Literature Survey

Text Classification is the process of assigning tags or categories to text based on its content. It's one of the fundamental tasks in Natural Language Processing (NLP) and has a wide range of applications such as sentiment analysis and spam detection.

There are two main types of machine learning model for doing text classification:

- Traditional machine learning models:
  - Models such as logistic regression, support vector machines, naive bayes.
  - This type of models leverage feature representations such as Bag-of-Words (with Tf-Idf) and Word Embedding (with Word2Vec)
- Deep Learning based machine learning models:
  - Models such as Recurrent Neural Networks (RNNs), Convolutional Neural Networks (CNNS), Long Short Term Memory (LSTM), and language models such as Bidirectional Encoder Representations from Transformers (BERT)
  - Languages models overcome the biggest limitation of the classic Word Embedding approach: polysemy disambiguation, a word with different meanings (e.g. “ bank” or “stick”) is identified by just one vector.
    - ELMO (2018), which doesn’t apply a fixed embedding, looks at the entire sentence and then assigns an embedding to each word using a bidirectional LSTM.
    - Google’s BERT (Bidirectional Encoder Representations from Transformers, 2018) combines ELMO context embedding and several Transformers. Moreover, BERT is bidirectional, which was a big novelty for Transformers. The vector BERT assigns to a word is a function of the entire sentence. Hence, a word can have different vectors based on its contexts

The commonly used evaluation metrics are:

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* Accuracy: the percentage of texts that were predicted with the correct
label.
* Precision: the number of true positives over the number of true positives
plus the number of false positives.
* Recall: the number of true positives over the number of true positives plus
the number of false negatives
* F1 Score: the harmonic mean of precision and recall.
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In the case of multi-class classification, to evaluate the overall model performance, we need to conduct either micro-average or macro-average:

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* A macro-average will compute the metric independently for each class and
then take the average (gives each class equal weight).
* A micro-average will aggregate the contributions of all classes to compute
the average metric (gives each classification instance equal weight).
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Citation

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