Natural Language Processing

Course Description

In this course, traditional, state-of-the-art basic and advanced approaches to natural language processing (NLP) will be taught. To achieve this goal, techniques, challenges, and solutions are presented with a comprehensive overview of related topics. Additionally, it will be shown how NLP can be used successfully in different use case scenarios – both theoretically and with practical examples.

Contents

1. Introduction to NLP
   1. What is NLP?
   2. Syntax, Semantics, and Prosodics
   3. Phonetics and Speech
   4. Evaluation of NLP Systems
2. Text Processing
   1. Word Vectors and Word Embeddings
   2. Regular Expressions
   3. Statistical Approaches
   4. Recurrent Neural Network Based Approaches
   5. Transformer Based Approaches
3. Speech Processing
   1. Statistical Speech Recognition and Synthesis
   2. Speech Recognition and Synthesis with Deep Learning
4. Application Scenarios
   1. Speech Recognition, Speech Synthesis, and Machine Translation
5. Information Extraction and Text Understanding
6. Chatbots and Voice Assistants
7. NLP in Education
8. NLP with Python
9. Challenges in NLP
   1. Data for NLP
10. Domain and Language Adaptation
11. Explainability
12. Bias

Voice Assistants

**Course Description**

In this course, the implementation of voice assistants with state-of-the-art methods and

frameworks will be taught. To achieve this goal in a structured manner, students will stepwise submit deliverables in a conception phase, a development/reflection phase, and a finalization phase. In each phase, students will receive feedback from the course tutor to iteratively enhance and extent the implementation.

Contents

▪ The practical implementation and development of a voice assistant with digital

documentation are combined as part of a portfolio that is designed and carried out individually but supervised by the responsible tutor. The implementation consists of three phases – the “conception phase,” the “development/reflection phase,” and the “finalization phase” – which are intended to illustrate the individual work or development steps and the adopted approach. In the conception phase, the concept or core idea should be introduced as well as the initial motivation. Implementation of the basic ideas takes place in the implementation/reflection phase. In the finalization phase, the final product and/or a final version of the written assessment are developed and delivered.