Deep Learning for Natural Language Processing

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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`

Textbooks No specific text,

- a good DL reference is:
  Goodfellow, Bengio, and Courville,
  Deep Learning. `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

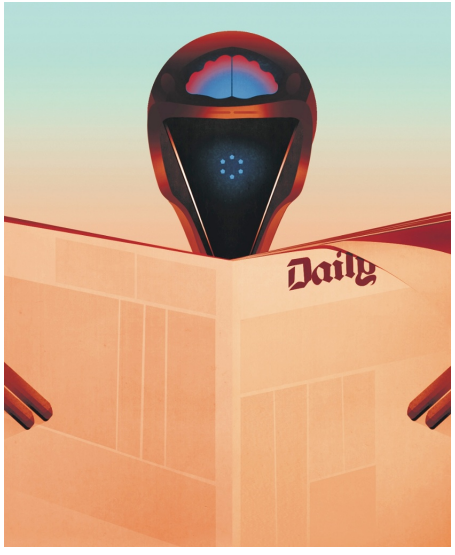
This course will survey the use of Deep Learning techniques for a range of Natural Language Processing applications.

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.

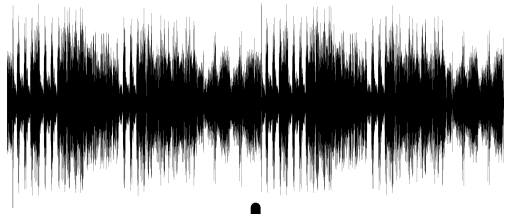
Language Understanding

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)

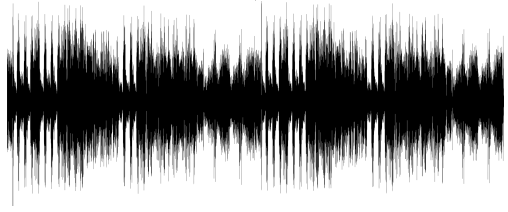
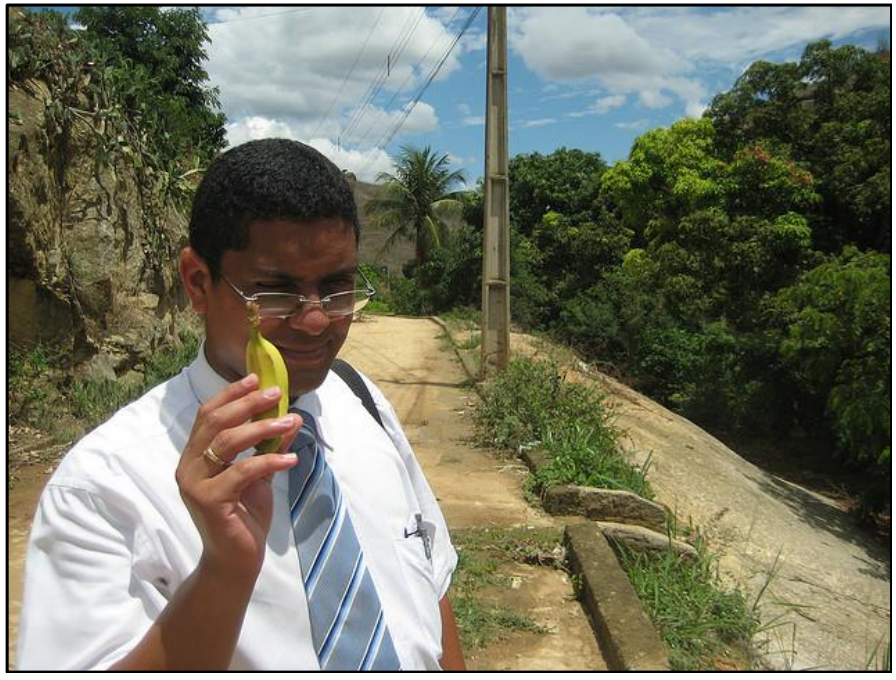


Image Understanding



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

Agrawal et al., VQA: Visual Question Answering, ICCV 2015.

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