



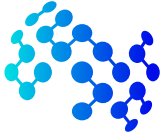
Core Courses Syllabi

NLP704 - Deep Learning for Language Processing

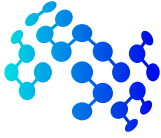
Title	Deep Learning for Language Processing
Code	NLP704
Loading	4 Credit-hours
Prerequisites	<ul style="list-style-type: none">• NLP 701 Natural Language Processing• Understanding of calculus, algebra, probability and statistics• Programming in Python or similar language
Catalog Description	This course focuses on recent advances in Natural Language Processing and on developing skills for performing research to advance the state of the art in Natural Language Processing. This course builds upon concepts from Natural Language Processing (NLP 701) and assumes familiarity with fundamental concepts in Word Embedding, Information Extraction and Machine Translation.
Goal	This graduate course aims to inculcate a deeper understanding of the advanced Natural Language Processing methods, so the students are capable of researching, developing, and implementing these methods for solving real-world problems. Additionally, a significant goal of this course is to enhance students' teamwork skills by requiring them to participate in group projects.
Content	The course covers three modules: (I) Word Embedding, (II) Information Extraction, (III) Machine Translation
Recommended Textbooks	<ol style="list-style-type: none">1. Chris Manning et al, <i>Foundation of statistical natural language processing</i>, MIT Press, 1999.2. Ian Goodfellow, Yoshua Bengio, and Aaron Courville. <i>Deep Learning</i>, MIT Press, 2016.
Recommended References & Supplemental Material	Relevant research papers, tech reports, and surveys for each topic, where needed, are identified in the teaching plan ahead. In addition, the following textbooks may be useful: C. Bishop, <i>Pattern Recognition and Machine Learning</i> , Berlin: Springer-Verlag, 2006.



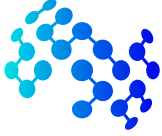
Teaching Week	Topics
1	<p>Word Embedding</p> <p>Lectures</p> <ul style="list-style-type: none">• Overview of Word Embedding• Discussion on papers:<ul style="list-style-type: none">- Yoshua Bengio et al, <i>A Neural Probabilistic Language Model</i>, JMLR, 2003- Ronan Collobert et al, <i>Natural Language Processing (almost) from Scratch</i>, JMLR, 2011 <p>Lab</p> <ul style="list-style-type: none">• Discussion on choosing a relevant paper to implement for the project• Start project-1 work
2	<p>Word Embedding</p> <p>Lecture</p> <ul style="list-style-type: none">• Word Embedding – Learning methods• Reading group activity on selected papers related to “Word Embedding”<ul style="list-style-type: none">- Tomas Mikolov et al, <i>Distributed Representations of Words and Phrases and their Compositionality</i>, NIPS, 2013 <p>Lab</p> <ul style="list-style-type: none">• Continue project-1 work
3	<p>Word Embedding</p> <p>Lecture</p> <ul style="list-style-type: none">• Word Embedding – Intrinsic and Extrinsic Evaluation• Group discussion on the relevant papers<ul style="list-style-type: none">- Jeffrey Pennington et al, <i>GloVe: Global Vectors for Word Representation</i>, EMNLP, 2014 <p>Lab</p> <ul style="list-style-type: none">• Continue project-1 work
4	<p>Word Embedding</p> <p>Lecture</p> <ul style="list-style-type: none">• Word Embedding – Applications• Group discussion on the relevant papers <p>Lab</p> <ul style="list-style-type: none">• Preparation of presentation on project-1 work• Continue project-1 work



Teaching Week	Topics
5	<p>Word Embedding</p> <p>Assessment 1.1</p> <ul style="list-style-type: none">• Presentation of the projects by different groups <p>Lab</p> <ul style="list-style-type: none">• Peer review of project reports <p>Assessment 1.2</p> <ul style="list-style-type: none">• In-class exam covering module I – Word Embedding.
6	<p>Information Extraction</p> <p>This module overviews the following: Named Entity Recognition, Relation Extraction, Event Extraction and Semantic Role Labelling.</p> <p>Lecture</p> <ul style="list-style-type: none">• Overview of Information Extraction• Discussion of papers:<ul style="list-style-type: none">- Ronan Collobert et al, <i>Natural Language Processing (almost) from Scratch</i>, JMLR, 2011- Guillaume Lample et al, <i>Neural Architectures for Named Entity Recognition</i>, NAACL, 2016 <p>Lab</p> <ul style="list-style-type: none">• Discussion on choosing a relevant paper to implement for the project• Start Project-2 work
7	<p>Information Extraction</p> <p>Lecture</p> <ul style="list-style-type: none">• Information Extraction – Name Entity Recognition• Reading group activity on relevant papers<ul style="list-style-type: none">- D Zeng et al, <i>Relation Classification via Convolutional Deep Neural Network</i>, COLING, 2014- TH Nguyen et al, <i>Joint Event Extraction via Recurrent Neural Networks</i>, NAACL, 2016 <p>Lab</p> <ul style="list-style-type: none">• Continue Project-2 work
8	<p>Information Extraction</p> <p>Lecture</p> <ul style="list-style-type: none">• Information Extraction – Relation Extraction and Event Extraction• Discussion of relevant papers:<ul style="list-style-type: none">- Zhou and Xu, <i>End-to-end Learning of Semantic Role Labeling Using Recurrent Neural</i>, ACL, 2015 <p>Lab</p> <ul style="list-style-type: none">• Continue Project-2 work



Teaching Week	Topics
9	Information Extraction Lecture <ul style="list-style-type: none">Information Extraction – Semantic Role LabellingDiscussion of relevant papers. Lab <ul style="list-style-type: none">Preparation of presentation on project-2 workContinue project-2 work
10	Information Extraction Assessment 2.1 <ul style="list-style-type: none">Presentation of the projects by different groups Lab <ul style="list-style-type: none">Peer review of project reports Assessment 2.2 <ul style="list-style-type: none">In-class exam covering module II – Information Extraction
11	Machine Translation Lecture <ul style="list-style-type: none">Overview of Machine TranslationDiscussion of relevant papers:<ul style="list-style-type: none">Ilya Sutskever, et al, <i>Sequence to Sequence Learning with Neural Networks</i>, NIPS, 2014 Lab <ul style="list-style-type: none">Discussion on choosing a relevant paper to implement for the projectStart Project-3 work
12	Machine Translation Lecture <ul style="list-style-type: none">Machine Translation – datasetsDiscussion of relevant papers<ul style="list-style-type: none">Bahdanau, et al, <i>Neural Machine Translation by Jointly Learning to Align and Translation</i>, ICLR, 2015 Lab <ul style="list-style-type: none">Continue project-3 work



Teaching Week	Topics
13	<p>Machine Translation</p> <p>Lecture</p> <ul style="list-style-type: none">Machine Translation – Deep learning models in Machine TranslationDiscussion of relevant papers<ul style="list-style-type: none">Rico Sennrich et al, <i>Neural Machine Translation of Rare Words with Subword Units</i>, ACL, 2016Ashish Vaswani et al, <i>Attention is All You Need</i>, NIPS, 2017 <p>Lab</p> <ul style="list-style-type: none">Continue project-3 work
14	<p>Machine Translation</p> <p>Lecture</p> <ul style="list-style-type: none">Machine Translation – EvaluationContinue discussion of relevant papers from previous weeks (12, 13) <p>Lab</p> <ul style="list-style-type: none">Preparation of presentation on project-3 workContinue project-3 work
15	<p>Machine Translation</p> <p>Assessment 3.1</p> <ul style="list-style-type: none">Presentation of the projects by different groups <p>Lab</p> <ul style="list-style-type: none">Peer review of project reports <p>Assessment 3.2</p> <ul style="list-style-type: none">In-class exam covering module III – Machine Translation