Natural Language Processing – Methods and Applications

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Outline

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

ML **NLP** **App**

CoLi

Outline

Introduction

- What is NLP?

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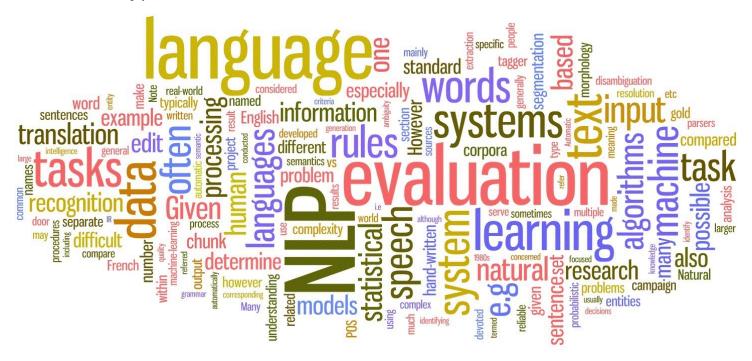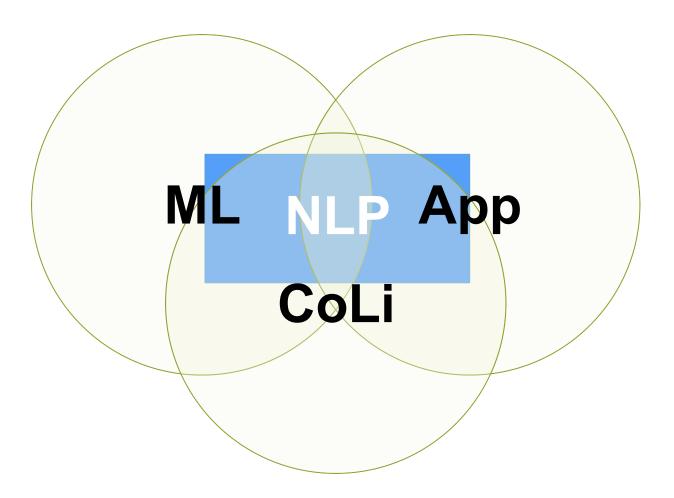
- What you can expect.
- What we expect.

Organization

- Examination procedure
- Schedule
- Course Structure
- Advisors

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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Introduction
- What is NLP?

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

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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

Schedule

Seminar milestones	Dates
Preliminary Meeting	30.01.2024
Send us your CV and transcript	Until 14.02.2024
Matching	Until 23.02.2024
Send your top 4 Topic Preferences	Until 01.03.2024
Topic Assignment	Until 08.03.2023
14 Weekly sessions (each Friday)	19.04.2024 – 19.07.2024 (10am – 12 pm)
Submission seminar review	28.07.2024
Submission peer review	04.08.2024
Submission revised seminar paper	11.08.2024

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
Explainablity in NLP

Research Interests

- Explainable AI
- Natural Language Processing
- Swarm Intelligence

Contact and Questions

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Mahdi Dhaini

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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