Natural Language Processing – Methods and Applications

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Introduction
- What is NLP?

Expectations
- What you can expect.
- What we expect.

Organization
- Examination procedure
- Schedule
- Course Structure
- Advisors
Natural Language Processing (NLP)

We will focus on:

- Texts (rather than speech)
- Methods and applications (rather than theory)
Natural Language Processing (NLP)

Three perspectives on NLP:

- Computational Linguistic
- Machine Learning
- Applications
Outline

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What you can expect.

- Overview over different areas and task within Natural Language Processing
- Insight into both, general methods and their application
- Overview over the current research within the field
- Deep dive into one topic of your choice
- Work with scientific literature and peer review process
What you can expect.

Foundations of NLP:
- Word Embeddings: Techniques and Applications
- Language Models: From N-grams to Transformers
- Attention Mechanisms in NLP: Transformer Architecture

Techniques in NLP:
- Document Classification and Topic Modeling
- Named Entity Recognition (NER) in NLP
- Part-of-Speech Tagging and Dependency Parsing: Models, Methods, Evaluation and Applications
- Machine Translation: Approaches and Evaluations

Privacy & Security in Natural Language Processing:
- Ethical Societal, and Legal Aspects of LLMs
- Differential Privacy in Natural Language Processing
- Adversarial Attacks in and Privacy Risks of (L)LMs

Miscellaneous:
- Natural Language Inference
- Explainability in NLP
- Knowledge Graphs in NLP: Construction and Applications

Large Language Models:
- Transfer Learning and Domain Adaptations: Challenges and Solutions
- Natural Language Generation (Auto Regressive Models): Techniques and Use Cases
- Prompt-Tuning
- Finetuning LLMs and Reinforcement Learning from Human Feedback
- Efficiency and Context Window in Large Language Models
- Text Summarization: Extractive and Abstractive Approaches
- Question Answering Systems: Challenges and Approaches
- Model Hallucination: Fact checking Approaches

Conversational AI:
- Task-based & Social Conversational Agents
- Dialogue Management (Dialogue State Tracking & Policy)
- Conversational Search Systems
What we expect.

- Participation (not just attendance)
- Project / Demo (optional)
- Presentation (30min + 15min discussion)
- Seminar paper (8 pages) + Peer review
- Usage of LaTeX
- You don’t need an extensive knowledge in NLP or ML (but consider your previous knowledge when choosing a topic)
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Examination procedure

- Module Number (Master-Seminar): IN2107, IN4816

- 5 ECTS (1 ECTS equals to 30h, hence, 5*30h = 150h)

- Regular attendance (not more than one missed session)

- Oral presentation:
  30 min presentation + 15 min discussion => 45 min

- Seminar paper:
  8 pages, LaTeX

- Peer reviews:
  Reviews for two other seminar papers

- Project / Demo (optional):
  0.3 bonus grade
## Seminar milestones

<table>
<thead>
<tr>
<th>Seminar milestone</th>
<th>Dates</th>
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<tbody>
<tr>
<td>Preliminary Meeting</td>
<td>30.01.2024</td>
</tr>
<tr>
<td>Send us your CV and transcript</td>
<td>Until 14.02.2024</td>
</tr>
<tr>
<td>Matching</td>
<td>Until 23.02.2024</td>
</tr>
<tr>
<td>Send your top 4 Topic Preferences</td>
<td>Until 01.03.2024</td>
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<tr>
<td>Topic Assignment</td>
<td>Until 08.03.2023</td>
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<tr>
<td>14 Weekly sessions (each Friday)</td>
<td>19.04.2024 – 19.07.2024 (10am – 12 pm)</td>
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<tr>
<td>Submission seminar review</td>
<td>28.07.2024</td>
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<tr>
<td>Submission peer review</td>
<td>04.08.2024</td>
</tr>
<tr>
<td>Submission revised seminar paper</td>
<td>11.08.2024</td>
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Course Structure

- After Topic assignment
  - Get in contact with your advisor to schedule your meetings

- At least two meetings with your advisor.
  - Topic discussion
  - Presentation feedback

- If you have questions, please contact your assigned advisor.
Your Advisors

Anum Afzal
NLP

Research Interests
- Natural Language Generation
- Text Summarization
- Domain Adaptation

Phillip Schneider
NLP

Research Interests
- Conversational Interfaces
- Information Retrieval
- Knowledge Graphs
- Knowledge Engineering

Juraj Vladika
NLP

Research Interests
- Natural Language Understanding
- Natural Language Generation
- Information Retrieval

Stephen Meisenbacher
NLP & Privacy

Research Interests
- Privacy-preserving NLP
- Hybrid, Expert-Driven Classification Systems
- Privacy, Data Protection, and Privacy-Enhancing Technologies

Tim Schopf
NLP & Knowledge Representation

Research Interests
- Knowledge Graphs
- Ontology Learning
- Question Answering
- Information Extraction

Mahdi Dhaini
Explainability in NLP

Research Interests
- Explainable AI
- Natural Language Processing
- Swarm Intelligence
Contact and Questions

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Are you Interested in applying?

1) Send your CV and transcript to Email: anum.afzal@tum.de
   Subject: NLP seminar 2024

2) Apply through the Matching system