RecSys Summer School 2017 – Deep Learning hands-on session

Task:

Implement a hybrid recommender in theano

- Flip recommendation (user-to-item) scenario
- Find users to an item for whom it is a good recommendation

Architecture:

- Content representation learning
- Item representation learning (embedding)
- Merging of the two representations
- Compute preferences of all users over the input item

Content representation learning

- Based on movie plots
- Choose one of the following
    - (a) TF-IDF weighted pretrained wordvectors (beginner)
        - Optional extension: fine tuning
    - (b) Pretrained paragraphvectors (intermediate)
        - Requires implementing and running paragraph2vec on the movi plots
        - Optional extension: fine tuning
    - (c) Paragraphvector with end-to-end training (advanced)
        - Jointly train the item representations (paragraph vectors) with the preference model
        - Requires experimentation for balancing the loss
    - (d) GRU/LSTM with end-to-end training (expert)
        - Same as above, but using recurrent neural networks
        - The architecture of the RNN is as you see fit

Item representation learning

- Parameter matrix including a feature vector for all items
- To be index by the item Ids

Merging

- Concatenation
- Sum:
    - The content representation is to be translated to the same dimensionality as the item mebedding by using another weight matrix

Preference computations

- Optional processing layers of the representation
- Product with learned user feature vectors (embeddings)

Loss options

- Weighted MSE: 1/0 for users with/without events on the item with α and 1 as weights ($\alpha \gg 1$)
    - Optional: sampling of negative users
- Pairwise loss (e.g. BPR): Select a positive user and several negatives and compute the average BPR loss
- Listwise loss: Select a positive user and several negatives, compute softmax over their scores and use cross-entropy as the loss

Features

- Mini-batch training
- Adaptive learning rates (suggestion: adagrad)
- ELU activations ($\alpha = 1$)
- Dropout
    - Separate parameters on user/item/content embedding and in the processing layers

Data

- http://tinyurl.com/rsss17dl-data