DEEP LEARNING:
Introduction and Applications

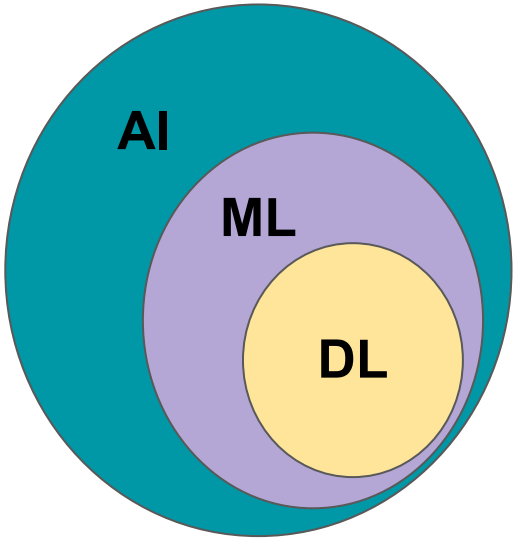
Gedeon M

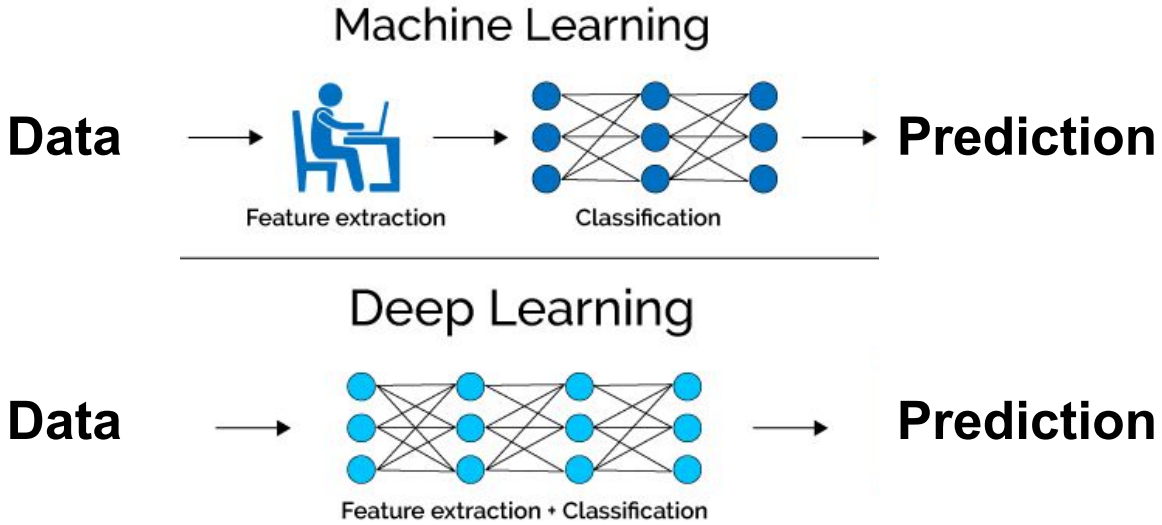
Nyandwi JD

Day 1 Agenda

2:30 - 3:30	**Presentation**
3:30 - 3:50	**Questions**
3:50 - 4:00	**Break**
4:00 - 4:30	**Practice**
4:30 - 5:00	**Questions**

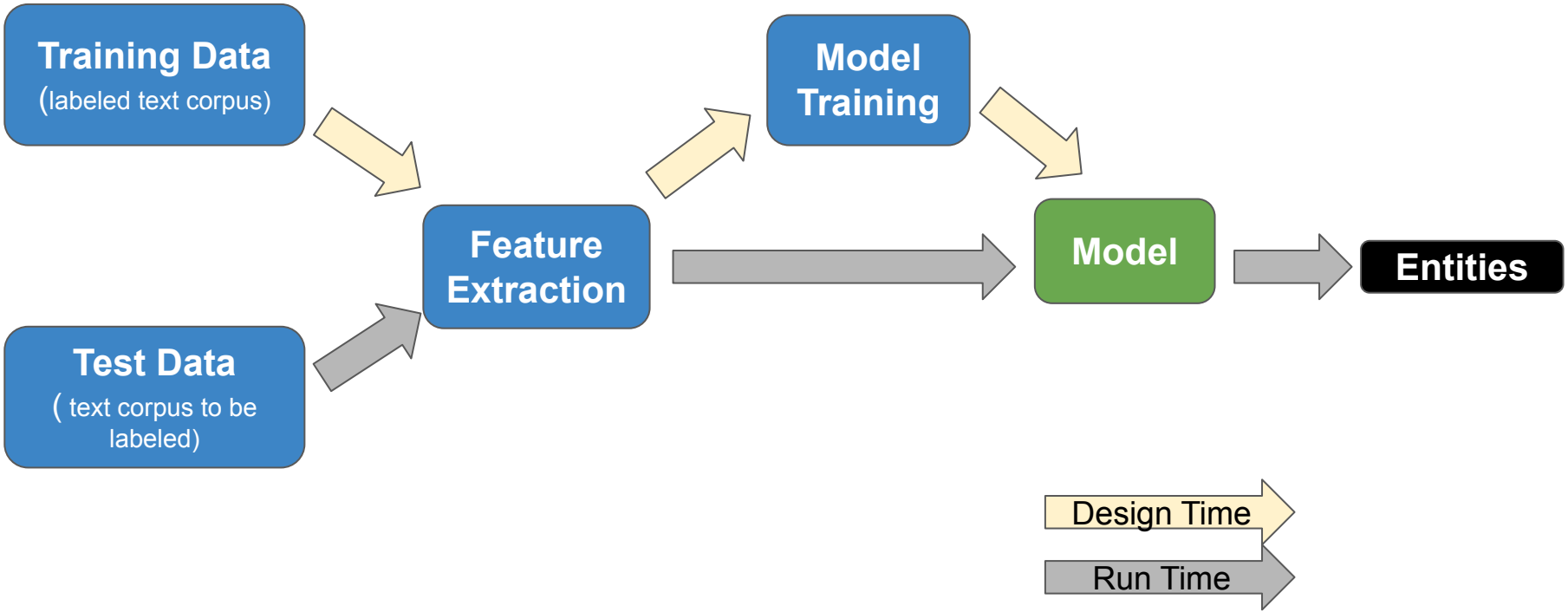
Introduction



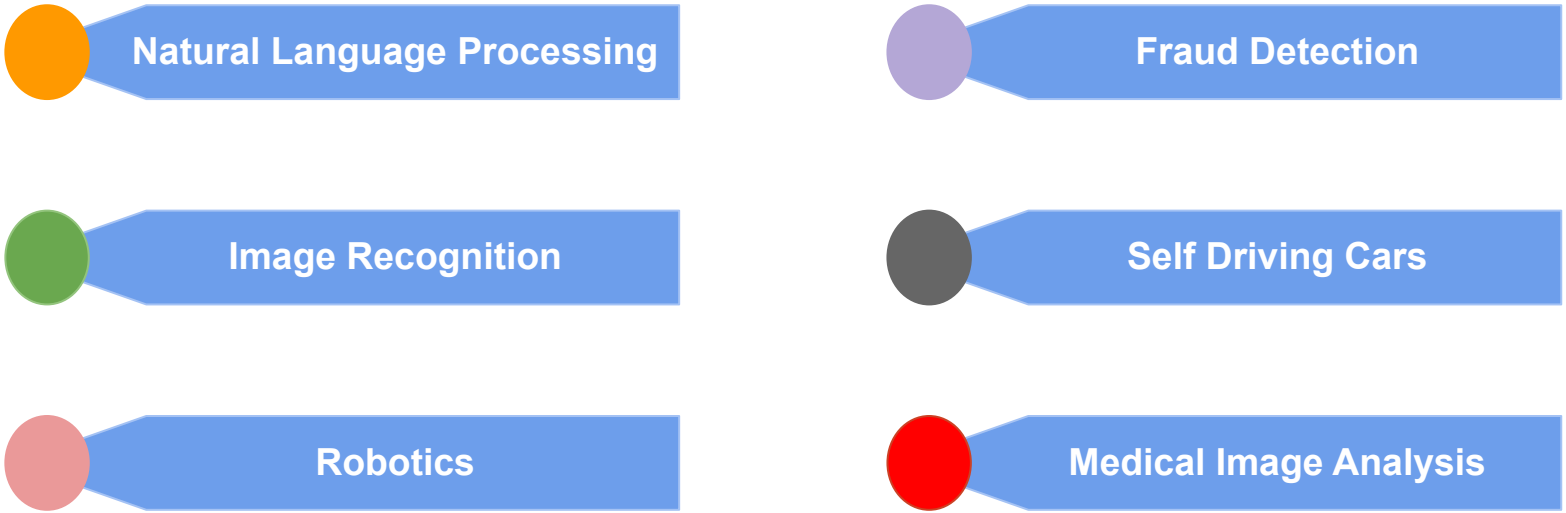


Deep learning is part of a broader family of machine learning methods based on artificial neural networks with representation learning.

Learning from the data



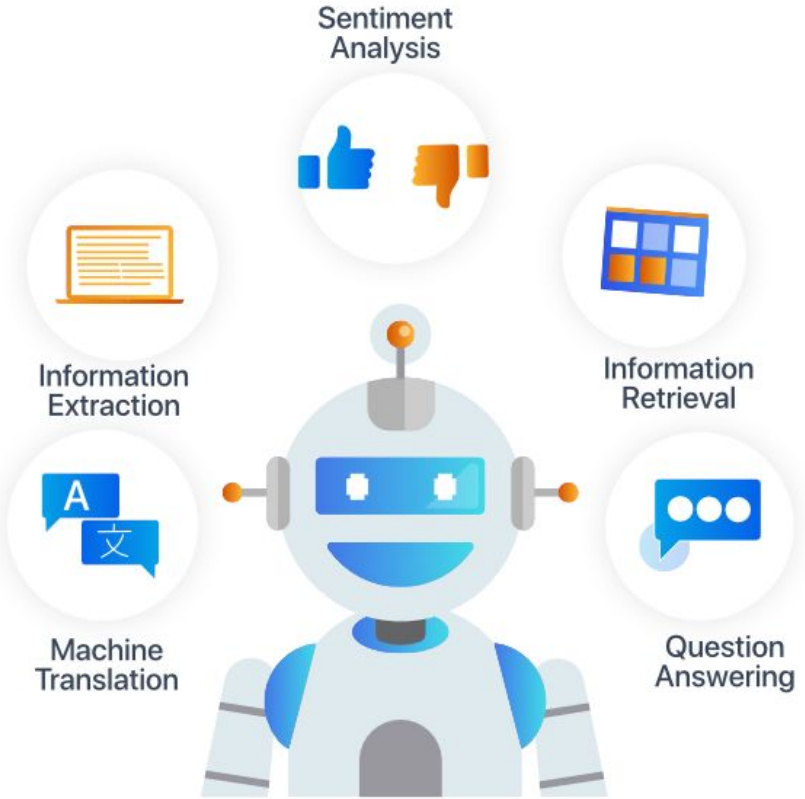
Applications



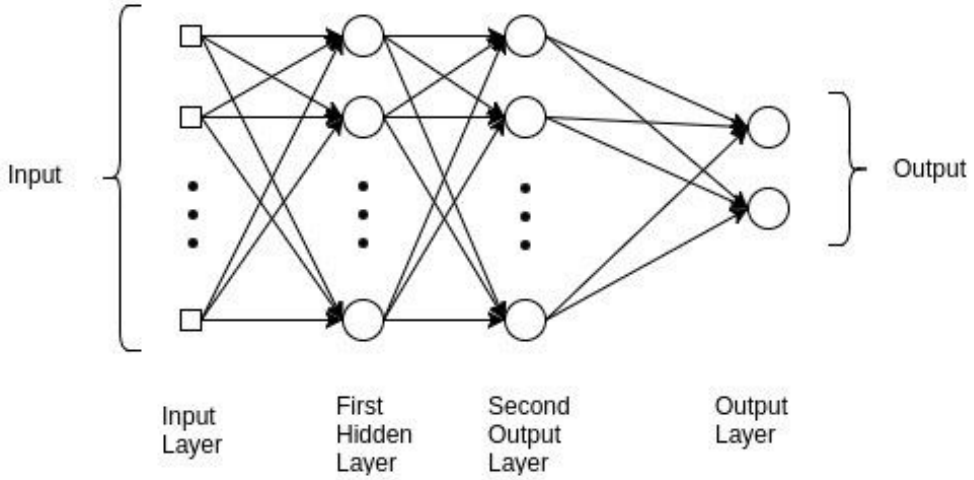
Applications of

Natural Language Processing

in Different Domains



Basics of Training Neural Networks: Multi-layer Perceptron



$$f(\boldsymbol{x}) = f^{(3)}\left(f^{(2)}\left(f^{(1)}(\boldsymbol{x})\right)\right)$$

MLP are typically represented by composing together many different functions.

Basics of Training Neural Networks: The Maths behind

Forward pass and back-prop

$$\frac{\partial L}{\partial W_2} = \frac{\partial L}{\partial X_2}\frac{\partial X_2}{\partial W_2}$$

$$\frac{\partial L}{\partial W_1} = \frac{\partial L}{\partial X_2}\frac{\partial X_2}{\partial X_1}\frac{\partial X_1}{\partial W_1}$$

Parameters update $W \leftarrow W - \alpha * \nabla_w L$

Example

Assume Mean squared error loss $L(X_2, Y) = ||X2 - Y||^2$

$\frac{\partial L}{\partial X_2} = 2(X_2 - Y)$

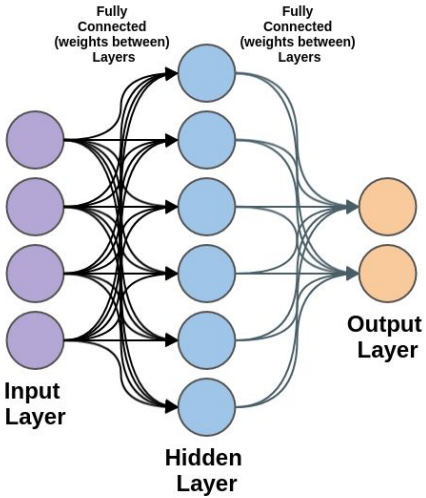
$\frac{\partial X_2}{\partial W_2} = X_1$

$\frac{\partial X_2}{\partial X_1} = W_2$

$\frac{\partial X_1}{\partial W_1} = X$

$\nabla_{w_2} L = 2(X_2 - Y)X_1$ and $\nabla_{w_1} L = 2(X_2 - Y)W_2 X$

Basics of Training Neural Networks: Tunable Parameters



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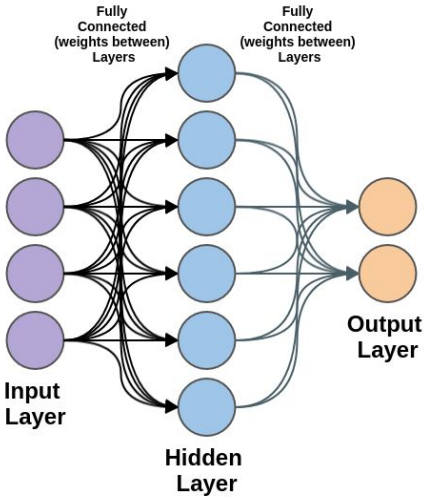

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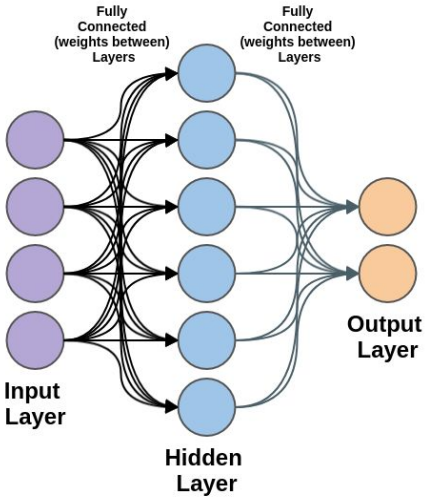

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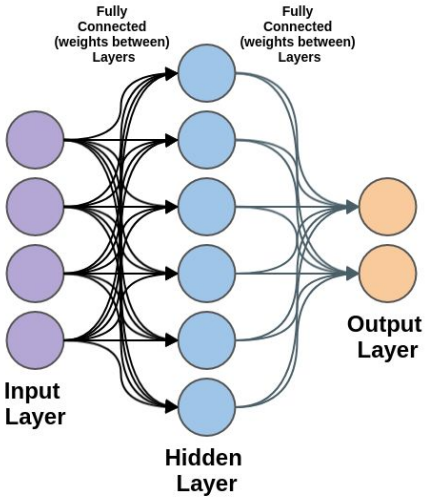

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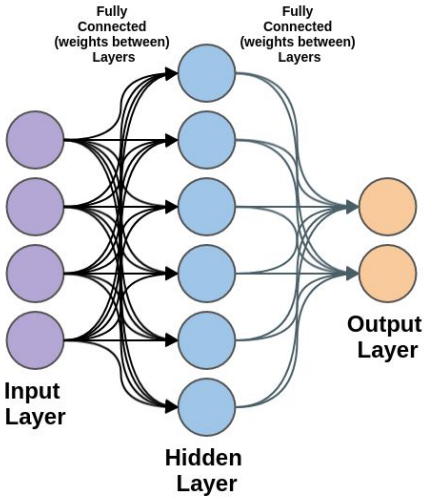

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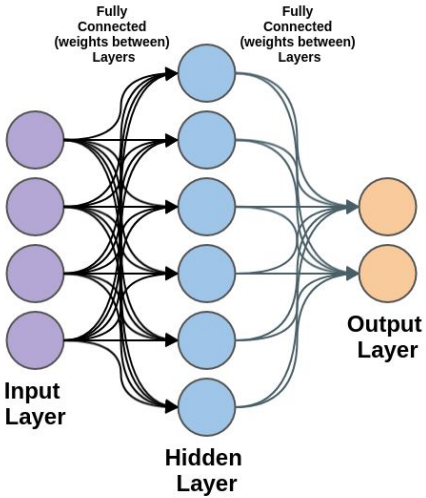

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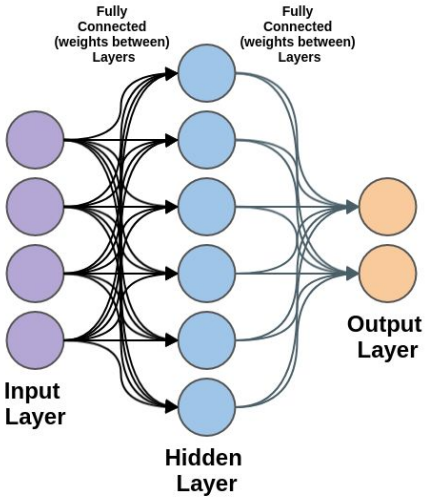

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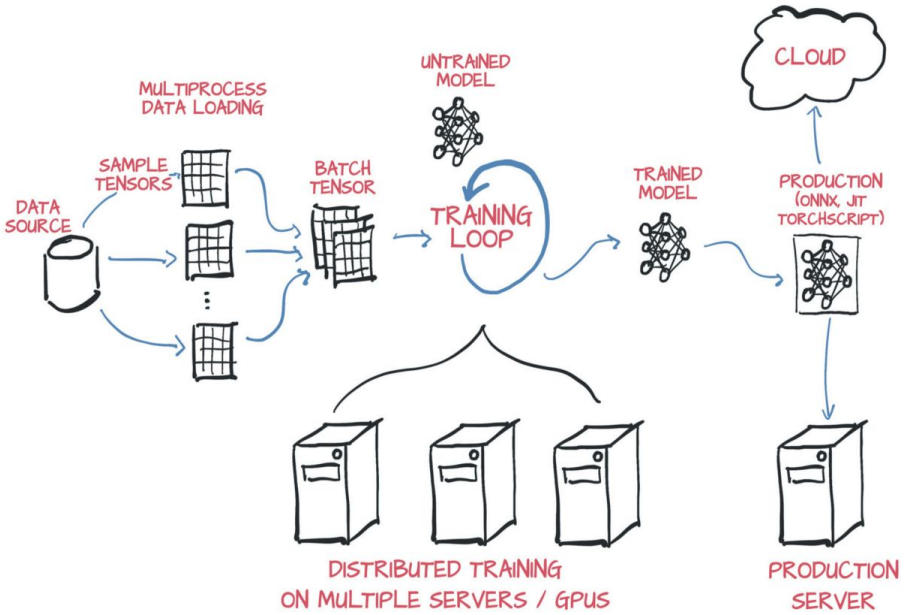
⚠ **Hyperparameters** are parameters whose values control the learning process and determine the values of model parameters that a learning algorithm ends up learning.

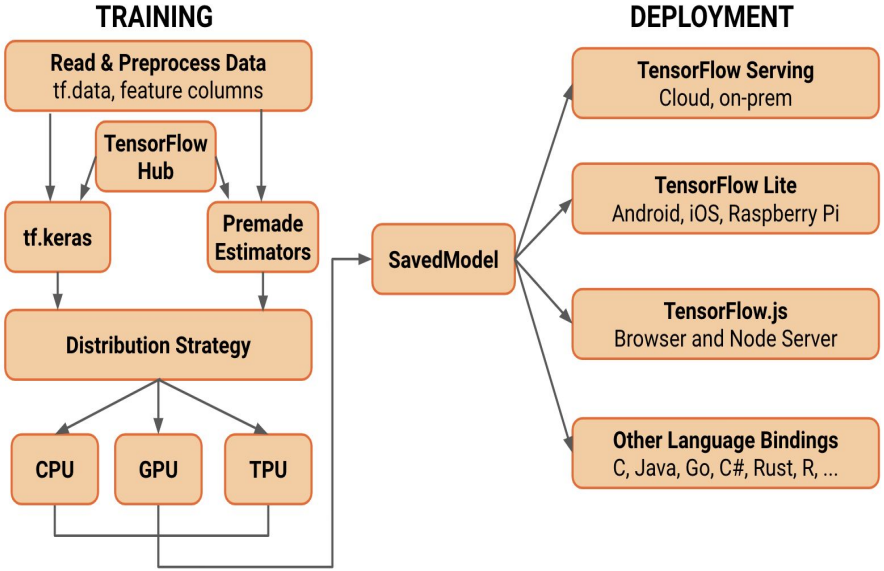
Deep Learning: Common Frameworks

PyTorch



Source: Medium

TensorFlow



Source: TF blog

NLP: Data and preprocessing

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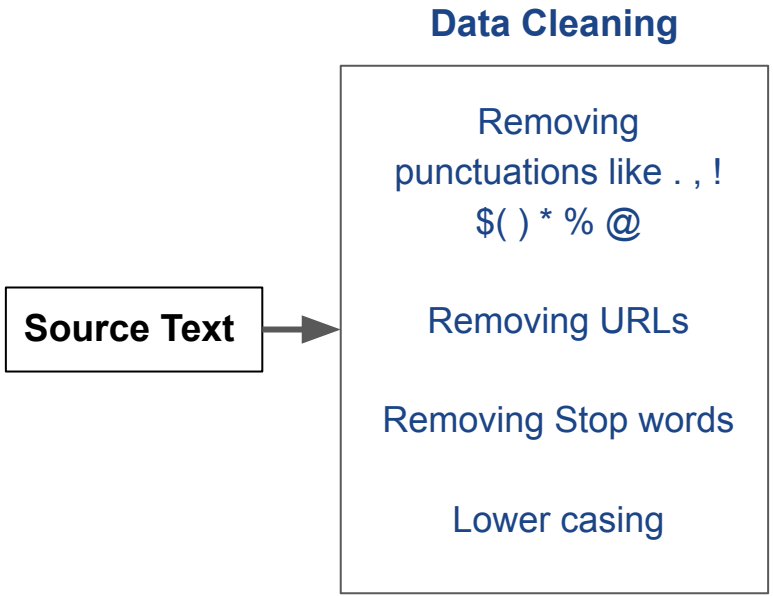

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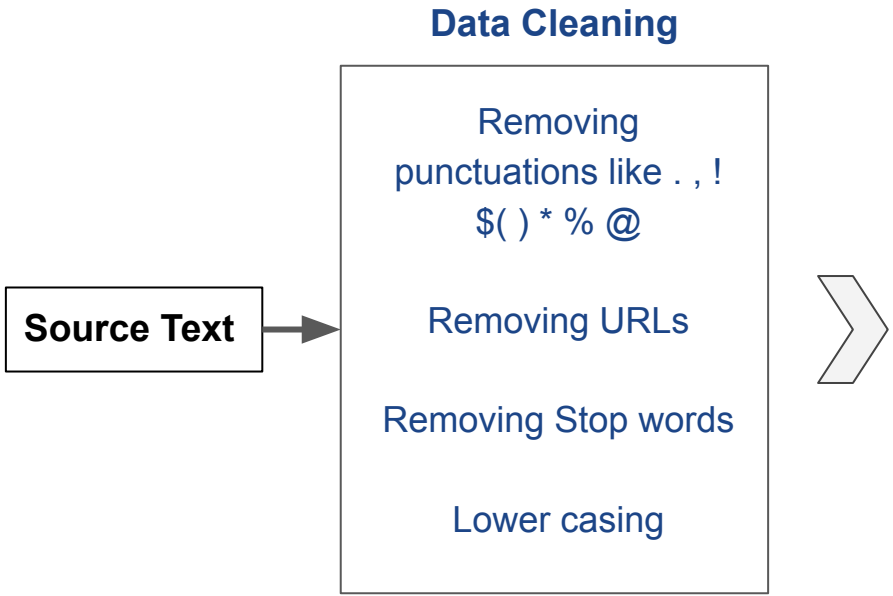

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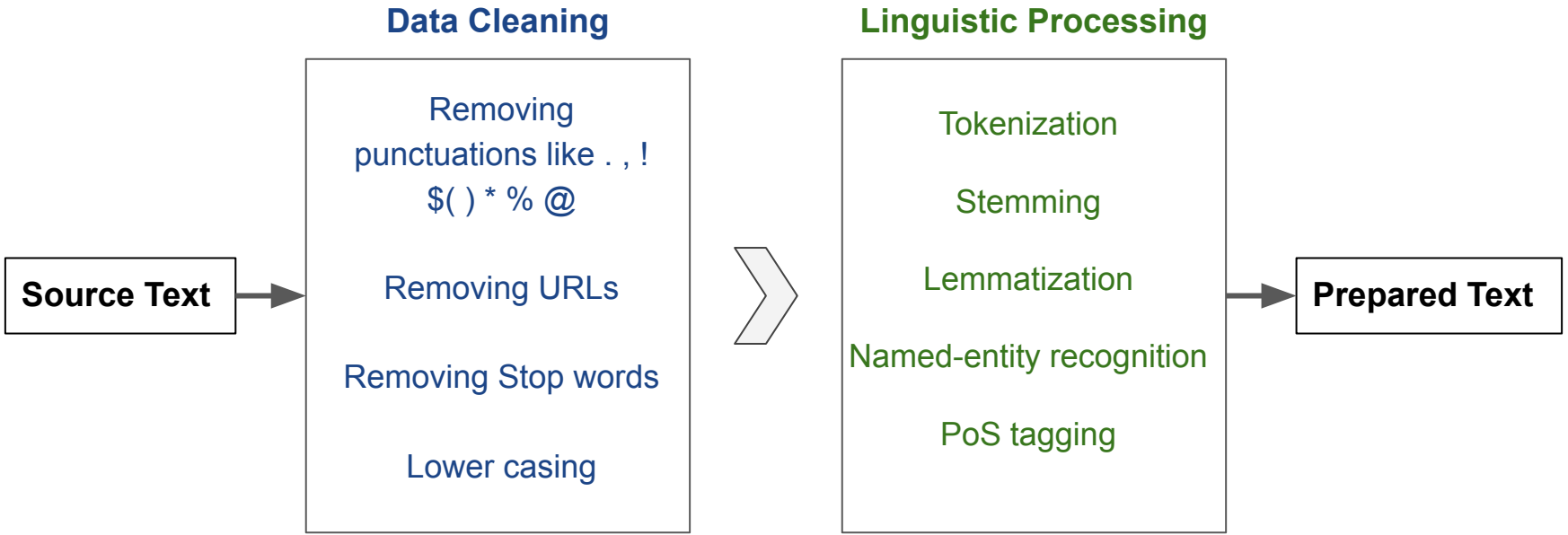
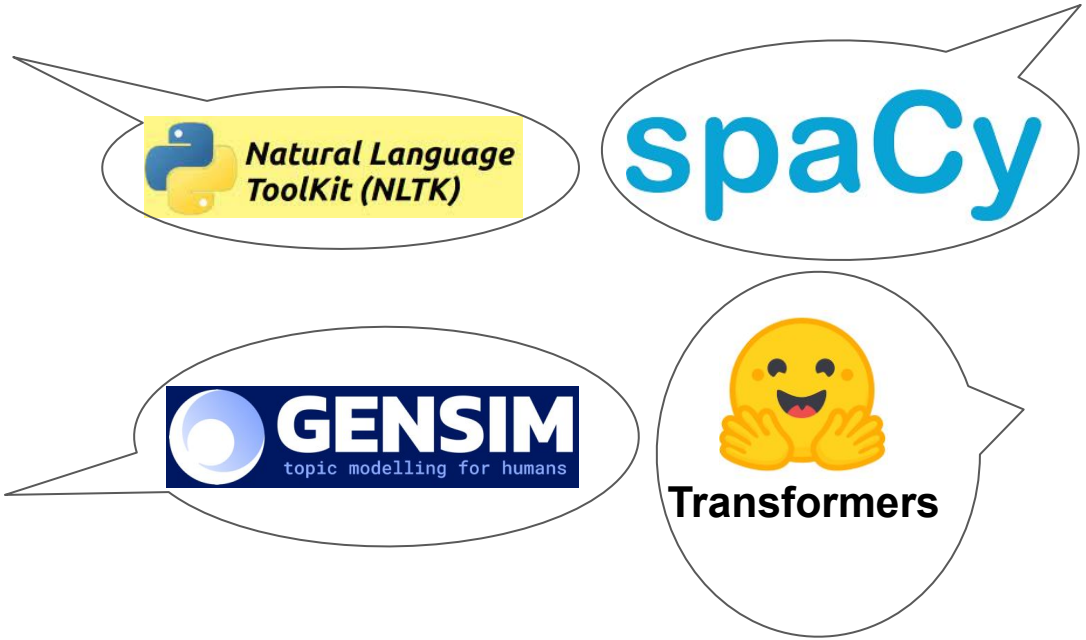


Common Packages: Linguistic Processing, NLP and Deep NLP



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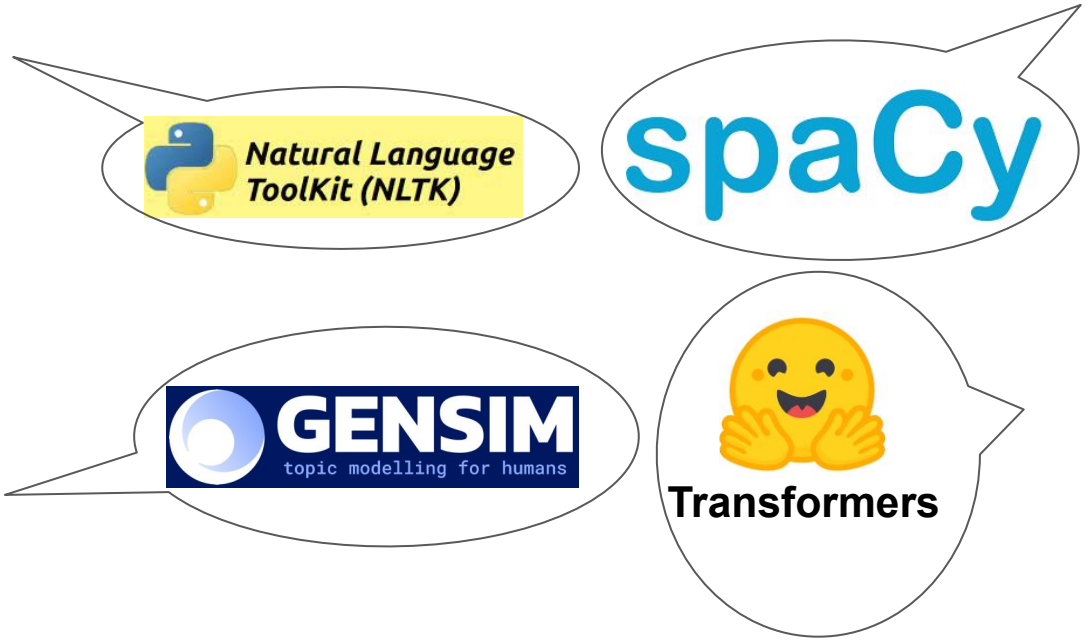
Corpus to keywords

- Tokenize
- Remove stop words
- Lemmatise



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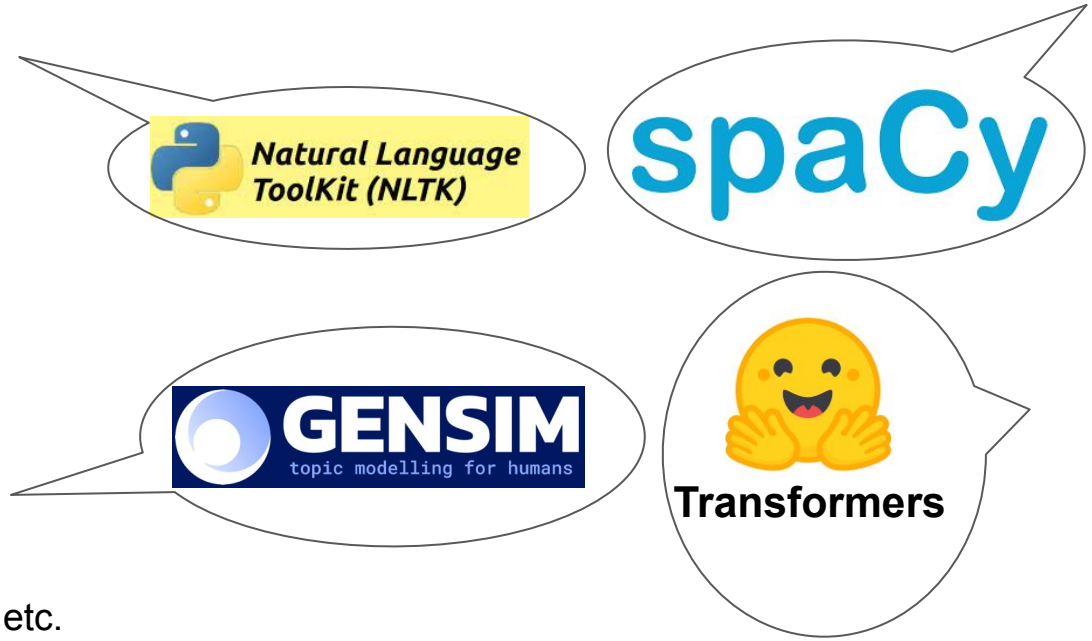

Topic modeling

- LDA
- Similarity matrix, etc.
- Bigrams and trigrams
- Topic modeling

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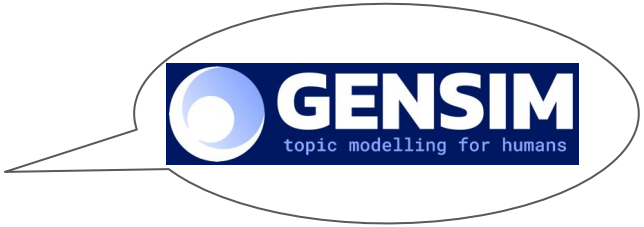
Linguistics features

- Rephrase sentence structure; Provides all info for each word in the paragraph(pos, stopword, lemma, named entity)
- Semantic search



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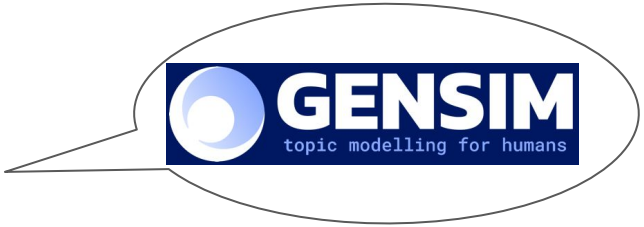

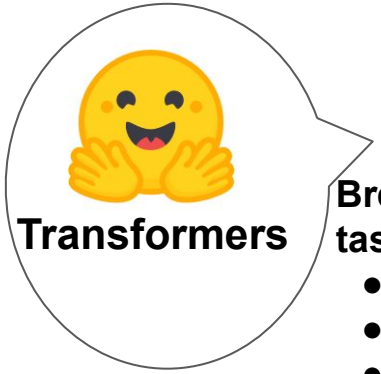

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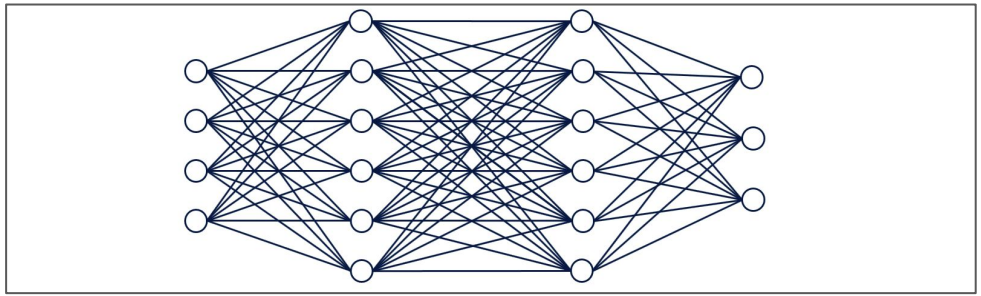
Breakthrough for any NLP tasks

- Question Answering
- Summarization
- Sentiment Analysis
- Document Classification
- Machine Translation

Recap

1



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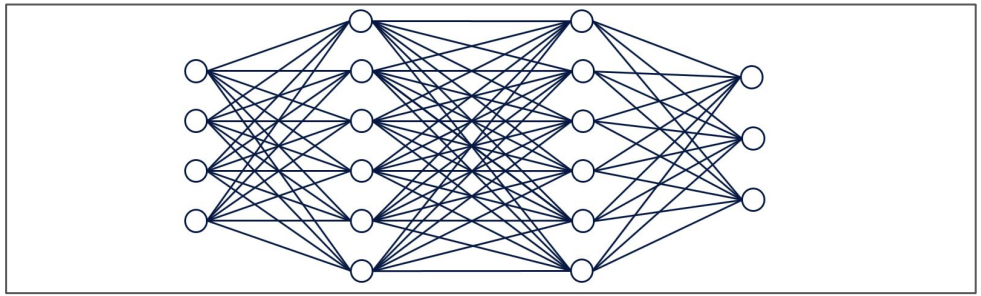

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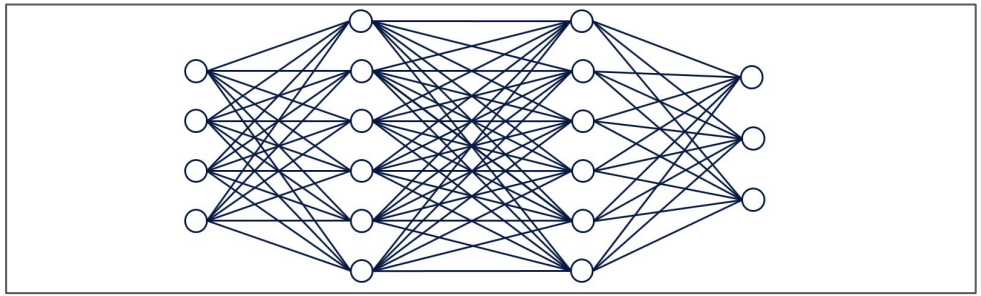

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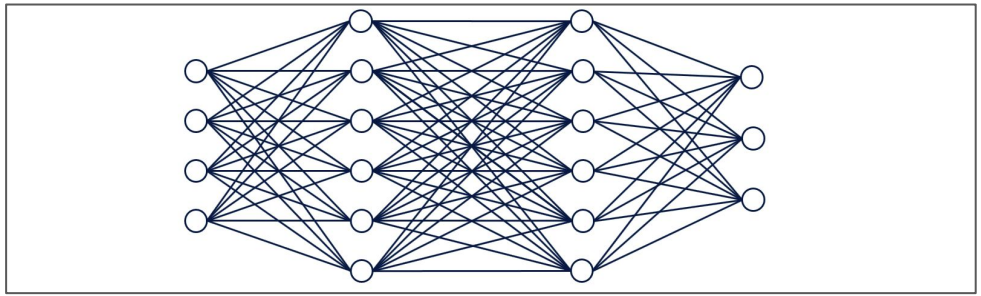

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Syntax is the sentence structure

Semantics is the meaning of text, (fundamental take away after reading the text)

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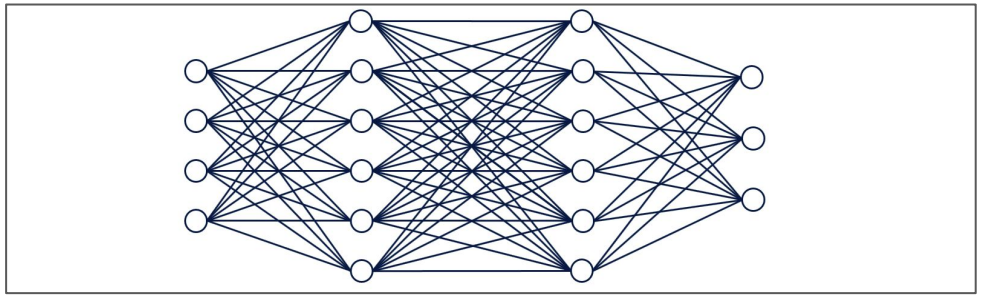

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https://bit.ly/3SLRsMS

The End!

— THANK YOU —