

# Deep Learning for Natural Language Processing

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DEPARTMENT OF  
**COMPUTER  
SCIENCE**

# Why take this course?

Artificial Intelligence is one of the most interesting fields of research today, and language is the most compelling manifestation of intelligence.

# Course Information

**Website** [www.cs.ox.ac.uk/teaching/courses/2016-2017/dl](http://www.cs.ox.ac.uk/teaching/courses/2016-2017/dl)

**Textbooks** No specific text,

- a good DL reference is:  
Goodfellow, Bengio, and Courville,  
Deep Learning. [www.deeplearningbook.org](http://www.deeplearningbook.org)
- for a general background in ML:  
Machine Learning: A Probabilistic Perspective  
Bishop, Pattern Recognition and Machine Learning

**Lectures** 4–6pm Tuesday and Thursday

**No lectures in week 2!**

**Practicals** 7 lab sessions, Weeks 2-8

Demonstrators: Brendan Shillingford, Yishu Miao, and  
Yannis Assael

**Assessment** take home exam.

# Provisional Lecture Schedule

**Week 1** 1. Introduction Phil Blunsom (Oxford and DM) and Wang Ling (DM)

2. Lexical Semantics Ed Grefenstette (DM)

**Week 2** No lectures

**Week 3** 3&4. RNNs and Language Modelling Phil Blunsom

**Week 4** 5. Text Classification Karl Moritz Hermann (DM)

6. RNNs and GPUs Jeremy Appleyard (nvidia)

**Week 5** 7&8. Sequence Transduction Chris Dyer (CMU and DM)

**Week 6** 9&10. Speech Andrew Senior (DM)

**Week 7** 11. Question Answering Karl Moritz Hermann

12. Memory Ed Grefenstette

**Week 8** 13. Linguistic Structure Chris Dyer

14. Conclusion Phil Blunsom

# Prerequisites

- Maths**
- Linear Algebra,
  - Calculus,
  - Probability.

## Machine Learning

- Evaluating ML models (train/validation/test split, cross validation etc.),
- overfitting, generalisation, and regularisation,
- optimisation (objective functions, stochastic gradient descent),
- linear regression and classification, neural networks (common non-linearities, backpropagations etc.).

## Programming

Knowledge of, or ability to learn quickly, a NN toolkit (e.g. Torch, TensorFlow, Theano, DyNet etc.)

# What this course is, and is not, about

This course will survey the use of Deep Learning techniques for a range of Natural Language Processing applications.

This is not a general course on NLP. There is a lot more to language and computational linguistics, and many interesting paradigms beyond deep learning, than we will cover.

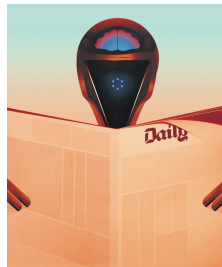
# Language Understanding

## CNN article:

Document The BBC producer allegedly struck by Jeremy Clarkson will not press charges against the “Top Gear” host, his lawyer said Friday. Clarkson, who hosted one of the most-watched television shows in the world, was dropped by the BBC Wednesday after an internal investigation by the British broadcaster found he had subjected producer Oisin Tymon “to an unprovoked physical and verbal attack.” ...

Query Who does the article say will not press charges against Jeremy Clarkson?

Answer Oisin Tymon



# Speech Processing and Machine Translation



Speech Recognition (ASR)

Les chiens aiment les os



Machine Translation (MT)

Dogs love bones



Text to Speech (TTS)





# Image Understanding



What is the man holding?  
Does it appear to be raining?  
Does this man have 20/20 vision?

# Linguistic Structure

## Sense



I saw her duck



## Idioms

He kicked a goal

He kicked the ball

He caught the ball

He kicked the bucket

## Reference

The ball did not fit in the box because it was too [big/small].

etc.

Next lecture, Wang Ling:  
Deep Neural Networks Are Our Friends



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