Intro to NLP

Dmitry Ilvovsky and Ekaterina Chernyak

September 1, 2020

Today

Intro

About this course

Recent trends in NLP

Example task: text classification

Practice: tools for processing Russian

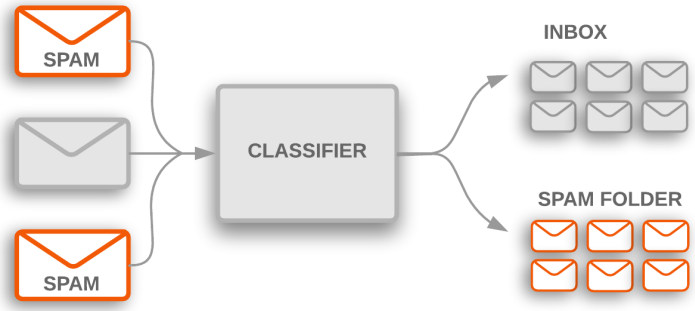
Natural language processing ...

- along with computer vision a crucial part of modern artificial intelligence
- deals with all human (and machine) interactions in language
- requires understanding of linear algebra, statistics, mathematics in general, linguistics and coding skills

Example tasks

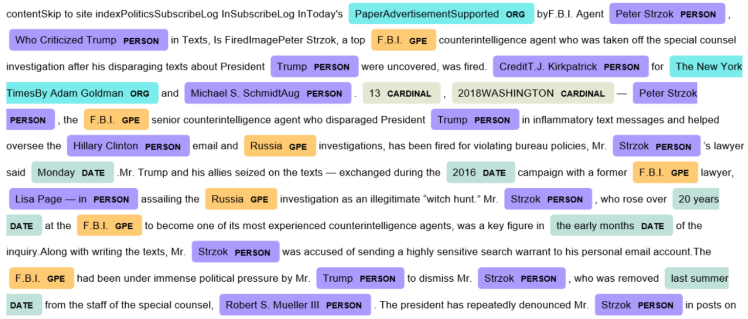
Text classification

- Sentiment analysis
- Intent detection
- Spam filtering
- Topic classification



Sequence labelling

- Named entity recognition
- Coreference resolution



Sequence transformation (seq2seq)

- Machine translation
- Question answering

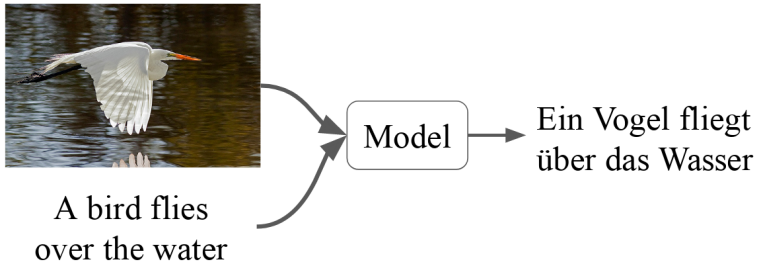


Image sources: developers.google.com, towardsdatascience.com, statmt.org

Phenomena to handle

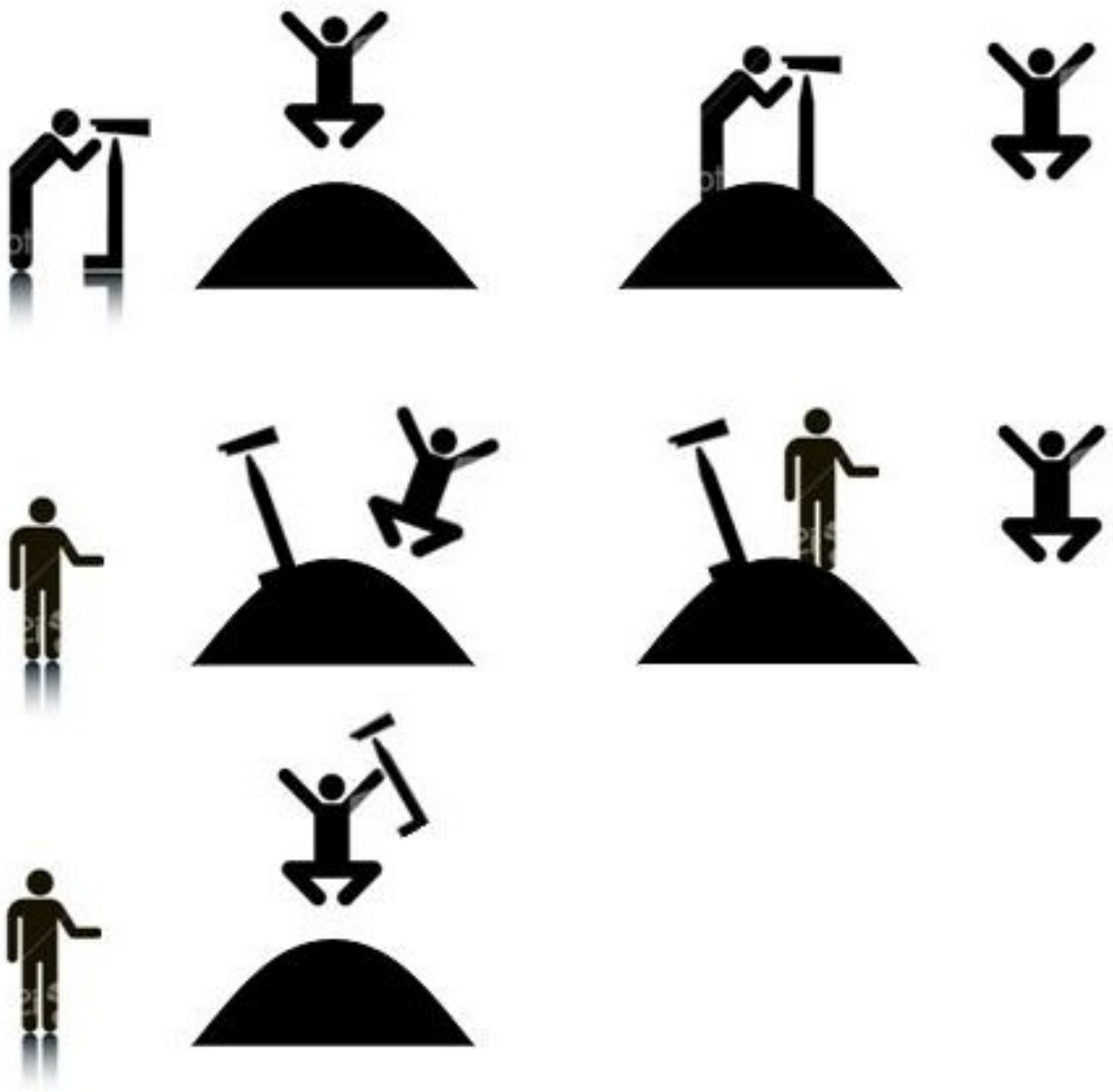
1. Tokenization and sentence boundary detection
2. Morphology
3. Syntax
4. Semantics
5. Discourse
6. Pragmatics
7. Multilinguality

Ambiguity

1. Polysemy and word-sense disambiguation: орган, bank
2. Homonymy: the ship or to ship, стекло
3. Syntactic ambiguity: John saw the man on the mountain with a telescope.

Syntactic ambiguity

John saw the man on the mountain with a telescope



Today

Intro

About this course

Recent trends in NLP

Example task: text classification

Practice: tools for processing Russian

About this course

This course is based on the NLP course developed by Ekaterina Chernyak from parallel education program:
github.com/PragmaticsLab/NLP-course-AMI

1. Lecturer: Dmitry Ilvovsky
2. Seminars: Dmitry Ilvovsky, Denis Smirnov
3. TA: Denis Smirnov, denis.m.smirnov@gmail.com
4. Repo: github.com/denis-smirnov/hse-ami-nlp-course-fall-20
5. Chat: https://t.me/joinchat/CDDAm03aoX53xIQi96JPoQ
6. Final mark: $M_1, 2 = round(0,6HW + 0,4Project)$
   $final = round(0,4exam + 0,3(M_1 + M_2) + 0,5_{questions})$
7. Project: SemEval 2020 or similar shared task

Our plan

1. Word embeddings
2. Text classification
3. Sequence modelling
4. Seq2Seq modelling
5. Syntax
6. Machine translation
7. Generative models
8. Linguistic resources
9. Discourse and Argumentation

Today

Intro

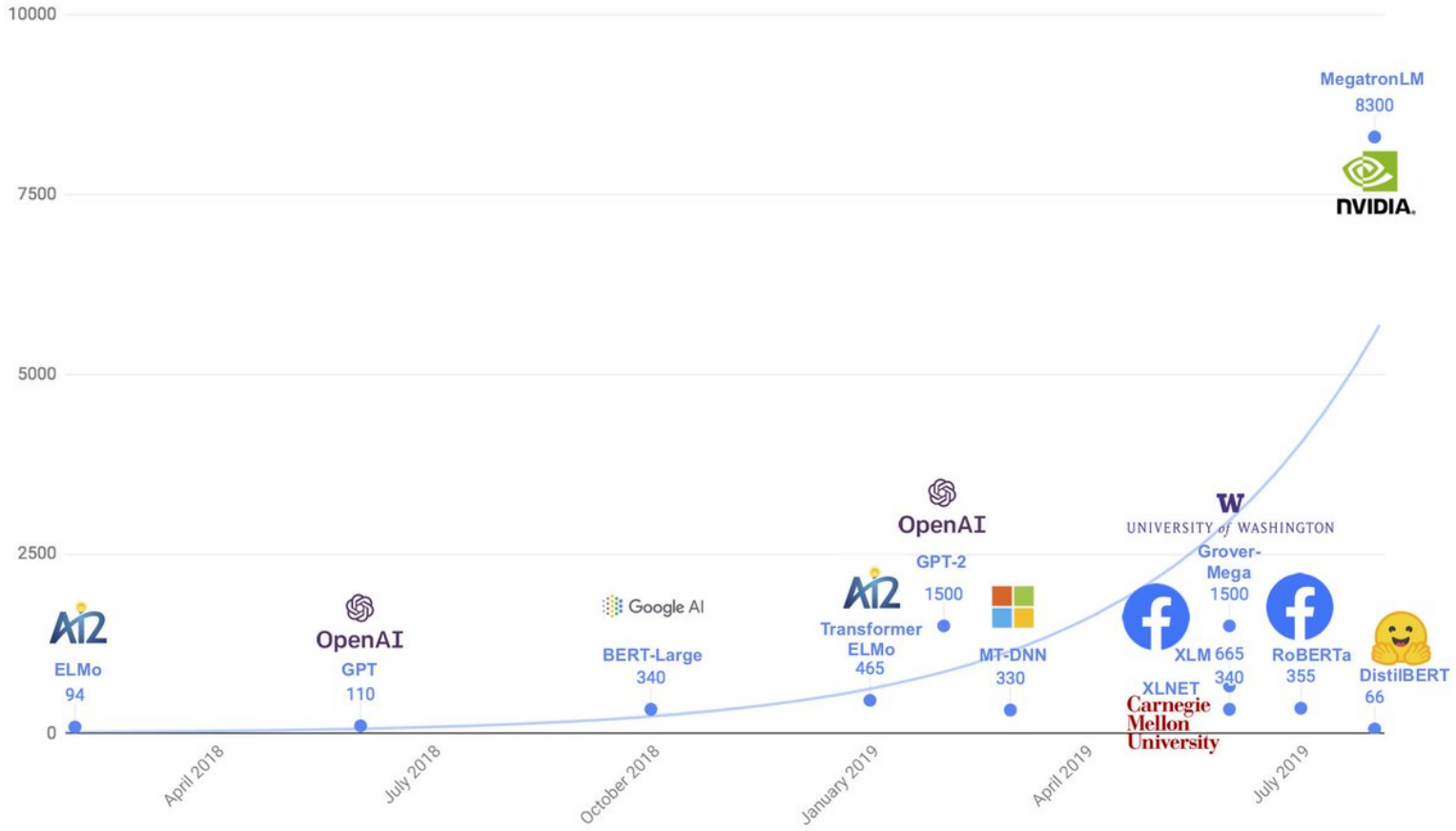
About this course

Recent trends in NLP

Example task: text classification

Practice: tools for processing Russian

NLP's ImageNet moment has arrived



... but is rather questionable

Recent trends in NLP

1. **The ethics of AI**
   - Fairness
   - Societal applications
2. **Transfer learning**
   - Cross-lingual methods
   - Cross-domain methods
3. **Question answering**
4. **Multimodal NLP**
5. **Clinical NLP**

Today

Intro

About this course

Recent trends in NLP

Example task: text classification

Practice: tools for processing Russian

Vector space model [1]

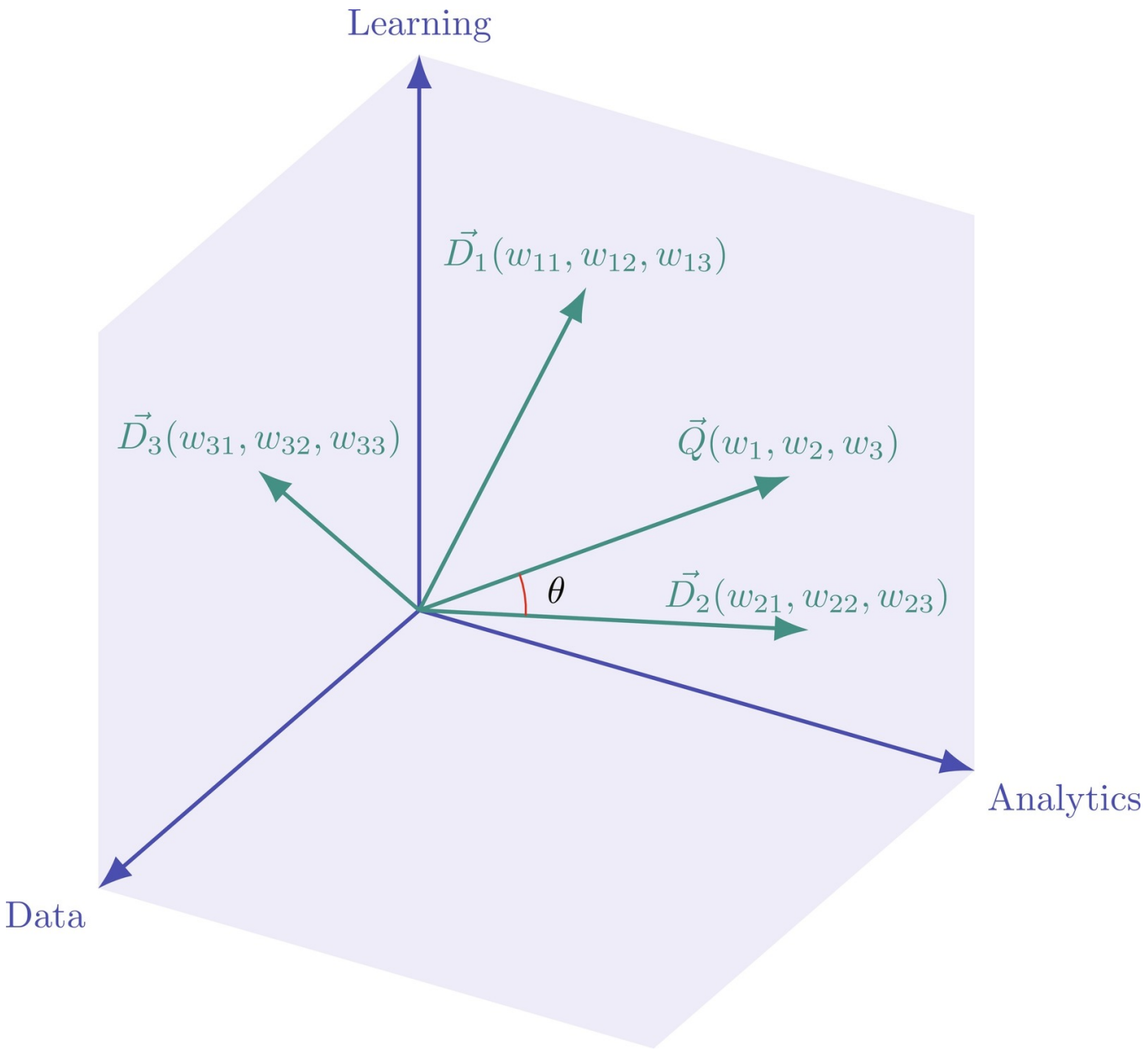


Image source: Handbook of statistics

Feed forward network

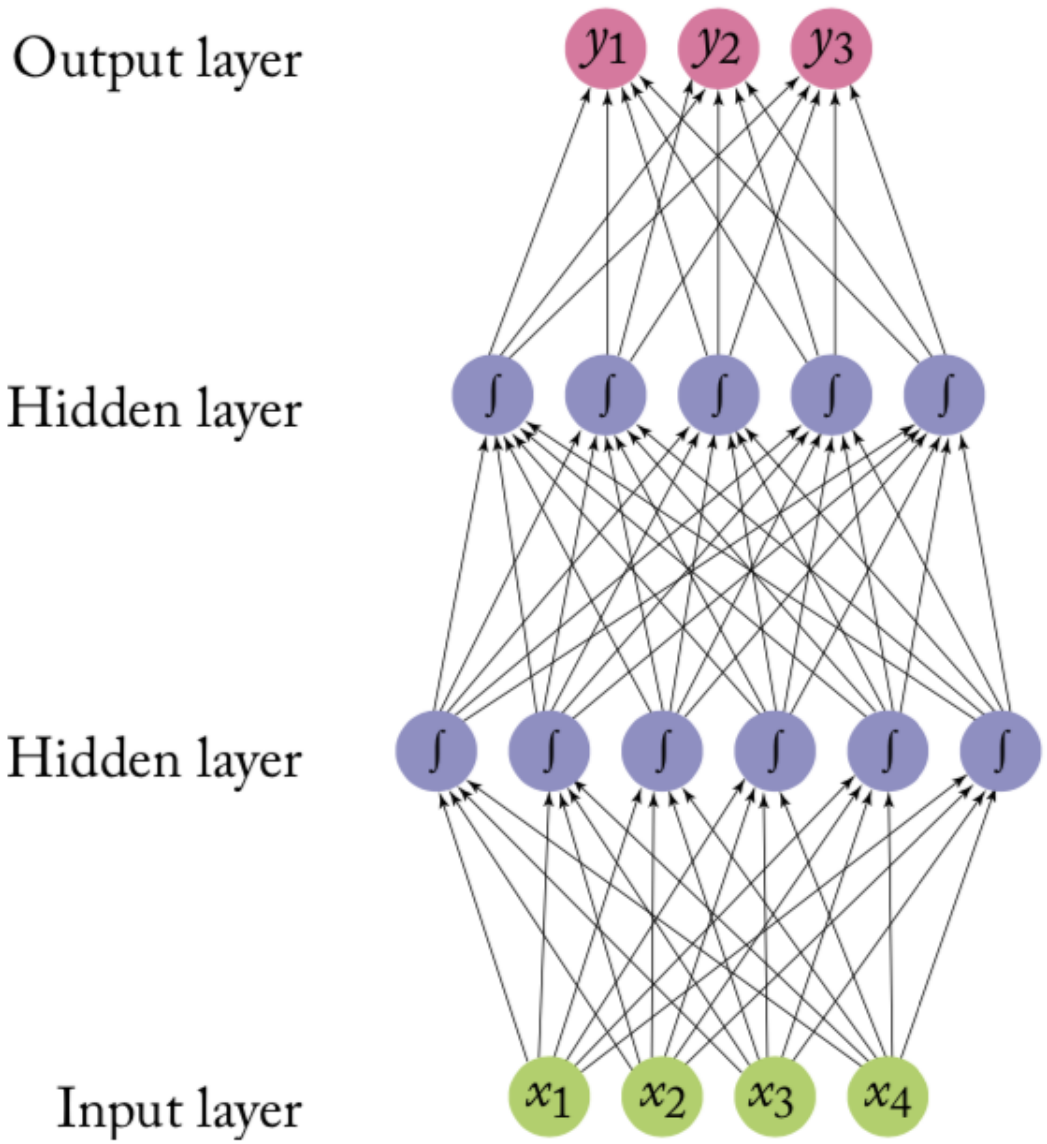
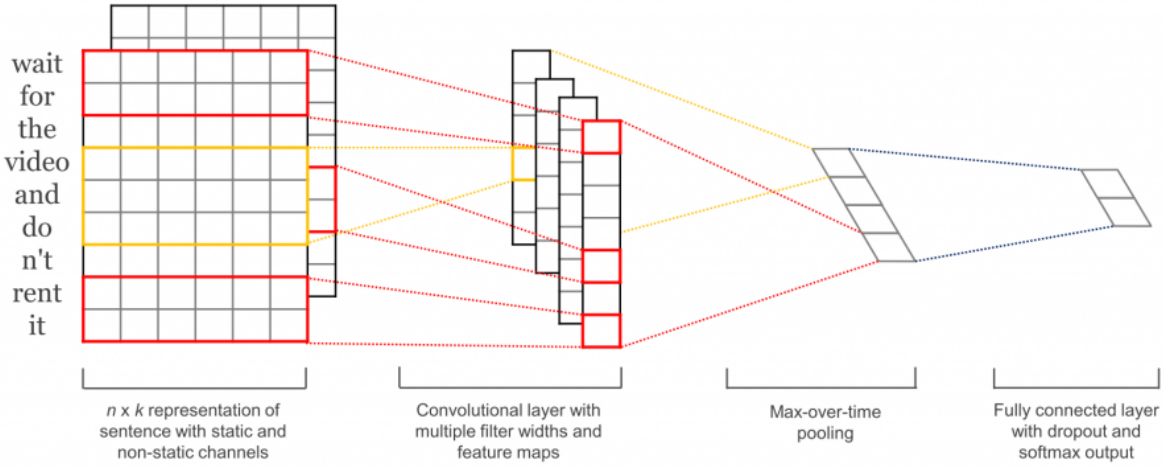


Image source: NN Methods for NLP

Convolutional network [2]



LSTM

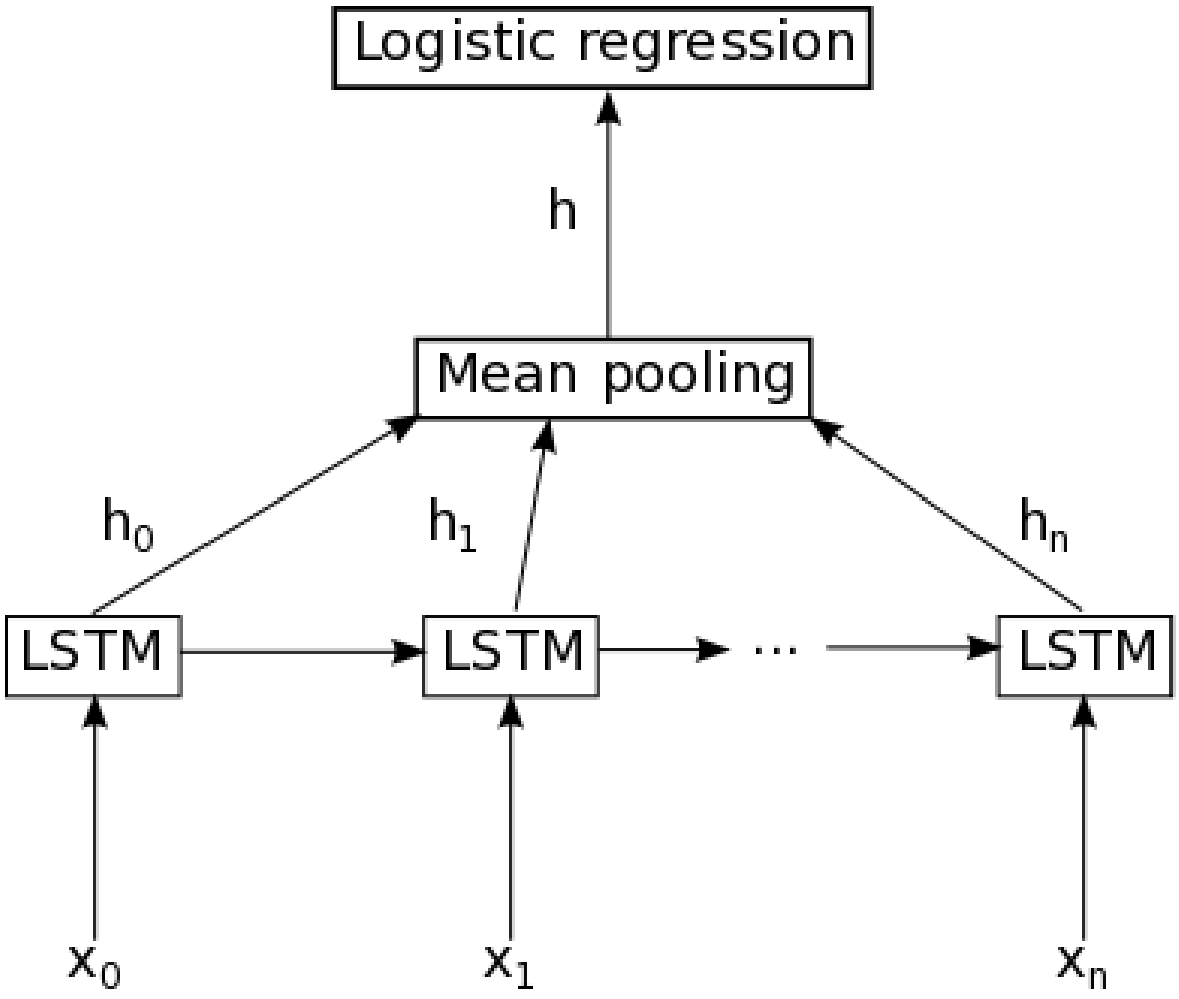
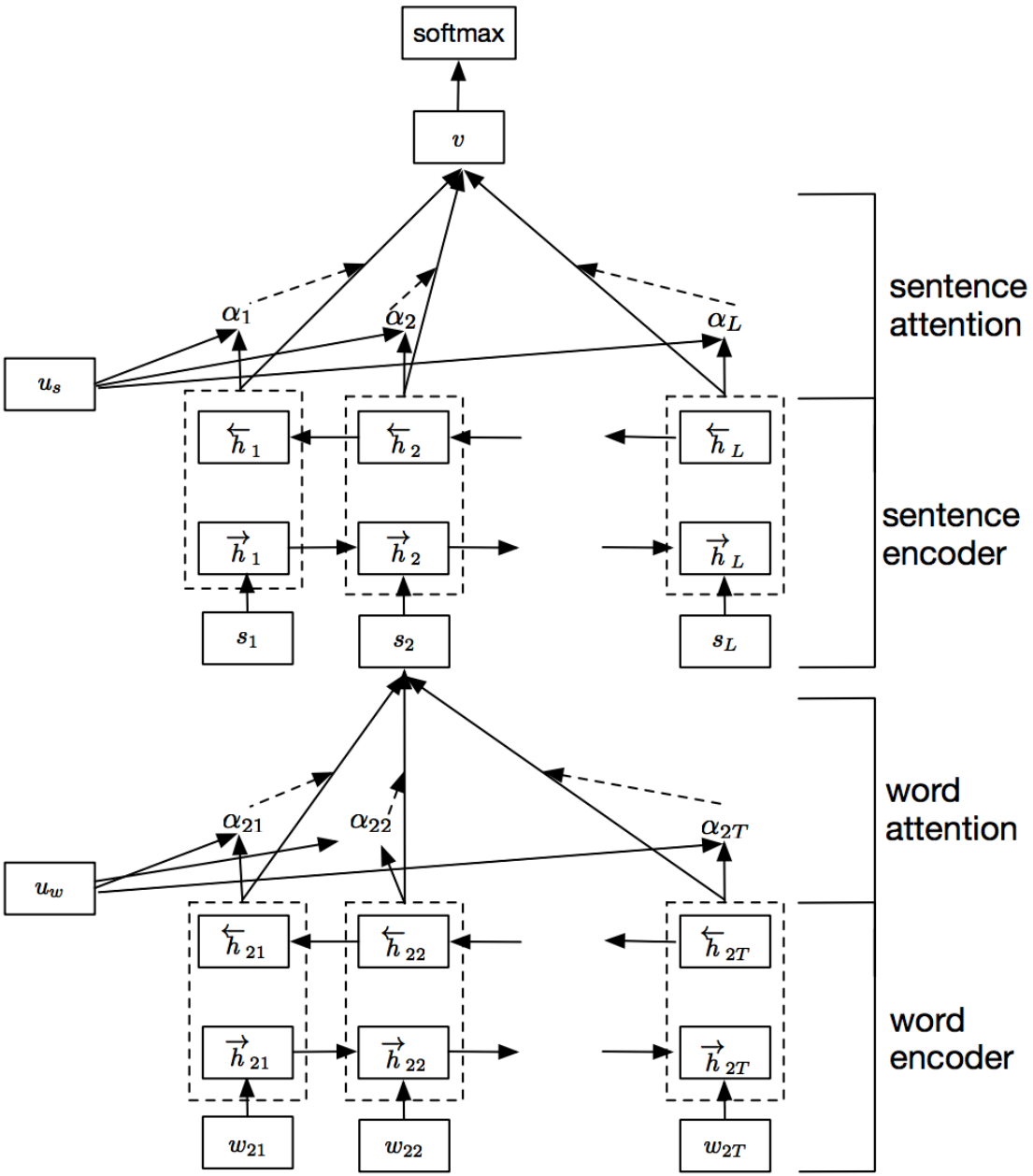
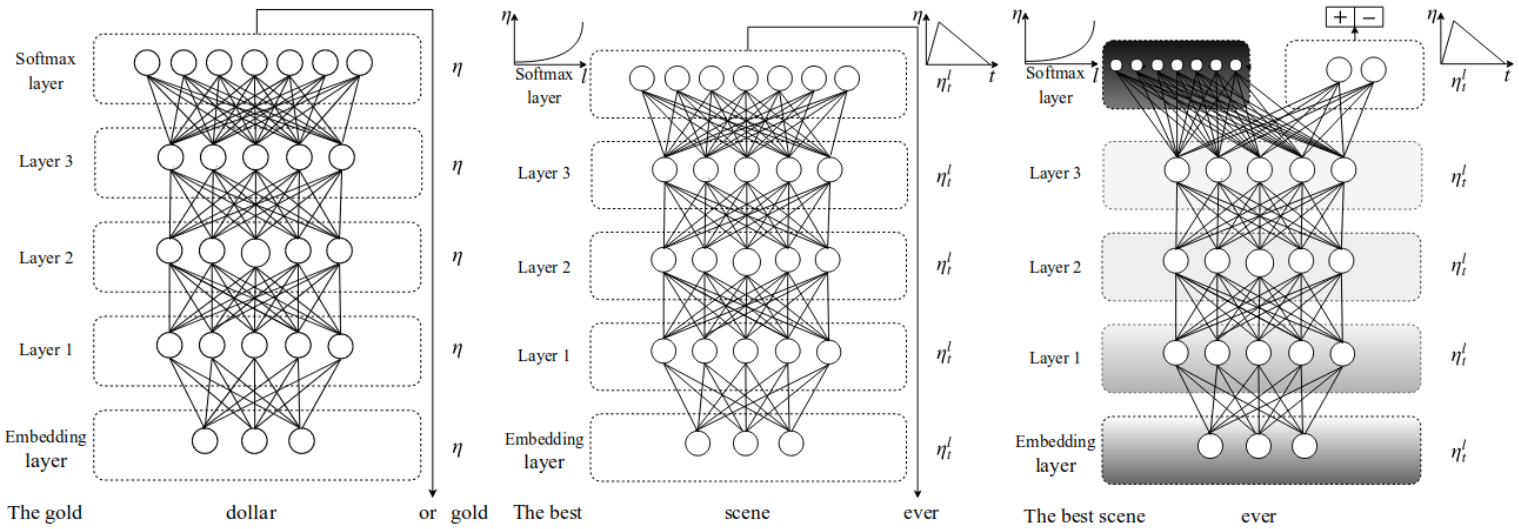


Image source: deeplearning.net

Hierarchical attention network [3]

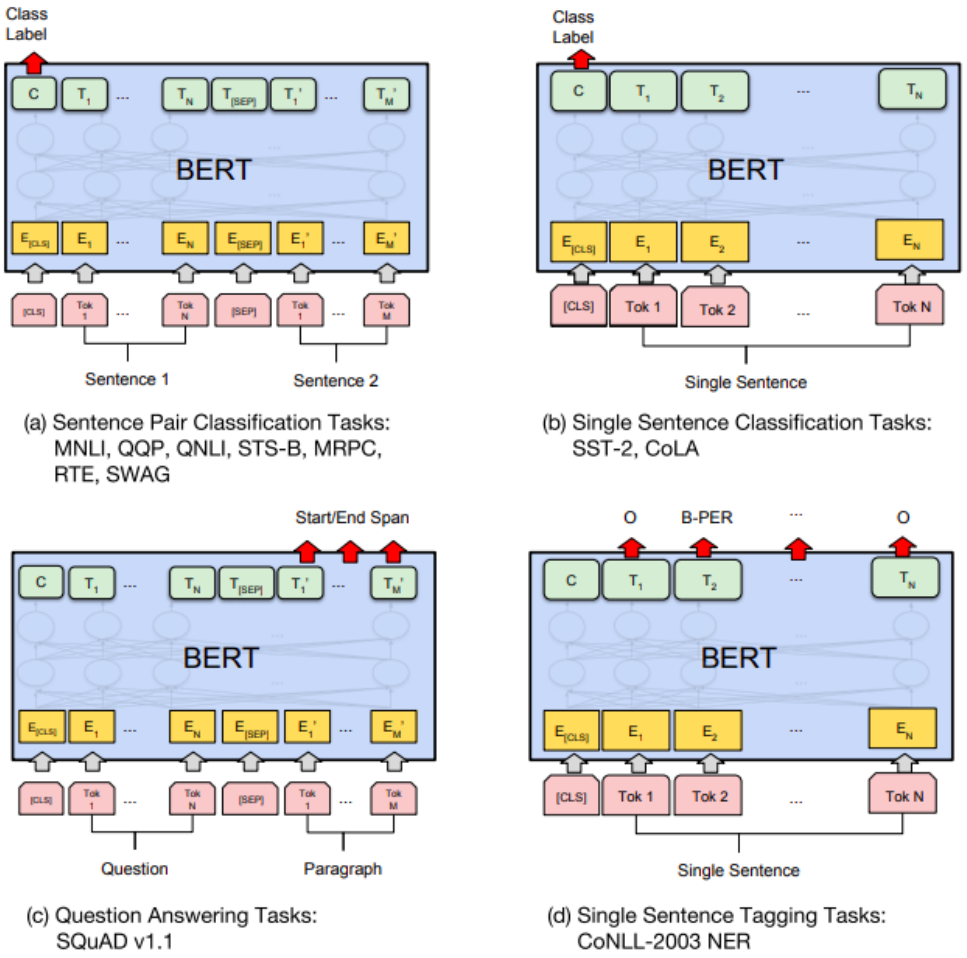


ULMFiT [4]



(a) LM pre-training (b) LM fine-tuning (c) Classifier fine-tuning

BERT [5]



(a) Sentence Pair Classification Tasks: MNLI, QQP, QNLI, STS-B, MRPC, RTE, SWAG

(b) Single Sentence Classification Tasks: SST-2, CoLA

(c) Question Answering Tasks: SQuAD v1.1

(d) Single Sentence Tagging Tasks: CoNLL-2003 NER

Today

Intro

About this course

Recent trends in NLP

Example task: text classification

Practice: tools for processing Russian

Reading

1. Text classification algorithms: a survey [arXiv]
2. Speech and Language Processing. Daniel Jurafsky, James H. Martin, Ch. 2 [url]
3. Natural Language Processing. Jacob Eisenstein, Ch. 2-4, [[GitHub]

Reference

- G. Salton, A. Wong и C.-S. Yang, “A vector space model for automatic indexing”, *Communications of the ACM*, т. 18, № 11, с. 613—620, 1975.
- Y. Kim, “Convolutional neural networks for sentence classification”, *arXiv preprint arXiv:1408.5882*, 2014.
- Z. Yang, D. Yang, C. Dyer, X. He, A. Smola и E. Hovy, “Hierarchical attention networks for document classification”, в *Proceedings of the 2016 conference of the North American chapter of the association for computational linguistics: human language technologies*, 2016, с. 1480—1489.
- J. Howard и S. Ruder, “Universal language model fine-tuning for text classification”, *arXiv preprint arXiv:1801.06146*, 2018.
- J. Devlin, M.-W. Chang, K. Lee и K. Toutanova, “Bert: Pre-training of deep bidirectional transformers for language understanding”, *arXiv preprint arXiv:1810.04805*, 2018.