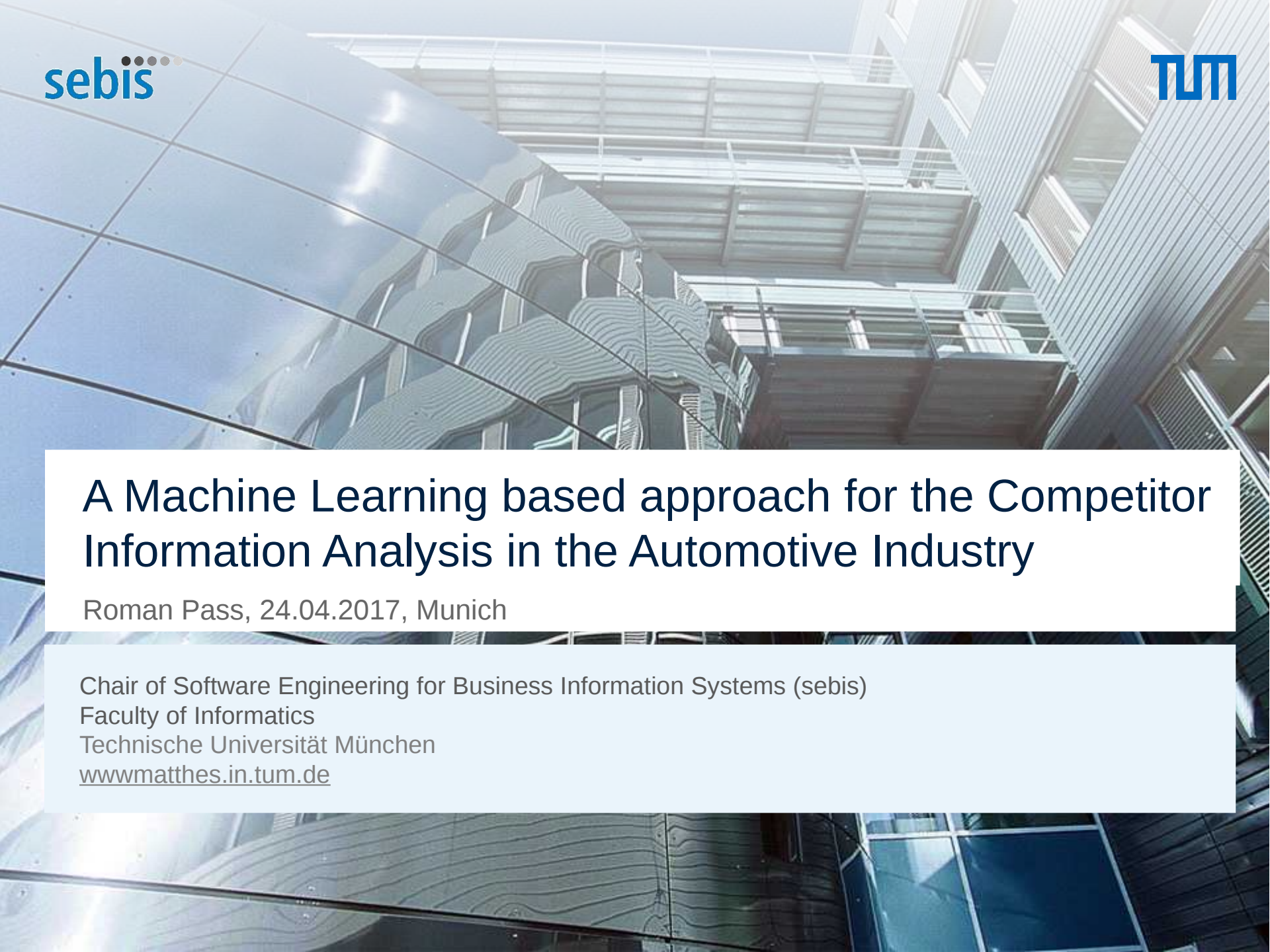

A Machine Learning based approach for the Competitor Information Analysis in the Automotive Industry

Roman Pass, 24.04.2017, Munich

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Outline

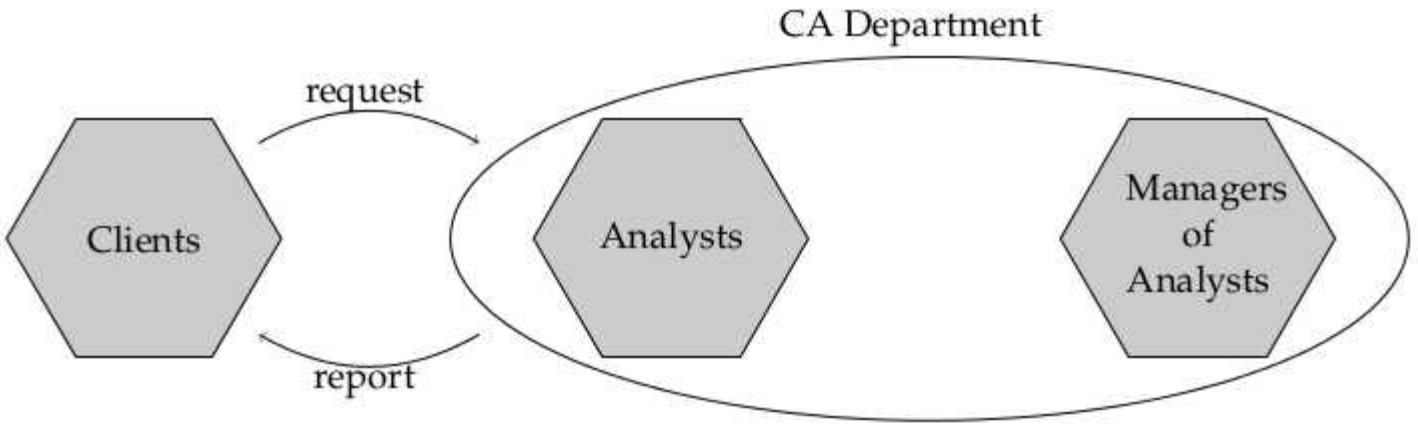
1. Introduction
   - Competitor Analysis
   - Problems
   - Research questions
2. Requirements
3. System Design
4. Evaluation
   - System Usability
   - Feedback
5. Future Work

Introduction

Competitor Analysis (CA)

- Identify Strength, Weakness, Opportunities, Threats (SWOT)
- Identify
  - All competitors
  - Basic competitors
  - Primary competitors
- Support decisions in management and development

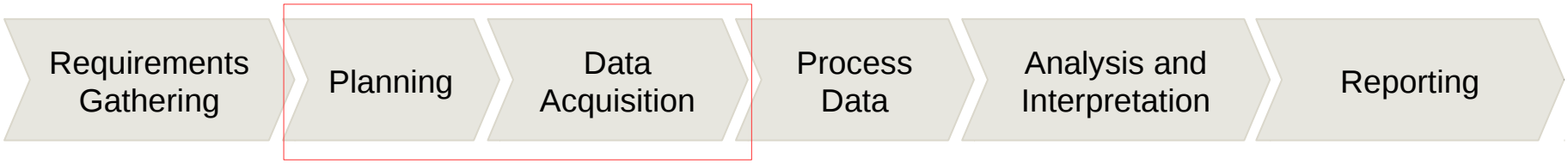
→ Spread Competitive Intelligence (CI) within the company



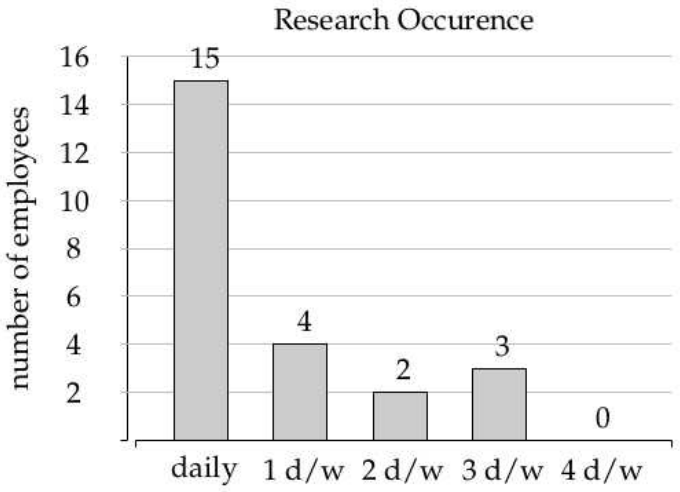
Introduction

Competitive Intelligence Process

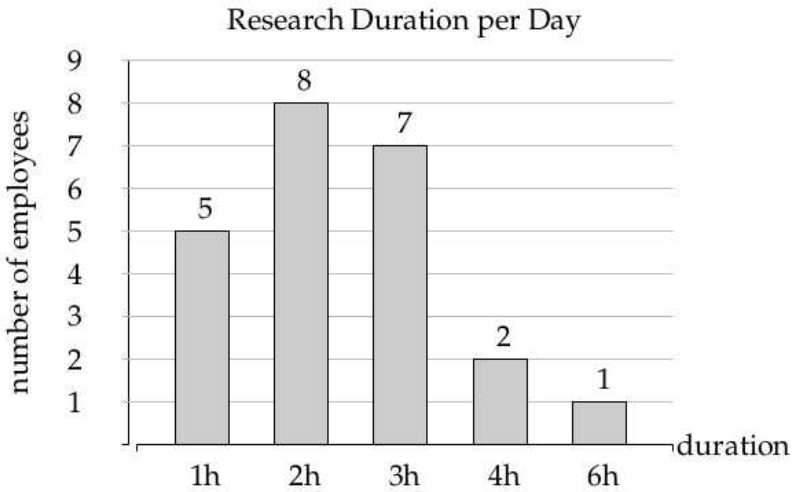
50 % of process time



Source: Rainer Michaeli. Competitive Intelligence: Strategische Wettbewerbsvorteile erzielen durch systematische Konkurrenz-, Markt- und Technologieanalysen. Springer-Verlag Berlin Heidelberg, 2006.



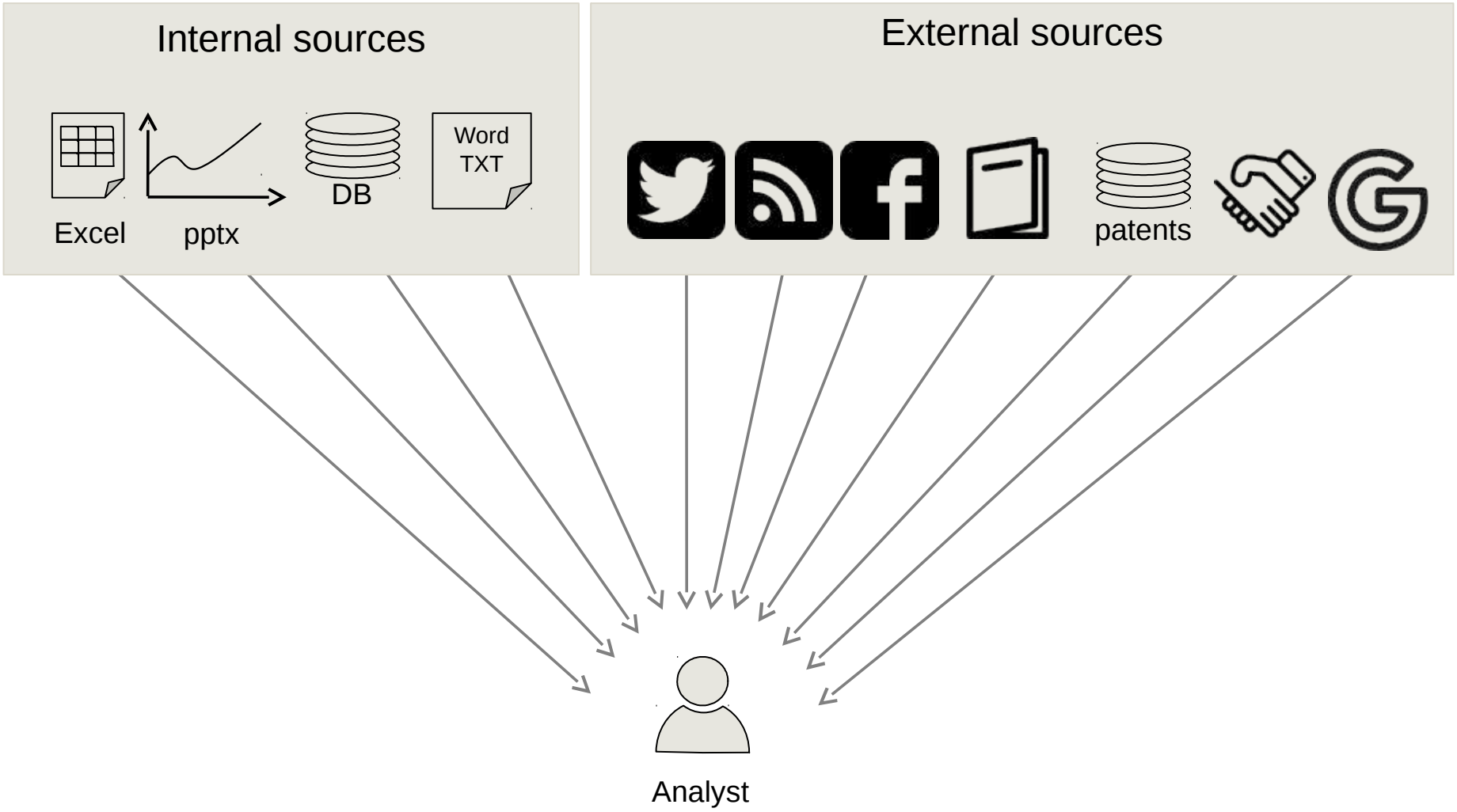
(a) Research Occurence per Week



(b) Research Duration per Day

Introduction

Competitive Intelligence Process – Data Acquisition



Introduction

Competitive Intelligence Process – Problems

- Too many information sources for manual analysis
- Long duration and high occurence of analysis
- Destinguish between relevant and irrelevant information
- Retrieve processed information

Introduction

Research Questions

- How to improve the existing competitor information analysis process in the automotive industry?
- What kind of documents and document sources are used for competitor information analysis in the automotive domain?
- Which categories/topics do these documents belong to?
- Which supervised classification algorithm is suitable for automatic document classification to support competitor information analysis in the automotive domain?

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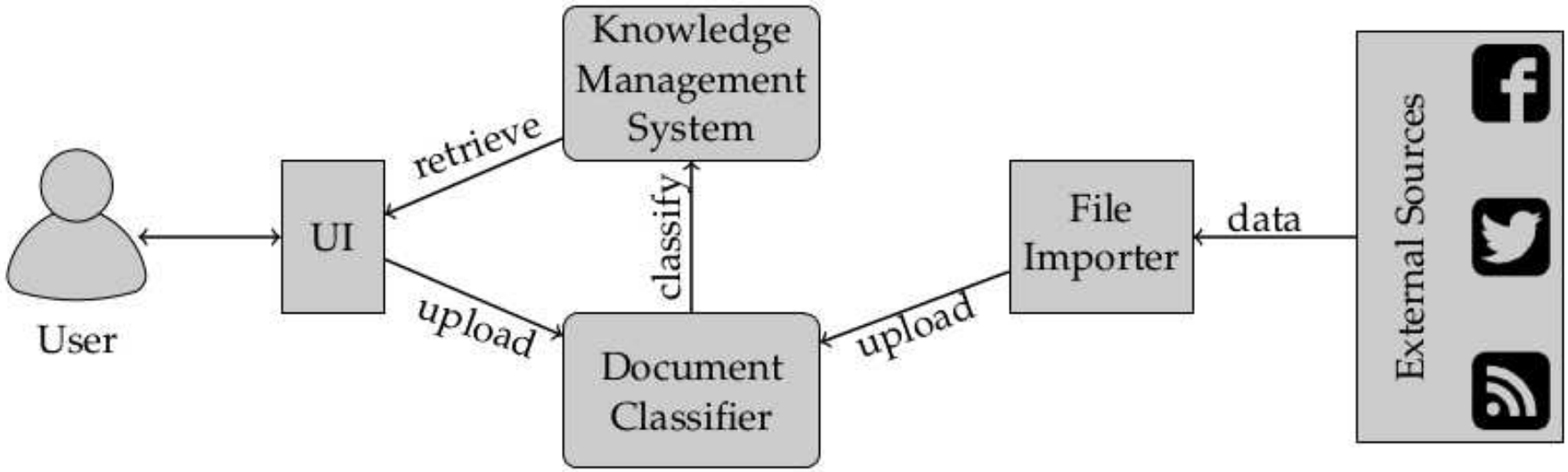
Requirements

- One stream of information
- Search engine as UI
- Automated import of data from external sources
- Knowledge management system with the support for storing both the internal and external data
- Topic structure within knowledge management system

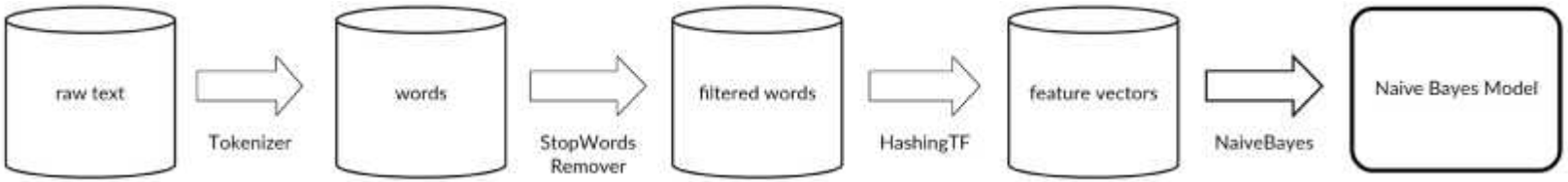


Automatic Document Classification

- Labels defined by department's topics
  - Prognosis
  - Exhibitions
  - General Information
  - Initial Evaluation
  - Press Evaluation
  - Garbage

- Training documents assigned manually to each topic

- Supervised Machine Learning (ML) algorithms compared
  - Support Vector Machine (SVM): low prediction accuracy
  - K-Nearest Neighbours (k-NN): low prediction performance
  - Naive Bayes (NB): good prediction performance and accuracy



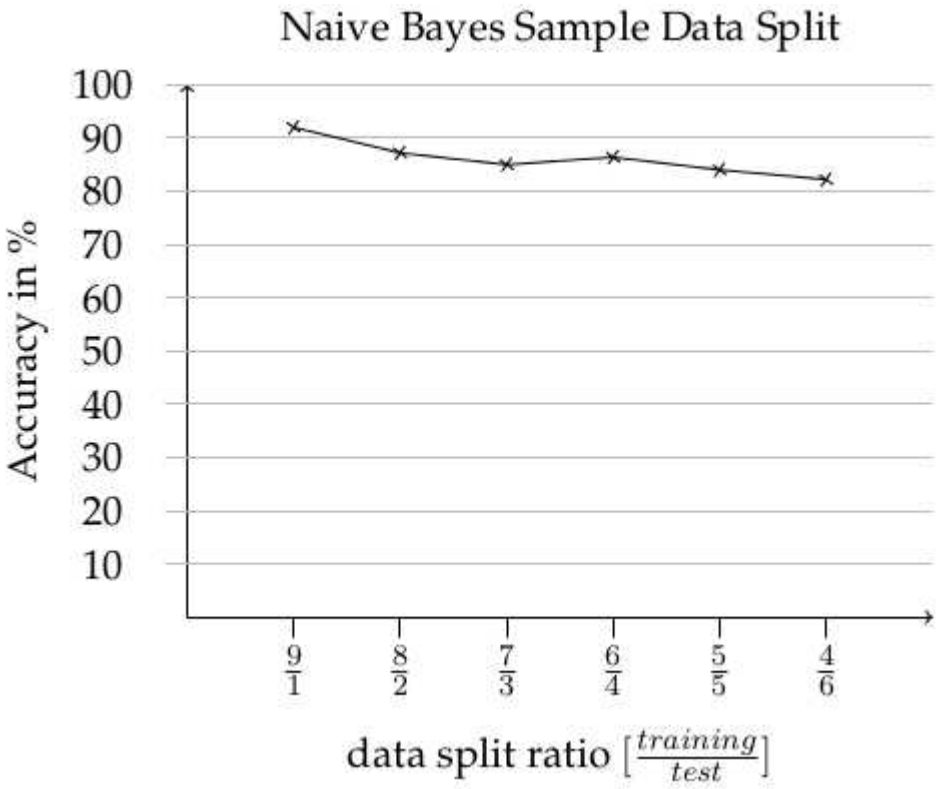
Automatic Document Classification

Naive Bayes

Training Phase:

- n-Fold cross validation (n=10)

- Different data split ratios (training : test) were tested



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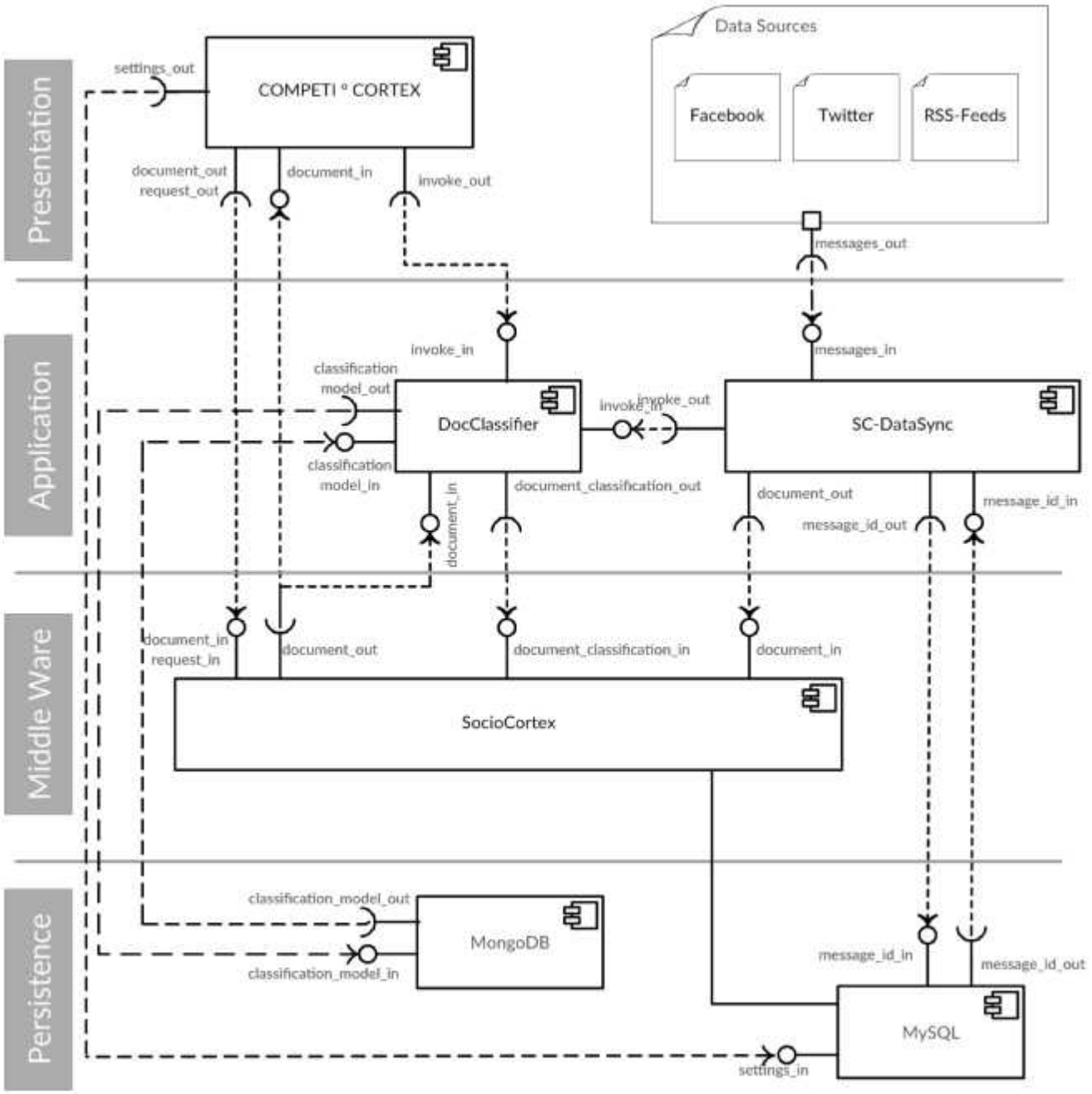
System Design



COMPETI•CORTEX

Demo

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Evaluation

- A subset of internal documents and messages of external sources used
- 9 test subjects (managers and analysts)
- Introduce system to every person individually
- Test the system
- Evaluation questionnaire (System Usability and Feedback)

Evaluation

System Usability Scale (SUS)

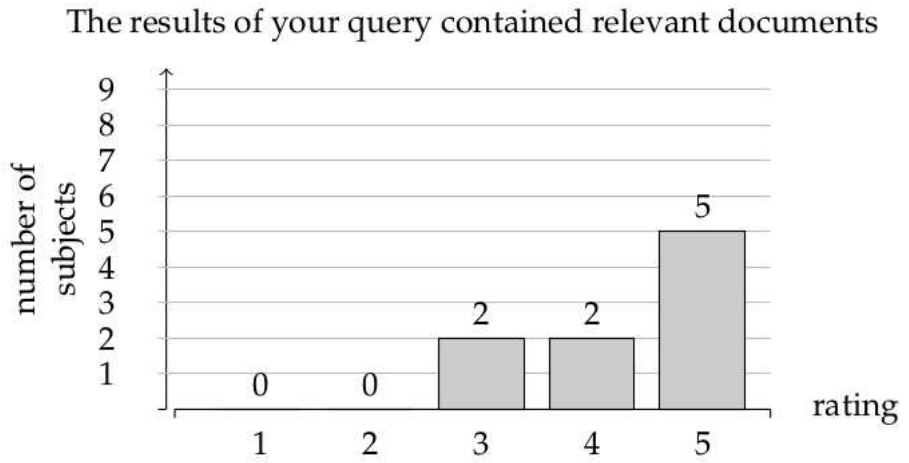
- Ten-item scale [1]
- Illustrating subjective assessments of system usability
- Positional value for each question (1 – 5)
- Calculating SUS-score (0% – 100%)

➔ Exceeds the recommended value of 68% [2]

Source: [1] John Brooke. Sus: A quick and dirty usability scale, 1996.
[2] John Brooke. Sus: A retrospective. Journal of Usability Studies, 8(2):29–40, 2013.

Feedback (1)

- What do you like most about the application?
  - Usability, simplicity & attractiveness of user views (intuitive system handling)
- What should be improved in the current system?
  - Transparency in results' relevance
- Did the result of your query contain relevant documents?



Feedback (2)

- Could you retrieve your uploaded file?
  + PDF, Word, Powerpoint
  - Excel

- Assess whether the efficiency of the information acquisition can be optimized by using the system
  + 7 subjects agree, if document pool is extended and external message currentness is granted
  - 1 subject: Only a subset of internal information sources can be included

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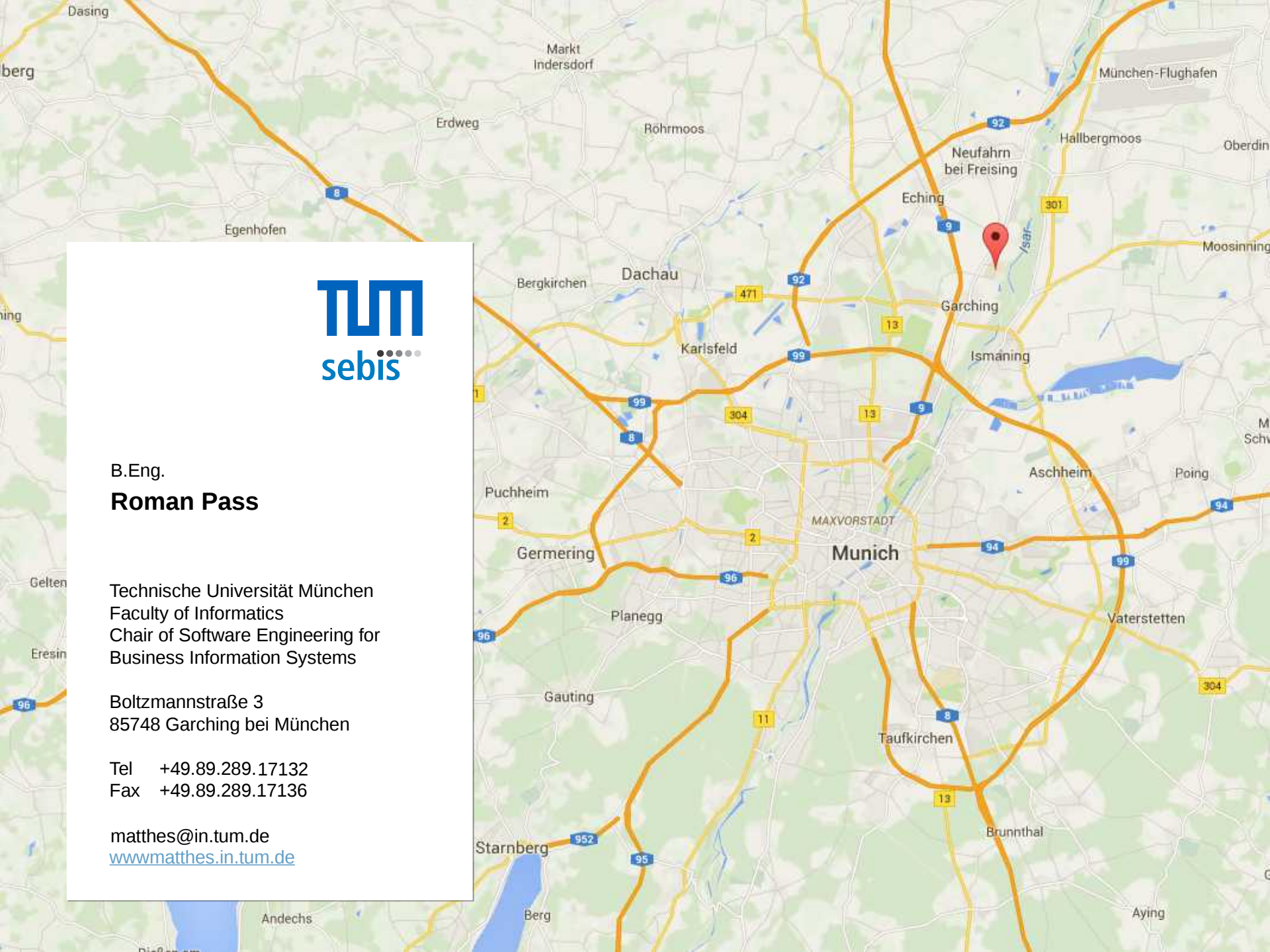
Future Work

- Extend information sources → improve automatic document classification
- Provide individuality (user accounts)
- Dictionary
  - Synonyms
  - Translations
- Provide Optical Character Recognition (OCR) for scanned documents



B.Eng.

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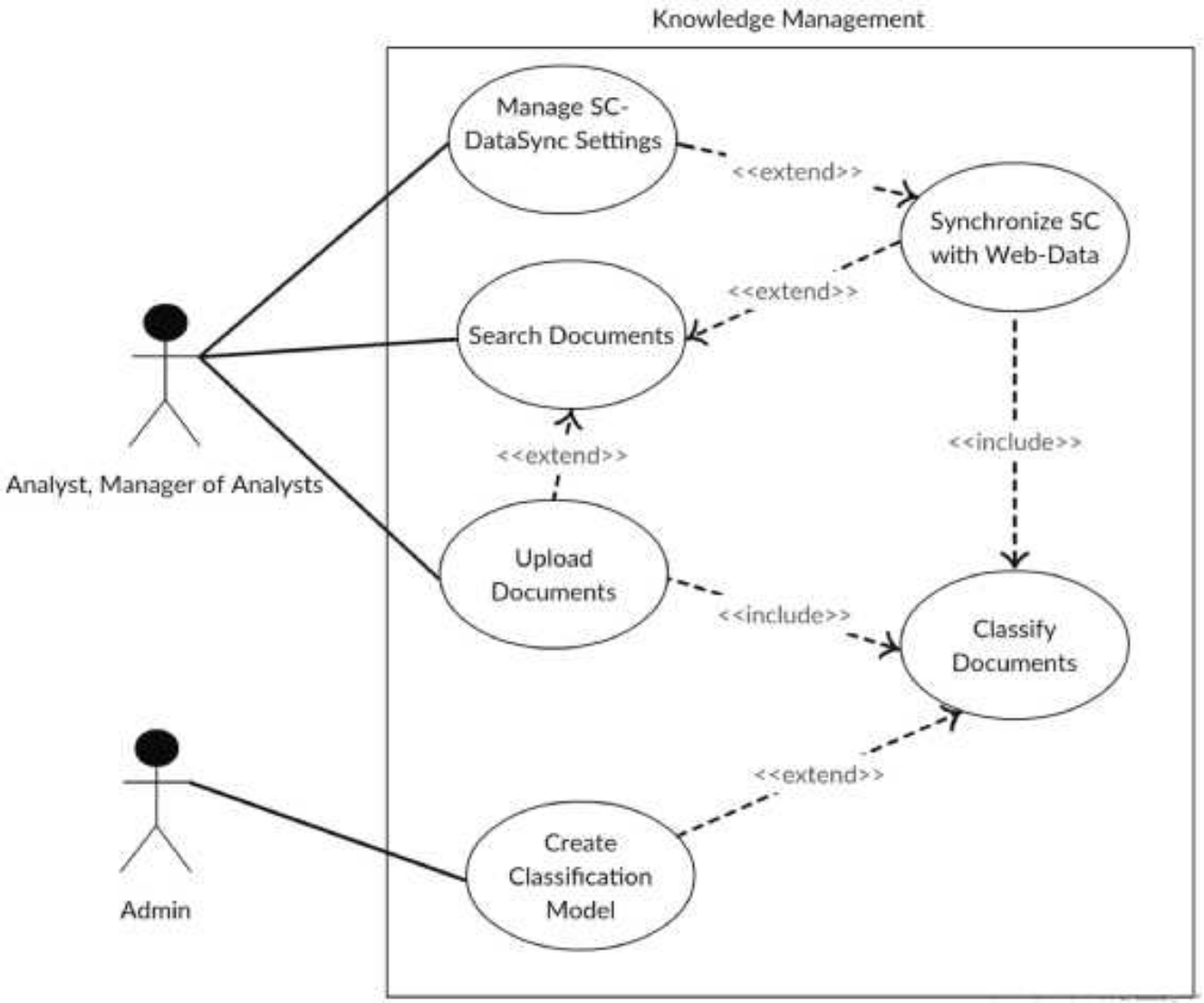
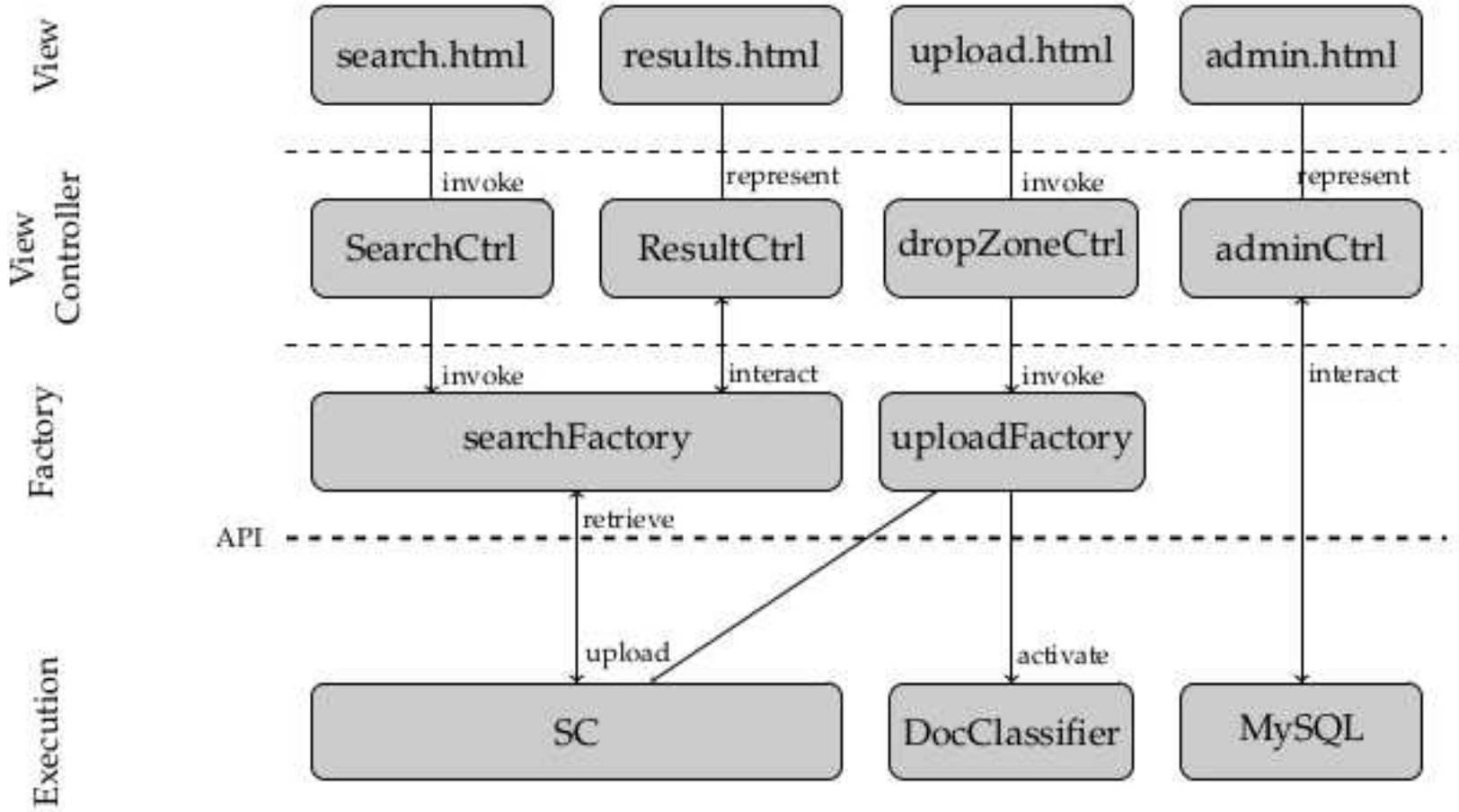
Backup

Use Case



CompetiCortex Layers



Comparison Between Classification Algorithms

Classification	accuracy	ø-precision	ø-recall
kNN (k=3)	91,28 %	88,12 %	85 %
Naive Bayes	92,77 %	89,46 %	88,02 %
SVM	47,66 %	7,94 %	16,67 %