K-means Clustering for POS Tagger Improvement

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Inspiration

Ljubešić, Erjavec and Fišer (2017):

Adapting a State-of-the-Art Tagger for South Slavic Languages to Non-Standard Text

- Efficiently using Brown clustering information to improve ReLDI tagger

Project: Using K-means clustering to improve the ReLDI tagger and compare with Brown clustering

Previous Work

- Turian et al, 2010
  - Compare Brown clustering, Collobert and Weston embeddings, HLBL embeddings for NER tasks
  - Brown clusters show highest accuracy
- Owoputi et al, 2013
  - Use Brown clusters to improve PoS tagging in informal conversational texts
- Lin and Wu, 2009
  - Use K-means clustering on phrases for NER and query classification with great results

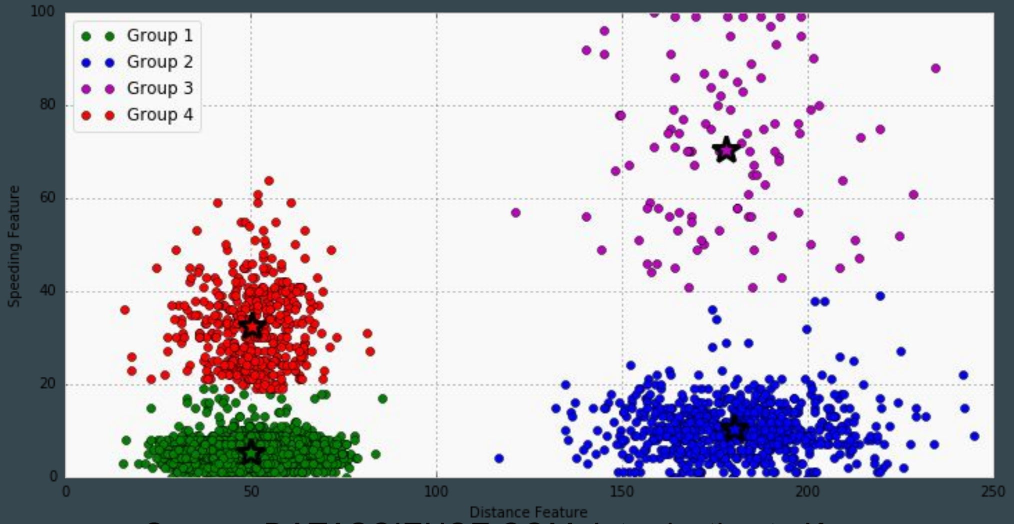
Dataset

- Clustering: *SlWaC v2.0* web corpus of Slovene (1.2 billion tokens)
- Tagger: *Janes-Tag v1.2* annotated dataset
  - Slovene CMC texts: forum posts, tweets, comments
  - Training: 60,367 tokens
  - Testing: 7,484

K-means Clustering

- *K* = number of clusters = number of centroids
- Random initialization

  of centroids
- In each iteration:
  1. Assign clusters
  2. Move centroids
- Repeat until conversion



Source: DATASCIENCE.COM: Introduction to K-means Clustering

Word2Vec

- Converts words to vectors based on their context
- Single layer of a feed-forward neural network
- Probability of word co-occurring with other words
- Output: a feature matrix of words

Clustering settings

- Word2Vec: Gensim library
  - Only words with frequency > 50
  - Window size is 2
- K-Means: Scikit-learn package
  - $K = 2000$

Results

	ReLDI trained on CMC data	Brown	**K-means**
MSD	84.15	85.17	**88.32**
PoS	89.85	91.12	**92.88**

Conclusions

- Clustering information improves tagger accuracy
- K-means combined with Word2Vec outperforms Brown
- Future work:
  - Finding a more efficient way of including K-means data into tagger
  - Testing of other parameter settings
  - Exploration of other clustering techniques