent formalisms and methods in natural-language semantics, and are able to apply them to natural language understanding systems. The students acquire the background knowledge necessary for an understanding of the current literature, and are acquainted with phenomena and methods in the semantics of words, sentences, and texts, together with their formal modelling, as well as with the modelling of the syntax-semantics interface and the interface to inference procedures for the evaluation of semantic information.

Inhalt

Compositional semantics (techniques for derive semantic representations from syntax trees; type theory; beta-reduction). Treatment of ambiguities: storage techniques and underspecification. Discourse semantics (Discourse Representation Theory, DRT; anaphora; presuppositions; dynamic logics). Lexical semantics (event semantics; interpretation of modifiers; thematic roles; lexical resources and language-oriented ontologies: WordNet, FrameNet).

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise:

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Syntactic Theory					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
2–4	2–4	jährlich / SS	1 Semester	4	6

Modulverantwortliche/r Prof. Dr. Tania Avgustinova

Dozent/inn/en Prof. Dr. Tania Avgustinova
Dozenten der Fachrichtung

Zuordnung zum Curriculum MSc Language Science and Technology

Core Lecture, Mandatory Elective

Zulassungsvoraussetzungen –

Leistungskontrollen / Prüfungen Written exam at the end of the course

Lehrveranstaltungen / SWS Lecture: 2 SWS

Tutorial : 2 SWS

Tutorials in groups of up to 20 students

Arbeitsaufwand 180 h = 60 h of classes and 120 h private study

Modulnote The grade is determined by result of the final exam. A re-exam takes place at the beginning of the lecture period of the following semester.

Lernziele / Kompetenzen

Natural language strings have implicit structure and the field of linguistics has been studying and elucidating that structure within a variety of competing grammar frameworks. This course covers theories of syntax that have focused on developing precisely formulated grammars whose empirical predictions can be directly tested. At the end of the course, students should be able to analyse linguistic data in a number of ways, read syntactic literature from a variety of viewpoints, and understand how these formalisms lend themselves well to computational needs.

Inhalt

This course addresses characteristic properties of different grammar models and covers fundamental concepts in syntactic analysis such as syntactic categories, syntactic functions, constituent structure, dependency structure, the syntax-semantics interface, and phenomena such as agreement, valence, diathetic alternations, coordination, anaphoric binding, word order and long-distance dependencies. The emphasis is on syntactic frameworks that allow for formally precise encoding of linguistic hypotheses and the design of grammars that can scale up to ever larger fragments of a language as is required in practical applications. Problem sets introduce data and phenomena from a variety of languages. Major thematic blocks include Generative Grammar (GG), Dependency Grammar (DG), Tree Adjoining Grammar (TAG), Lexical Functional Grammar (LFG), and Head-driven Phrase Structure Grammar (HPSG).

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise:

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Machine Translation					ML
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
2–4	2–4	jährlich / SS	1 Semester	4	6

Modulverantwortliche/r	Prof. Dr. Josef van Genabith
Dozent/inn/en	Prof. Dr. Josef van Genabith
Zuordnung zum Curriculum	MSc Language Science and Technology
	Core Lecture, Mandatory Elective
Zulassungsvoraussetzungen	–
Leistungskontrollen / Prüfungen	Written exam at the end of the course
Lehrveranstaltungen / SWS	Lecture: 2 SWS
	Tutorial : 2 SWS
	Tutorials in groups of up to 20 students
Arbeitsaufwand	180 h = 60 h of classes and 120 h private study
Modulnote	The grade is determined by result of the final exam. A re-exam takes place at the beginning of the lecture period of the following semester.

Lernziele / Kompetenzen

Make students familiar with the basic concepts and mathematical foundations of machine learning, including supervised and unsupervised approaches, with, and where appropriate, a focus on natural language processing. Students will be able to build, train and evaluate their own ML models. Students will be able to critically assess ML models.

Inhalt

- Pattern Matching, Machine Learning and Data Analytics

- Types of Data and Data Exploration

- Information-based Learning: Entropy, Information-Gain, Decision Trees, Random Forests

- Similarity-based Learning: Similarity Measures, the Nearest Neighbour Algorithm

- Probability-based Learning: Probability, Bayes Theorem, Conditional Independence, Naïve Bayes, Bayesian Networks and Graphical Models

- Error-based Learning: Error Measures, Gradient Descent, Linear Regression, Multivariable Linear Regression, Logistic Regression, Multivariable Logistic Regression, Multinomial Logistic Regression

- Neural Networks and Deep Learning: Vectorisation and Matrix Algebra, Backpropagation, basic network topologies: feed-forward, convolutional and recurrent, auto-encoders

- Maximum Margin based Learning: Support Vectors, Kernel Methods, Support Vector Machines

- Evaluation: Experiment Design, Performance Measures

- Unsupervised Learning: K-Means, (latent variable) Expectation Maximisation Algorithm

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise:

Textbooks:

- Goodfellow, Y. Bengio and A. Courville, "Deep Learning", MIT Press, 2016

- G. James, D. Witten, T. Hastie and R. Tibshirani, "An Introduction to Statistical Learning", Springer 2013
- J. D. Kelleher, B. Mac Namee and A. D'Arcy, "Fundamentals of Machine Learning for Predictive Data Analytics", MIT Press, 2015
- T. Mitchell, "Machine Learning", McGraw-Hill, 1997

General Overview and Background:

- E. Alpaydin, "Machine Learning", MIT Press, 2016
- P. Domingos, "The Master Algorithm", Basic Books, 2015 (also Penguin Books 2017)

Speech Science					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
1–3	1–3	jährlich / WS	1 Semester	4	6

Modulverantwortliche/r	Prof. Dr. Bernd Möbius
Dozent/inn/en	Prof. Dr. Bernd Möbius Mitarbeiter des Lehrstuhls Phonetik
Zuordnung zum Curriculum	MSc Language Science and Technology Core Lecture, Mandatory Elective
Zulassungsvoraussetzungen	–
Leistungskontrollen / Prüfungen	Written exam at the end of the course
Lehrveranstaltungen / SWS	Lecture: 2 SWS Tutorial : 2 SWS Tutorials in groups of up to 20 students
Arbeitsaufwand	180 h = 60 h of classes and 120 h private study
Modulnote	The grade is determined by result of the final exam. A re-exam takes place at the beginning of the lecture period of the following semester.

Lernziele / Kompetenzen

General Goals: An understanding of different speech production and perception models, and a conceptual understanding of speech acoustics.

Competence goals: An ability to observe and relate speech events in different media articulatory (self) observation, acoustic and physiological representation and auditory perception. Knowledge of instrumental and experimental methods.

Inhalt

The course, consisting of a lecture and an exercise session, gives an overview of the three main areas of Speech Science: speech production, the acoustic structure of speech, and speech perception. The topics covered include the anatomy and physiology of speech production; articulation and the symbolic representation of speech; theories of speech production; the source-filter model of speech production and the acoustic properties of sound classes; the ear and hearing physiology, theories of speech perception.

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise:

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Statistical Natural Language Processing					SNLP
Studiensem. 2–4	Regelstudiensem. 2–4	Turnus jährlich / SS	Dauer 1 Semester	SWS 4	ECTS-Punkte 6

Modulverantwortliche/r   Prof. Dr. Dietrich Klakow

Dozent/inn/en   Prof. Dr. Dietrich Klakow

Zuordnung zum Curriculum   MSc Language Science and Technology

Core Lecture, Mandatory Elective

Zulassungsvoraussetzungen   –

Leistungskontrollen / Prüfungen   Written exam at the end of the course

Lehrveranstaltungen / SWS   Lecture: 2 SWS

Tutorial : 2 SWS

Tutorials in groups of up to 20 students

Arbeitsaufwand   180 h = 60 h of classes and 120 h private study

Modulnote   The grade is determined by result of the final exam. A re-exam takes place half a year after the first exam.

Lernziele / Kompetenzen

The students will get to know and understand the basic methods and applications of statistical natural language processing. In the tutorials they well learn how to apply the methods to acutal language data. In addition the tutorials will deepen the theoretical knowledge.

Inhalt

- Natural Language
- Basics of Language Modeling
- Entropy
- Backing-Off Language Models
- Text Classification
- Word Sense Disambiguation
- Part-of-Speech Tagging
- Named Entity Taggging
- Information Retrieval
- Topic Detection and Tracking
- Statistical Machine Translation

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise: C. Manning and H. Schütze: Foundations of Statistical Natural Language Processing, MIT Press, 1999.

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Connectionist Language Processing					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
2–4	2–4	jährlich / SS	1 Semester	4	6

Modulverantwortliche/r   Prof. Dr. Matthew Crocker

Dozent/inn/en   Prof. Dr. Matthew Crocker and Dr. Harm Brouwer

Zuordnung zum Curriculum   MSc Language Science and Technology

Elective Course

Zulassungsvoraussetzungen   –

Leistungskontrollen / Prüfungen   Successful completion of tutorials, and written exam

Lehrveranstaltungen / SWS   Lecture: 2 SWS

Tutorial : 2 SWS

Tutorials in groups of up to 20 students

Arbeitsaufwand   180 h = 60 h of classes and 120 h private study

Modulnote   Grade is determined by result of the final exam. A re-exam takes place at the beginning of the lecture period of the following semester.

Lernziele / Kompetenzen

- Understand basics of neural information processing in the brain, and artificial neural networks
- Principles of how neural networks can learn
- Ability to specify, train and evaluate single and multi-layer networks
- Understanding of how connectionist approaches can be used to model a wide range of language learning and processing behavior
- Ability to critically evaluate and compare connectionist with symbolic approaches

Inhalt

- Modeling neural information processing (Connectionism)
- Two-layer neural networks and their properties (The Perceptron)
- Multi-layer neural networks: Towards internal representations (Multi-layer Perceptrons)
- Neural information encoding: Localist versus Distributed schemes (Representations)
- Modeling the acquisition of the English past-tense and reading aloud
- Processing sequences: Simple Recurrent Networks (SRNs)
- Modeling the acquisition of hierarchical syntactic knowledge
- Richer representations for sentence understanding (beyond syntactic derivations and semantic formulas)
- Neurobiological plausibility of connectionism

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise:

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Digital Signal Processing					DSP
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
2–4	2–4	jährlich / SS	1 Semester	4	6

Modulverantwortliche/r   Prof. Dr. Dietrich Klakow

Dozent/inn/en   Prof. Dr. Dietrich Klakow

Zuordnung zum Curriculum   MSc Language Science and Technology

Elective Course

Zulassungsvoraussetzungen   –

Leistungskontrollen / Prüfungen   Written exam at the end of the course

Lehrveranstaltungen / SWS   Lecture: 2 SWS

Tutorial : 2 SWS

Tutorials in groups of up to 20 students

Arbeitsaufwand   180 h = 60 h of classes and 120 h private study

Modulnote   The grade is determined by result of the final exam. A re-exam takes place half a year after the first exam.

Lernziele / Kompetenzen

The students will get familiar with advanced signal processing techniques in particular those that are relevant to speech processing. There will be practical and theoretical exercises.

Inhalt

- Introduction
- Signal Representations
- Microphone Arrays
- Filtering and Smoothing
- Feature Extraction from Speech Signals
- Musical Genre Classification
- Speaker Recognition
- KL-Transform and Linear Discriminant Analysis
- Linear Predictive Coding
- Wiener Filter
- Spectral Subtraction

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise:

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Experimental Methods					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
2–4	2–4	jährlich / SS	1 Semester	4	6

Modulverantwortliche/r   Prof. Dr. Matt Crocker

Dozent/inn/en   Dr. Heiner Drenhaus or Dr. Les Sikos

Zuordnung zum Curriculum   MSc Language Science and Technology

Elective Course

Zulassungsvoraussetzungen   –

Leistungskontrollen / Prüfungen   Successful completion of experiment, and written report

Lehrveranstaltungen / SWS   Lecture: 2 SWS

Project : 2 SWS

Arbeitsaufwand   180 h = 60 h of classes and 120 h private study

Modulnote   The grade is determined by final written project report

Lernziele / Kompetenzen

- Understanding of how controlled experimentation can be used to test hypotheses concerning language processing
- Overview of state-of-the-art methods in experimental psycholinguistics, including online methods such as eye-tracking, EEG
- Principles of experimental designs, analyses tools and evaluation of findings.
- Experience of all stages of experimental research: designing and running experiments, and basics of statistical analysis
- How to present the results in the academic standard format for experimental research reports (APA).

Inhalt

- Experimental Composition: forming a research question, types of variables
- Paradigms for sentence processing research, lexical processing, and language production research
- Control and Validity: types of validity, threats to validity, methods to control for threats
- Design: Within designs, between designs, and factorial designs
- Preparation of experimental stimuli
- Analysis and Interpretation: preparing the data, types of data
- Descriptive and inferential statistics, parametric and non-parametric tests

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise:

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Grundlagen der Signalverarbeitung					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
1–3	1–3	jährlich / WS	1 Semester	4	6

Modulverantwortliche/r   Prof. Dr. Dietrich Klakow

Dozent/inn/en   Prof. Dr. Dietrich Klakow

Zuordnung zum Curriculum   MSc Language Science and Technology

Elective Course

Zulassungsvoraussetzungen   –

Leistungskontrollen / Prüfungen   Written exam at the end of the course

Lehrveranstaltungen / SWS   Lecture: 2 SWS

Tutorial : 2 SWS

Tutorials in groups of up to 20 students

Arbeitsaufwand   180 h = 60 h of classes and 120 h private study

Modulnote   The grade is determined by result of the final exam. A re-exam takes place half a year after the first exam,

Lernziele / Kompetenzen

Kennlernen der wesentlichen Grundkonzepte der Signalverarbeitung wie lineare zeitinvariante Systeme und Fouriertransformation, so wie die Fähirgkeit Aufgaben in diesem Bereich zu lösen.

Inhalt

• Darstellung von Signalen und LTI-Systeme

• Fourier-Transformation

• Numerische Aspekte der Fouriertransformation und der FFT Algorithmus

• Korrelation von Signalen

• Statistische Beschreibung von Signalen

• Filter

Weitere Informationen

Unterrichtssprache: Deutsch

Literaturhinweise:

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Mathematical Logic					ML
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
2–4	2–4	jährlich / SS	1 Semester	4	6

Modulverantwortliche/r	Studienbeauftragte/r der FR Sprachwissenschaft und Sprachtechnologie
Dozent/inn/en	Dr. Werner Saurer
Zuordnung zum Curriculum	MSc Language Science and Technology
	Elective Course
Zulassungsvoraussetzungen	A good working knowledge of first order logic
Leistungskontrollen / Prüfungen	Written exam at the end of the course
Lehrveranstaltungen / SWS	Lecture: 2 SWS
	Tutorial : 2 SWS
	Tutorials in groups of up to 20 students
Arbeitsaufwand	180 h = 60 h of classes and 120 h private study
Modulnote	The grade is determined by result of the final exam. A re-exam takes place at the beginning of the lecture period of the following semester.

Lernziele / Kompetenzen

In this course students will learn about the theory of formal systems in general, and about logical systems in particular (propositional logic and first order predicate logic). Students will also learn about formalization of natural language sentences, methods in formal semantics and proof theory, in particular natural deduction systems as well as axiomatic systems, and proofs of correctness and completeness of first order logic systems.

Inhalt

Mathematical logic is one of the most important formal tools in computational linguistics, especially - but not only - for semantics. In this intermediate to advanced course in logic we will be largely concerned with metalogical results such as correctness and completeness of logical calculi. We will consider axiom systems for propositional and first order predicate logic and prove that these systems are semantically correct and complete. We will also deal with techniques of formalizing natural language, methods in formal semantics and natural deduction systems for propositional as well as first order predicate logic.

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise: Richmond H. Thomason, Symbolic Logic. London, Toronto (Macmillan), 1970, as well as extensive handouts.

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Text-to-Speech Synthesis					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
2–4	2–4	jährlich / SS	1 Semester	2	3

Modulverantwortliche/r   Prof. Dr. Bernd Möbius

Dozent/inn/en   Prof. Dr. Bernd Möbius

Zuordnung zum Curriculum   MSc Language Science and Technology

Elective Course

Zulassungsvoraussetzungen   Recommended: Foundations of Language Science and Technology, Speech Science

Leistungskontrollen / Prüfungen   Written exam at the end of the course

Lehrveranstaltungen / SWS   Lecture: 2 SWS

Arbeitsaufwand   90 h = 30 h of classes and 60 h private study

Modulnote   The grade is determined by result of the final exam. A re-exam takes place at the beginning of the lecture period of the following semester.

Lernziele / Kompetenzen

To introduce students to the state-of-the-art methods in text-to-speech (TTS) synthesis and the architecture and components of TTS systems, including symbol and signal processing modules.

Inhalt

Speech synthesis is an essential component of any system relying on intuitive human-machine communication. Speech synthesis systems are also used in phonetic research to gain further insight into speech production and acoustic properties of speech. This advanced course offers an introduction to text-to-speech (TTS) synthesis systems and strategies. Various approaches to speech synthesis are presented, including formant synthesis, concatenative synthesis, and state-of-the-art corpus-based unit selection synthesis. Linguistic text analysis and natural language processing modules typically included in TTS systems are covered as well.

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise:

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Information Theory	

Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
2–4	2–4	jährlich / SS	1 Semester	2	3

Modulverantwortliche/r	Prof. Dr. Matthew Crocker and Prof. Dr. Vera Demberg
Dozent/inn/en	Prof. Dr. Matthew Crocker and Prof. Dr. Vera Demberg
Zuordnung zum Curriculum	MSc Language Science and Technology
	Elective Course
Zulassungsvoraussetzungen	–
Leistungskontrollen / Prüfungen	Project with poster presentation
Lehrveranstaltungen / SWS	Lecture plus some practicals: 2 SWS
Arbeitsaufwand	90 h = 30 h of classes and 60 h private study
Modulnote	Grade is determined based on the poster presentation.

Lernziele / Kompetenzen

- understand the mathematical basis of surprisal and entropy
- apply NLP tools to annotate corpora with surprisal estimates
- grasp the current issues and techniques related to the concepts of surprisal and the uniform information density in psycholinguistics, language adaptation and language evolution
- understand and critically evaluate experimental designs and corpus analyses related to information-theoretic concepts
- apply the concepts taught in the course to a new research question and propose a suitable experimental design and technology
- explain proposal of research study related to information-theoretic concepts to the group

Inhalt

This course will cover the mathematical basis of information theory, and then proceed to information theoretic approaches to the study of language.

Topics will include the question whether human language is a good code, and look at related information theoretic concepts including surprisal, entropy and entropy reduction. We will then proceed to comprehension studies investigating whether surprisal is a good predictor of human sentence processing difficulty, and the corresponding uniform information density hypothesis which proposes that humans distribute information uniformly across an utterance.

We will also discuss various critical papers questioning the uniform information density hypothesis, as well as limits of information-theoretic accounts.

The course includes tutorials where we look at ways to estimate surprisal from text corpora, in order to test for effects of surprisal or uniform information density.

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise:

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Seminar (changing topics)					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
1–4	1–4	jedes Semester	1 Semester	2	7

Modulverantwortliche/r   Studienbeauftragte/r der FR Sprachwissenschaft und Sprachtechnologie

Dozent/inn/en   N.N.

Zuordnung zum Curriculum   MSc Language Science and Technology

Mandatory Elective

Zulassungsvoraussetzungen   Depending on topic

Leistungskontrollen / Prüfungen   Contributions to discussions
Thematic talk
Written elaboration

Lehrveranstaltungen / SWS   Seminar: 2 SWS

Arbeitsaufwand   210 h = 30 h of classes and 180 h private study

Modulnote   Die Modalitäten der Notenvergabe werden vom verantwortlichen Hochschullehrer festgelegt.

Lernziele / Kompetenzen

In a seminar students are made familiar with the practice of advanced scientific research:

- reading and analysis of advanced scientific texts, as well as the development of their own solutions to the problems under discussion

- argumentation for their approaches and formal presentation of these in the seminar

- writing of an essay presenting their work in near- publishable form

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise:

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Seminar (changing topics)					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
1–4	1–4	jedes Semester	1 Semester	2	4

Modulverantwortliche/r   Studienbeauftragte/r der FR Sprachwissenschaft und Sprachtechnologie

Dozent/inn/en   N.N.

Zuordnung zum Curriculum   MSc Language Science and Technology
Elective Course

Zulassungsvoraussetzungen   Depending on topic

Leistungskontrollen / Prüfungen   Contributions to discussions
Thematic talk

Lehrveranstaltungen / SWS   Seminar: 2 SWS

Arbeitsaufwand   120 h = 30 h of classes and 90 h private study

Modulnote   Die Modalitäten der Notenvergabe werden vom verantwortlichen Hochschullehrer festgelegt.

Lernziele / Kompetenzen

In a seminar students are made familiar with the practice of advanced scientific research:

- reading and analysis of advanced scientific texts, as well as the development of their own solutions to the problems under discussion

- argumentation for their approaches and formal presentation of these in the seminar

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise:

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Software Project (changing topics)					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
1–4	1–4	jedes Semester	1 Semester	3	8

Modulverantwortliche/r — Studienbeauftragte/r der FR Sprachwissenschaft und Sprachtechnologie

Dozent/inn/en — N.N.

Zuordnung zum Curriculum — MSc Language Science and Technology

Wahlpflicht

Zulassungsvoraussetzungen — abhängig vom Thema

Leistungskontrollen / Prüfungen — Programmierprojekt, Vortrag, Hausarbeit / Dokumentation

Lehrveranstaltungen / SWS — Software-Projekt: 3 SWS, bis zu 10 Studierende

Arbeitsaufwand — 240h = 45h Präsenz- und 195h Eigenstudium

Modulnote — Die Modalitäten der Notenvergabe werden vom Dozenten festgelegt und zu Beginn der Veranstaltung bekanntgegeben.

Lernziele / Kompetenzen

Die Studierenden lernen anhand eines größeren praktischen computerlinguistischen Programmierprojekts, in Teamarbeit eine Aufgabe eigenständig zu lösen und ihre Arbeit zu präsentieren. Zu den vermittelten Kompetenzen gehört: Planung und Durchführung eines größeren Projekts; Teamarbeit; Arbeit unter Zeitbeschränkungen; softwaretechnische Kenntnisse und Fertigkeiten; Vertiefung von Programmierkenntnissen; Anwendung fortgeschrittener Programmierwerkzeuge; Darstellung der eigenen Arbeit in einer Hausarbeit und Präsentation im Vortrag.

Inhalt

Die Softwareprojekte richten sich typischerweise nach aktuellen Forschungsschwerpunkten des Master-Programms und sind in der Regel an Forschungsprojekte angebunden. Daher ändert sich die thematische Ausrichtung regelmäßig.

Weitere Informationen

Unterrichtssprache: Englisch

Master Seminar	

Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
3	1–4	jedes Semester	1 Semester	2	12

Modulverantwortliche/r — Studienbeauftragte/r der FR Sprachwissenschaft und Sprachtechnologie

Dozent/inn/en — Professoren der Fachrichtung

Zuordnung zum Curriculum — MSc Language Science and Technology

Mandatory

Zulassungsvoraussetzungen — –

Leistungskontrollen / Prüfungen — Vortrag über die geplante Aufgabenstellung mit anschliessender Diskussion

Schriftliche Beschreibung der Aufgabenstellung der Masterarbeit.

Lehrveranstaltungen / SWS

Arbeitsaufwand — 360 h = 30 h of classes and 330 h private study

Modulnote — unbenotet

Lernziele / Kompetenzen

Im Masterseminar vertieft der Studierende unter Anleitung die Fähigkeit zum wissenschaftlichen Arbeiten im Kontext eines angemessen Themengebietes. Am Ende des Masterseminars sind die Grundlagen für eine erfolgreiche Anfertigung der Masterarbeit gelegt und wesentliche Lösungsansätze bereits eruiert. Das Masterseminar bereitet somit die Themenstellung und Ausführung der Masterarbeit vor.

Inhalt

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise:

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Master Thesis					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
4	4	jedes Semester	1 Semester	2	30

Modulverantwortliche/r Studienbeauftragte/r der FR Sprachwissenschaft und Sprachtechnologie

Dozent/inn/en N.N.

Zuordnung zum Curriculum MSc Language Science and Technology

Mandatory

Zulassungsvoraussetzungen –

Leistungskontrollen / Prüfungen Written elaboration in form of a scientific paper. It describes the scientific findings as well as the way leading to these findings. It contains justifications for decisions regarding chosen methods for the thesis and discarded alternatives. The student's own substantial contribution to the achieved results has to be evident. In addition, the student presents his work in a colloquium, in which the scientific quality and the scientific independence of his achievements are evaluated.

Lehrveranstaltungen / SWS

Arbeitsaufwand 900 h = 50 h contact hours and 850 h private study

Modulnote graded

Lernziele / Kompetenzen

In the master thesis the student demonstrates his abilitiy to perform independent scientific work focusing on an adequately challenging topic prepared in the master seminar.

Inhalt

Depending on topic

Weitere Informationen

Unterrichtssprache: Englisch

Literaturhinweise:

Bekanntgabe jeweils vor Beginn der Vorlesung auf der Vorlesungsseite im Internet

Tutor					
Studiensem.	Regelstudiensem.	Turnus	Dauer	SWS	ECTS-Punkte
3	1–4	jedes Semester	1 Semester	2	4

Modulverantwortliche/r Studienbeauftragte/r der FR Sprachwissenschaft und Sprachtechnologie

Dozent/inn/en N.N.

Zuordnung zum Curriculum MSc Language Science and Technology

Elective Course

Zulassungsvoraussetzungen Each lecturer selects the tutors for his courses. A prerequisite for becoming a tutor is a very good grade in the relevant course, interest in didactics and an observable talent for didactical work.

Leistungskontrollen / Prüfungen The lecturer supervises tutors and gives them feedback regarding their contributions to weekly assignments (creating, finding sample solutions for exisiting eercises), answers to questions on the mailing list as well as correcting the exams.

The assistant of the course visits each tutorial once a semester and gives feedback to the tutor as well as to the lecturer. At the end of the semester each students evaluates the work of his/her tutor as a part of the course evaluation.

Lehrveranstaltungen / SWS Tutorial: 2 SWS
Tutoring groups of up to 20 students

Arbeitsaufwand 120 h = 30 h of classes and 90 h private study

Modulnote ungraded

Lernziele / Kompetenzen

Inhalt

- A tutor assists a course (usually basic or core lectures) for one semester. This includes the following tasks:
- Learning the specific didactic aspects of the course matter (4h).
- Moderating the weekly meetings (90 min each) of a tutorial group
- Correction of weekly tests, taken in the group
- Weekly office hours (90 min) for students attending the course.
- Attending weekly team-meetings with all tutors and lecturers of the course (45 min)
- Participation in developing sample exercise solutions of the weekly assignments (90 min weekly)
- Answering incoming questions on the mailing list regarding topics of the course and the weekly assignments (60 min weekly)
- Getting to grips with the contents of the current lecture (2h weekly)
- Creating new exercises (1h weekly)
- Supervising and correcting exams (midterm, final exam, re-exam, 12h each)

Weitere Informationen

Unterrichtssprache: Deutsch / Englisch