Machine Learning with NLP

Objective: To introduce the Machine Learning Algorithm with the help of Natural Language Processing.

Pre-requisites: Working knowledge of Linear Algebra, Probability Theory, Python Programming

Session 1 (Introduction to Deep Learning)

- Introduction
- Linear Models for Classification
- Biological Neural Network
- Perceptron
- Perceptron Learning
- Logical XOR
- Activation Function
- Gradient Descent

Session 2 (Introduction to NLP)

- Introduction
- Operations on a Corpus
- Probability and NLP
- Vector Space Models
- Sequence Learning
- Machine Translation & Preprocessing
- Statistical Properties of Words

Session 3 (NLP Tools)

- Vector Space Models for NLP
- Document Similarity – Demo, Inverted Index, Exercise
- Vector Representation of words
- Understanding of text
- Bigram model and Trigram model
- Singular value decomposition
- Query Processing
- Examples of word prediction

Session 4 (Mathematical tools for NLP)

- Introduction to Probability in the context of NLP
- Joint and Conditional Probabilities, independence with examples
- The definition of probabilistic language model
- Chain rule and Markov assumption
- Generative Models
- Bigram and Trigram Language models – peeking inside the model builiding

Session 5 (Advanced ANN Model)

- Feedforward and Backpropagation Neural Network
- BPTT

Session 6 (Word to Vector Problems)

- Introduction Word to Vector
- CBOW and Skip-Gram Models
- One word learning architecture
- Forward pass for Word2Vec
- Building Skip-gram model using Python
- Reduction of complexity – sub-sampling, negative sampling
- Binary Tree, Hierarchical Softmax
- Mapping the output layer to Softmax
- Updating the weights using hierarchical softmax
- Discussion on the results obtained from word2vec

Session 7 (Sequence Learning)

- ANN as a LM and its limitations
- Sequence Learning and its applications
- Introduction to Recurrent Neural Network
- RNN – Based Language Model
- BPTT – Forward Pass
- LSTM
- Exploding and vanishing gradient
- GRU

Session 8 (Encoders and Decoders)

- Encoder-Decoder model for Neural Machine Translation
- RNN Based Machine Translation
- Recap and Connecting Bloom Taxonomy with Machine Learning

- Introduction to Attenuation based Translation
- Introduction to Conversion Modeling
- A few examples in Conversation Modeling

Session 9 (Project Work)