Convolutional Neural Networks for Sentence Classification

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Course-Website: www.deeplearning4nlp.com

Implementation

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- Implementation is based on:
  - Kim, 2014, *Convolutional Neural Networks for Sentence Classification*
    https://github.com/yoonkim/CNN_sentence

- This folder provides two implementations:
  - cnn.py: Usage of the Keras sequential model. Only a single convolutional layer is applied
    cnn_functional.py: Usage of the Keras functional API. Several convolutional with different filter lengths can be used

Preprocessing

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- We use the preprocessing from Kim et al.
- Each token is mapped to its respective word index in the embedding matrix. This creates a matrix like:
  - [[4, 5, 8], #First sentence, 3 tokens with word indices 4, 5 & 8
    [1, 3, 9, 1], #Second sentence
    [8, 2, 2, 1, 4, 7]] #Third sentence
- In order to pass it to Keras/Theano/Tensorflow, all sentences must be padded to the same length. The function sequence.pad_sequences() uses zero padding. This creates a matrix like:
  - [[0, 0, 0, 4, 5, 8],
    [0, 0, 1, 3, 9, 1],
    [8, 2, 2, 1, 4, 7]]
- Ensure that first token in the embedding matrix is a padding token and wordEmbeddings[0] = [0, 0, …, 0]

cnn.py – Sequential Model

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- Using the sequential API from Keras the model is:

```
model = Sequential()
model.add(Embedding(…)) # Add lookup word indices -> embeddings
model.add(Convolution1D(…)) # Add the conv. layer
model.add(GlobalMaxPooling1D()) # Add max-over-time
model.add(Dense(hidden_dims, activation='relu')) # Hidden layer
model.add(Dropout(0.2)) # Dropout layer
model.add(Dense(1, activation='sigmoid')) # Single output neuron
```

Cnn_functional.py – Functional API

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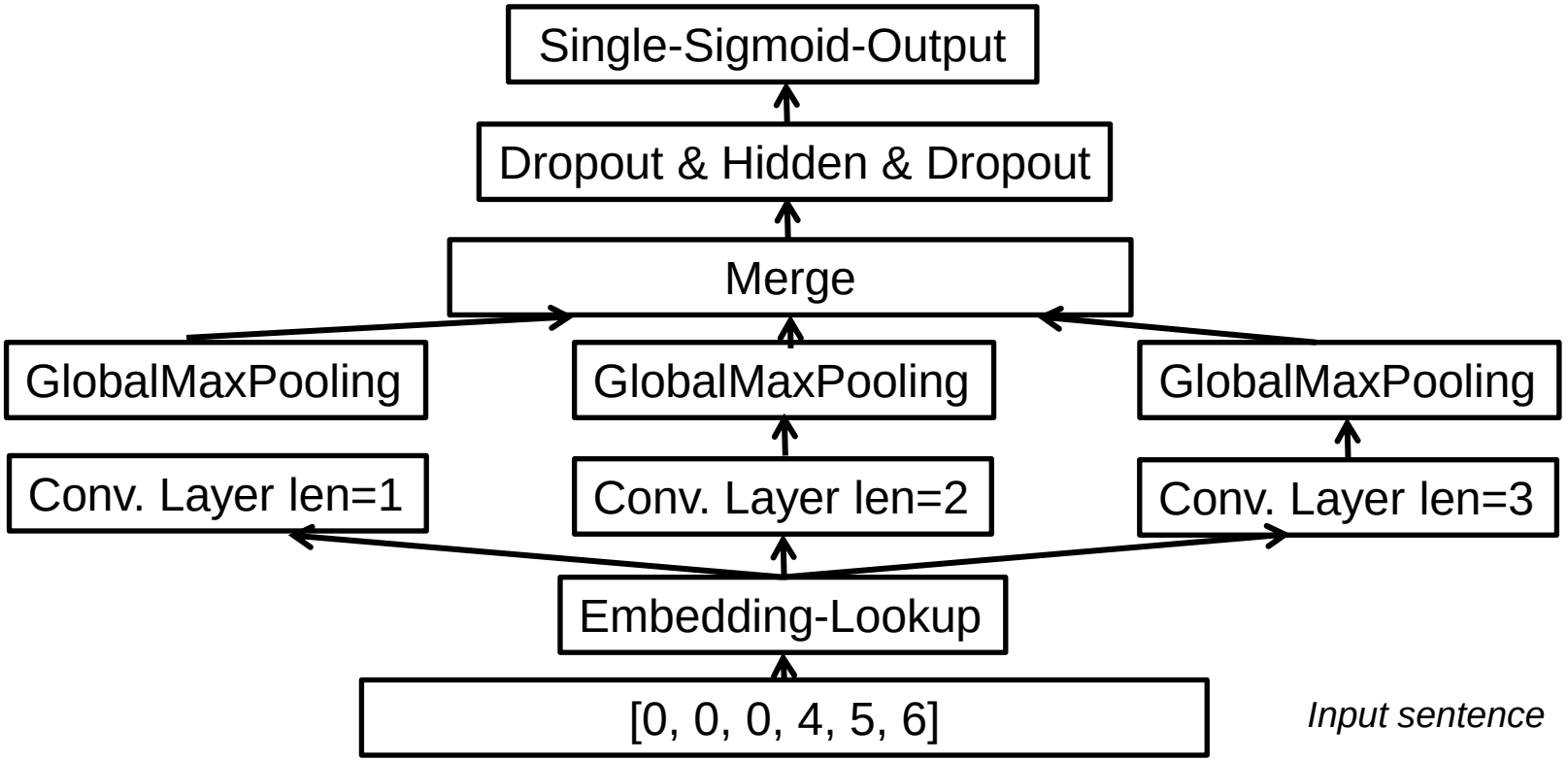
- Check this guide to the functional API of Keras: https://keras.io/getting-started/functional-api-guide/
- The functional API allows the definition of an arbitrary graph



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