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# Sentiment and Emotion Classification using Deep Learning (Text)

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# Outline

- Introduction to Sentiment / Emotion analysis
- Sentiment classification using convolutional neural network/Recurrent Neural Network
- Demo

# Sentiment and Emotion Analysis

- **Sentiment analysis** aims to identify the orientation of opinion in a piece of text.
  - Positive, Negative, or Neutral.
- **Emotions analysis** is deeper analysis of human emotions and sensitivities.
  - Anger, disgust, happy, fear, sadness, etc.
- Of course the same can overlap: if the user is happy, they will typically express positive sentiments on something.



# Levels of Sentiment Analysis

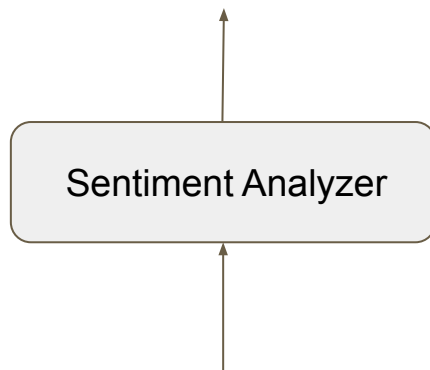
- Document Level
  - Overall sentiment of document.
- Sentence Level
  - Document consist of many sentences/paragraphs
  - Sentiment of a stand alone sentence
- Aspect Level
  - Sentiment towards an attribute/feature/aspect of a sentence.
  - Aspect is an attribute or component of the product that has been commented on in a review.
  - Sentiment targets helps us to understand the sentiment analysis problem better.
  - Battery of this phone is good but camera quality is poor.
    - aspect: **camera: positive**
    - aspect: **battery: negative**

# Problem Definition

- Given a document/sentence, predict its sentiment class.

**Output**

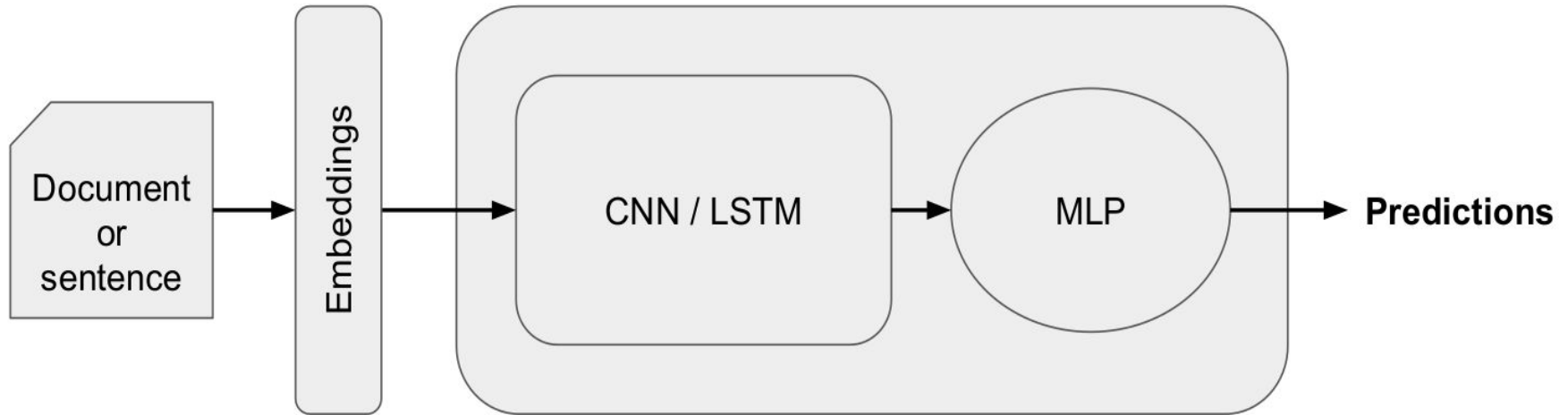
Positive/ Negative/ Neutral



**Input**

$w_1, w_2, w_3, w_4 \dots w_n$

# Deep Learning Solution

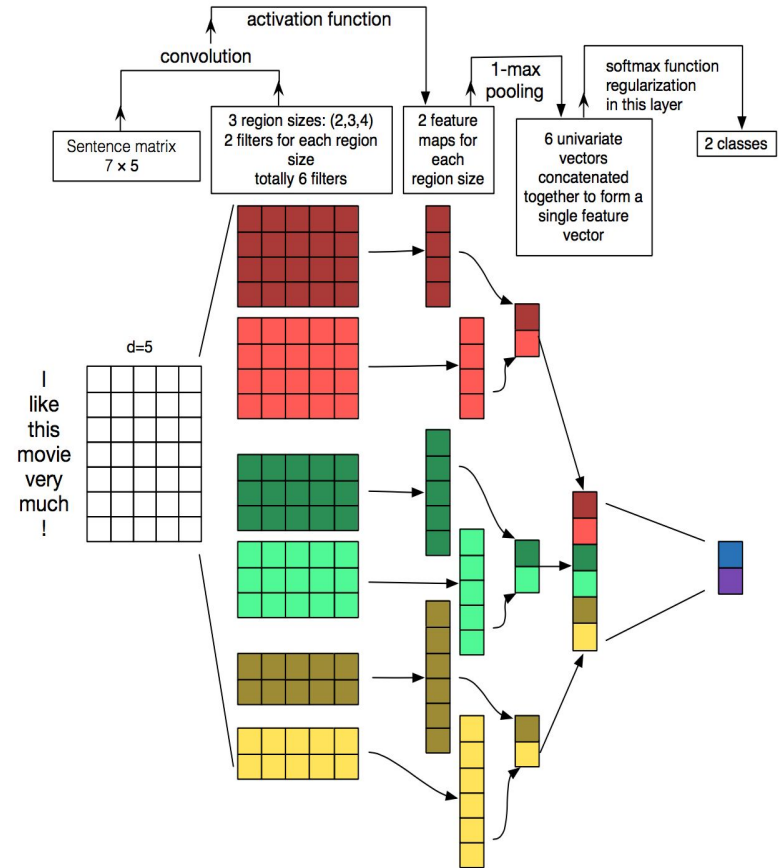


# Data Representation: Input and Output

- Tokenize a sentence into words.
  - Camera of this phone is good.
    - **Tokens:** 'camera', 'of', 'this', 'phone', 'is', 'good'
- Convert sequence of words into some numeric representation (i.e. word embeddings)
- Let label representation be:
  - Negative: 0, Neutral: 1, Positive: 2
  - Input will be one hot vector representation of label.
    - Negative: [1, 0, 0]
- **Input:** Sequence of word embeddings for sentence.
- **Output:** Label 0, 1, or 2.

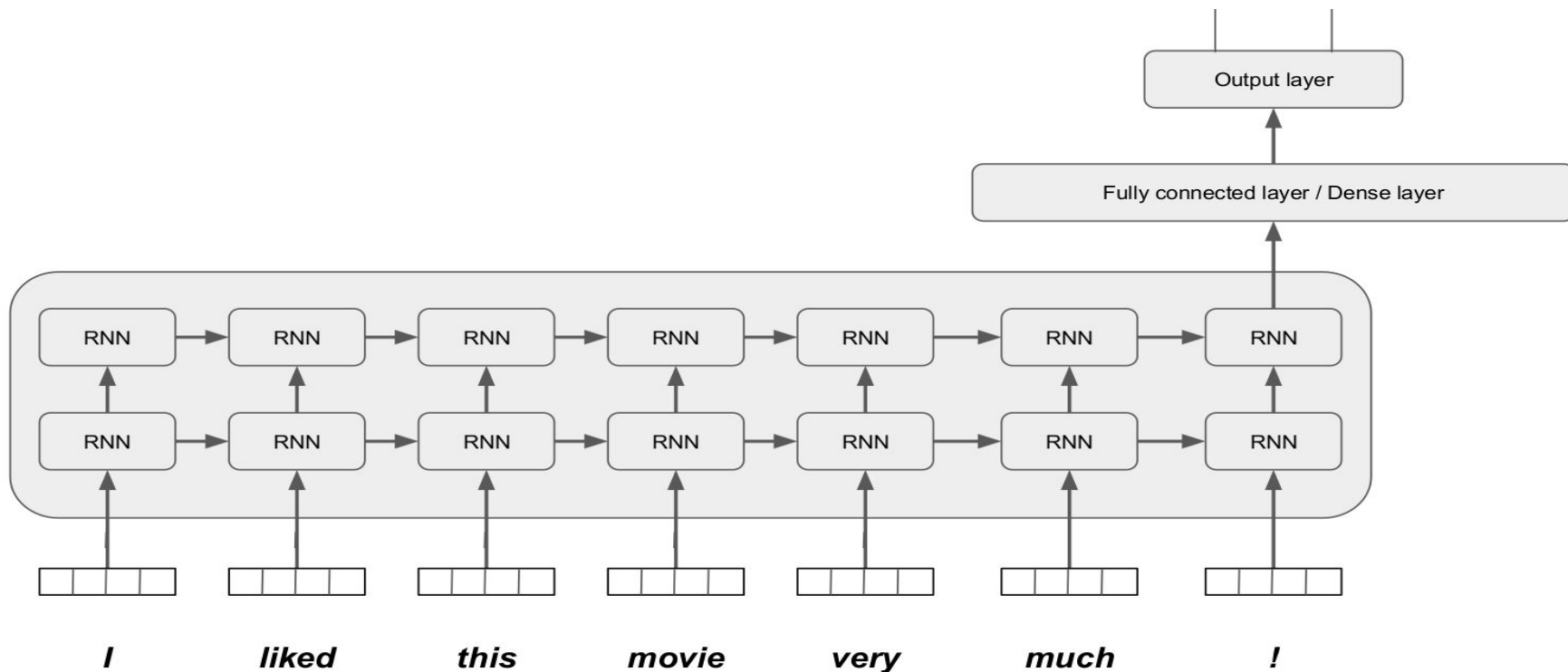
# Sentiment Classification Using Convolutional Neural Network

- Word Embedding Matrix
  - Embedding of words of a sentence.
- Convolutional Layer
  - Total filters: 6; 2 each of size 2, 3, and 4.
- Pooling layer
  - Max pooling
- Concatenate the max pool vectors
- Classification
  - Softmax activation function (multiclass)





# Sentiment Classification using RNN (LSTM/GRU)



# Basic steps

- Import necessary libraries.
- Design network
- Prepare/ load training data
- Train the network
- Evaluate the network
  - Prepare/load testing data
  - Predict output data

# Implementation Details

- Python based Keras API <https://keras.io/>
- Task description:
  - Dataset: Shared task dataset (SemEval 2013): tweet, sentiment
  - Labels: positive, negative, or neutral.
  
- Training data, development data, test data.

Thank you