# DKPro TC: A Java-based Framework for Supervised Learning Experiments on Textual Data


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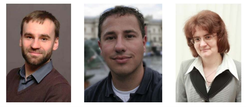

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## Supervised Learning on Textual Data: Requirements

**Flexibility**

- single- and multi-label classification vs. regression
- feature extraction for different kinds of data: documents, document pairs, sequential data

**Replicability and Usability**

- reuse of existing components wherever possible
- detailed documentation of experiment setup
- simple reproduction of experimental results

## Why DKPro TC?

**Is DKPro TC for you?**

✓ You have **annotated**, **textual** data, and …

… you want to:

✓ train a model for **automatic learning** from your data

✓ know which **features** do a good job classifying your data

✓ make your experiments **reproducible** for you and others

… you don't want to:

¬ rerun your experiments many times to test all sorts of **different parameters** in your model

¬ **re-implement** common NLP pre-processing and feature extraction facilities

**What makes DKPro TC unique?**

- rapid prototyping due to preconfigured experiment setups
- parameter sweeping capability, i.e. testing several parameter values and parameter combinations all at once
- detailed documentation of the experimental setup
- a comprehensive, flexible, and modular architecture
- code completely open-source under ASL/GPL, i.e. you can view and modify the sources

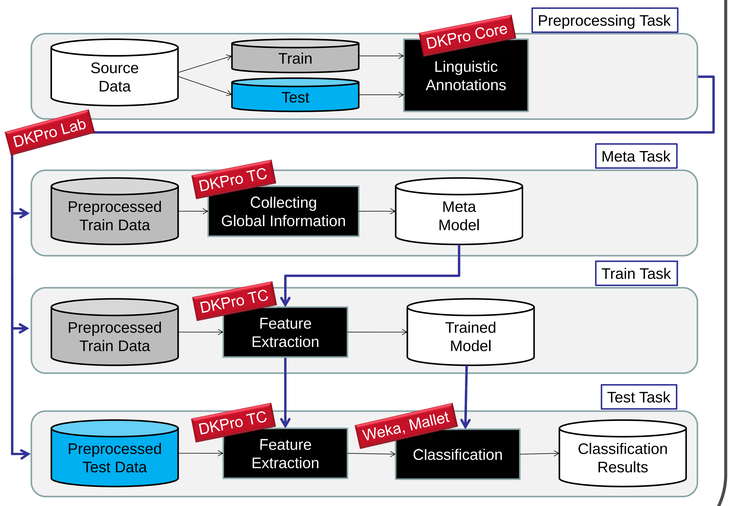

## Supported Learning Scenarios in DKPro TC

| | Single-label (Label) | Multi-label (Label, Label, Label) | Regression (0.75) |
|---|---|---|---|
| **Document Mode** | Spam Detection<br>Sentiment Detection | Text Categorization<br>Keyphrase Assignment | Text Readability |
| **Unit/Sequence Mode** | Named Entity Recognition<br>Part-of-Speech Tagging | Dialogue Act Tagging | Word Difficulty |
| **Pair Mode** | Paraphrase Identification<br>Textual Entailment | | Text Similarity |

## Architecture

**DKPro TC is built on top of several open-source NLP frameworks**

- *Apache UIMA (*Document Representation and Type Systems)
- *DKPro Lab (*Workflow Engine and Parameter Sweeping)
- *DKPro Core* (Linguistic Preprocessing for several languages)
- *Weka*, *Meka*, *Mallet (*Machine Learning)




## Example: Sentiment Detection on Tweets

**Example Experiment Configuration:** 10-fold cross-validation

```
BatchTaskCrossValidation batchTask = [
   experimentName: "Twitter Sentiment",
   preprocessingPipeline: createEngineDescription(ArkTweetTagger),
   parameterSpace: [// multi-valued parameters will be swept
      Dimension.createBundle("reader", [
         readerTrain: LabeledTweetReader,
         readerTrainParams: [LabeledTweetReader.PARAM_CORPUS_PATH, "tweets.txt"]]),
      Dimension.create("featureMode", "document"),
      Dimension.create("learningMode", "singleLabel"),
      Dimension.create("featureSet", [EmoticonRatioExtractor.name,
                                      NumberOfHashTagsExtractor.name]),
      Dimension.create("dataWriter", WekaDataWriter.name),
      Dimension.create("classificationArguments", [NaiveBayes.name], [RandomForest.name])],
      reports: [BatchCrossValidationReport], // collects results from folds
      numFolds: 10];
```

**Example Feature Extractor:** extracts the ratio of emoticons to all tokens

```
public class EmoticonRatioExtractor
   extends FeatureExtractorResource_ImplBase
   implements DocumentFeatureExtractor
{
   @Override
   public List<Feature> extract(JCas annoDb)
      throws TextClassificationException
   {
      int nrOfEmoticons = JCasUtil.select(annoDb, EMO.class).size();
      int nrOfTokens = JCasUtil.select(annoDb, Token.class).size();
      double ratio = (double) nrOfEmoticons / nrOfTokens;
      return new Feature("EmoticonRatio", ratio).asList();
   }
}
```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**http://dkpro-tc.googlecode.com**

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