
IFC-Bank of Italy Workshop on “Data Science in Central Banking: Applications and tools”

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Natural language processing for risk management¹

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¹ This contribution was prepared for the workshop. The views expressed are those of the authors and do not necessarily reflect the views of the Bank of Italy, the BIS, the IFC or the other central banks and institutions represented at the event.

Natural Language Processing for Risk Management

Discussion of Use-Cases

Dr. Bijan Sahamie, Deutsche Bundesbank

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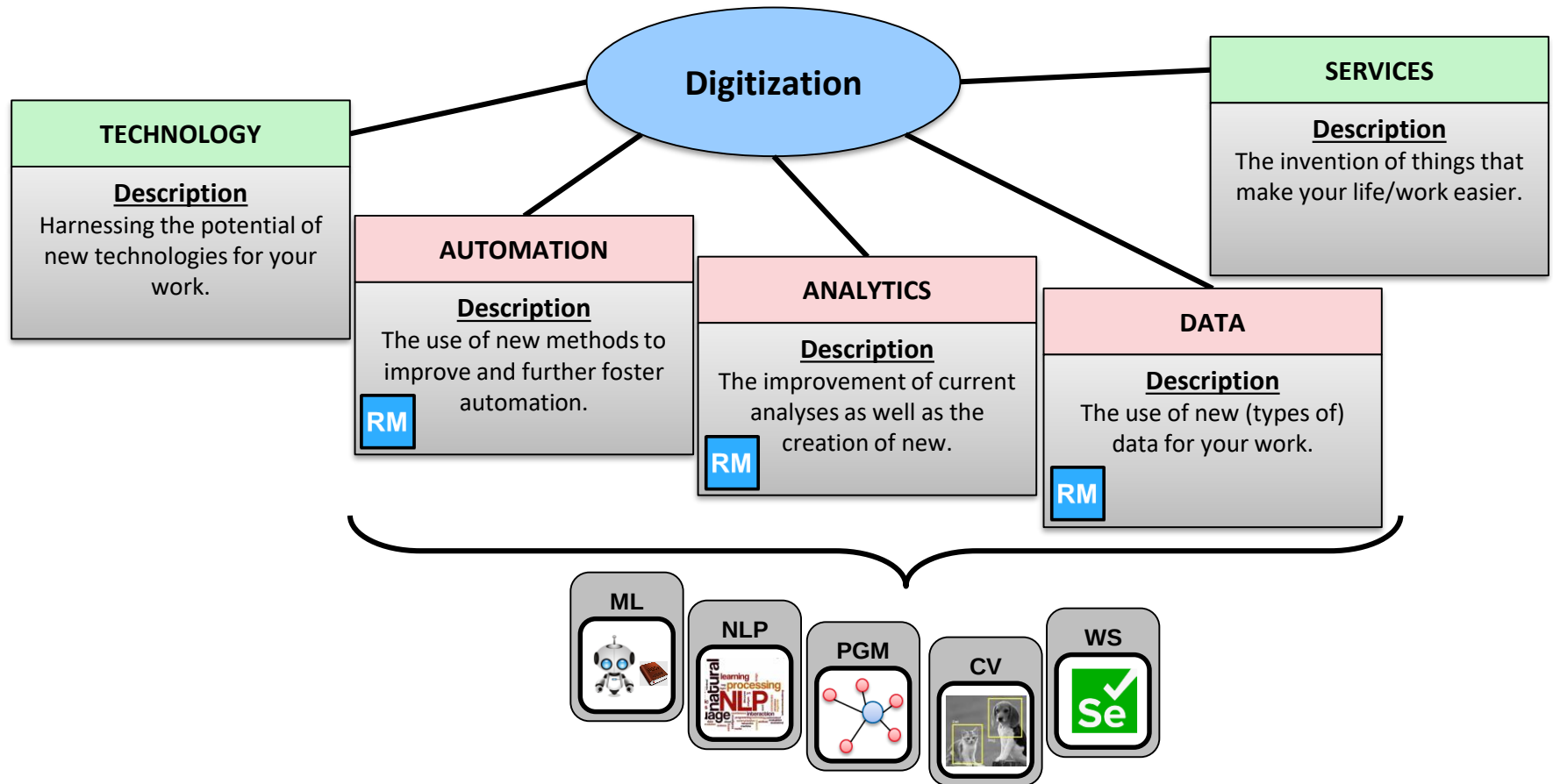
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Let's have a very high-level overview

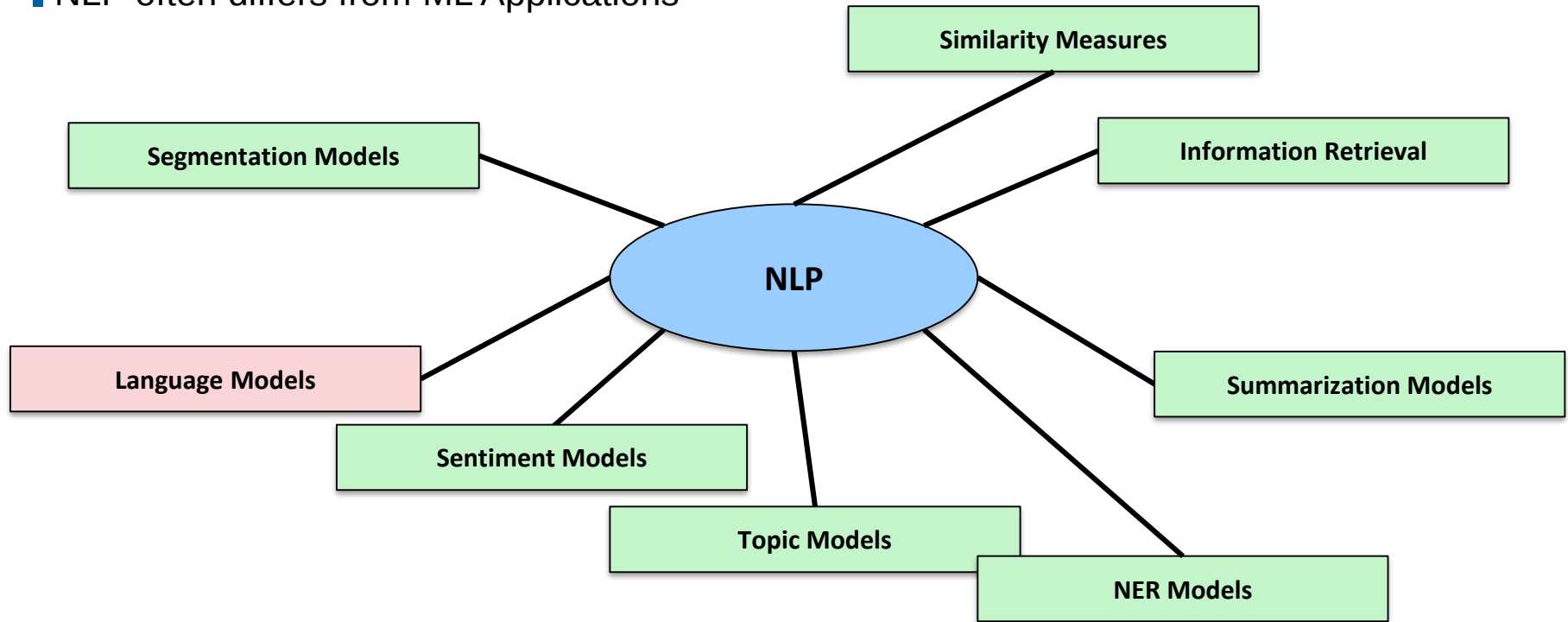
What are the main areas of interest and which technologies might be a good choice?

Let us have a look at the main areas of Digitization



Natural Language Processing

NLP often differs from ML Applications



Two Properties of NLP that stand out.

- Your use-case, although it might be specialized, is an (immediate) derivative of a general purpose task. Both are intimately related.
- Inside your IT-system there are several intertwined machine learning components. The machine learning system might even work as a hierarchy.

Counterparty Risk

Use-Cases in Risk Control

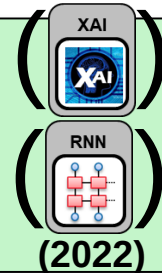
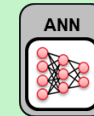
There are use-cases for both machine learning and natural language processing in Risk Control

Prediction of Financial Distress using Accounting Data

What's it about: „Classic“ forecasting using machine learning

Primary Utility: Generating a short-list for our analysts

Models: Ensemble of Neural Nets with calibrated thresholds (in the sense of a Outlier Detection)



ONLINE

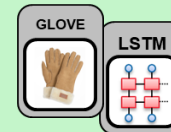
(2022)

(Fact-associated) Financial Sentiment of News Messages

What's it about: Automated assessment of news messages

Primary Utility : Workload reduction (i.e. improved efficiency)

Modelle: Mixture of Experts – Approach incl. LSTMs + Glove



ONLINE

(2022)

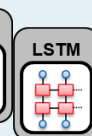
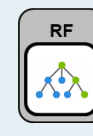
Filtering of News Messages sourced through webscraping

(Doing webscraping since nov 2019)

What's it about: Filter out uninteresting messages

Primary Utility: Better signal/noise-ratio, scalability of the approach

Models: (Self-Defined) Frequency Measures, Random Forests, LSTMs and/or GRUs + Glove.



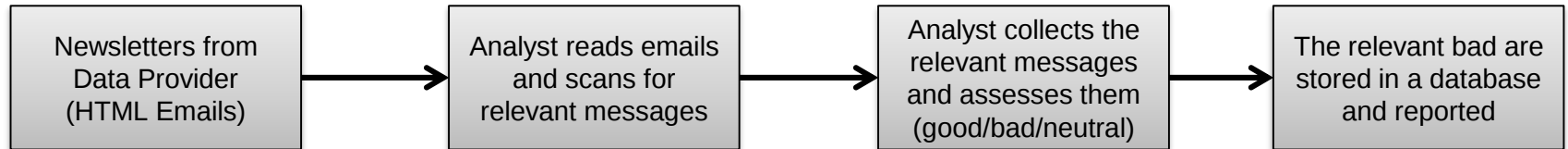
WORK IN
PROGRESS

(2022)

Financial Sentiment Analysis of News Data

Overview

Imagine the process. (very rough and simplified sketch, not entirely correct for the sake of brevity.)



Question. Can we make this more efficient?

Goal.

- Let a machine read the messages and just present to the analyst a pre-selected list (based on the system output)

Cost/Benefit compromise.

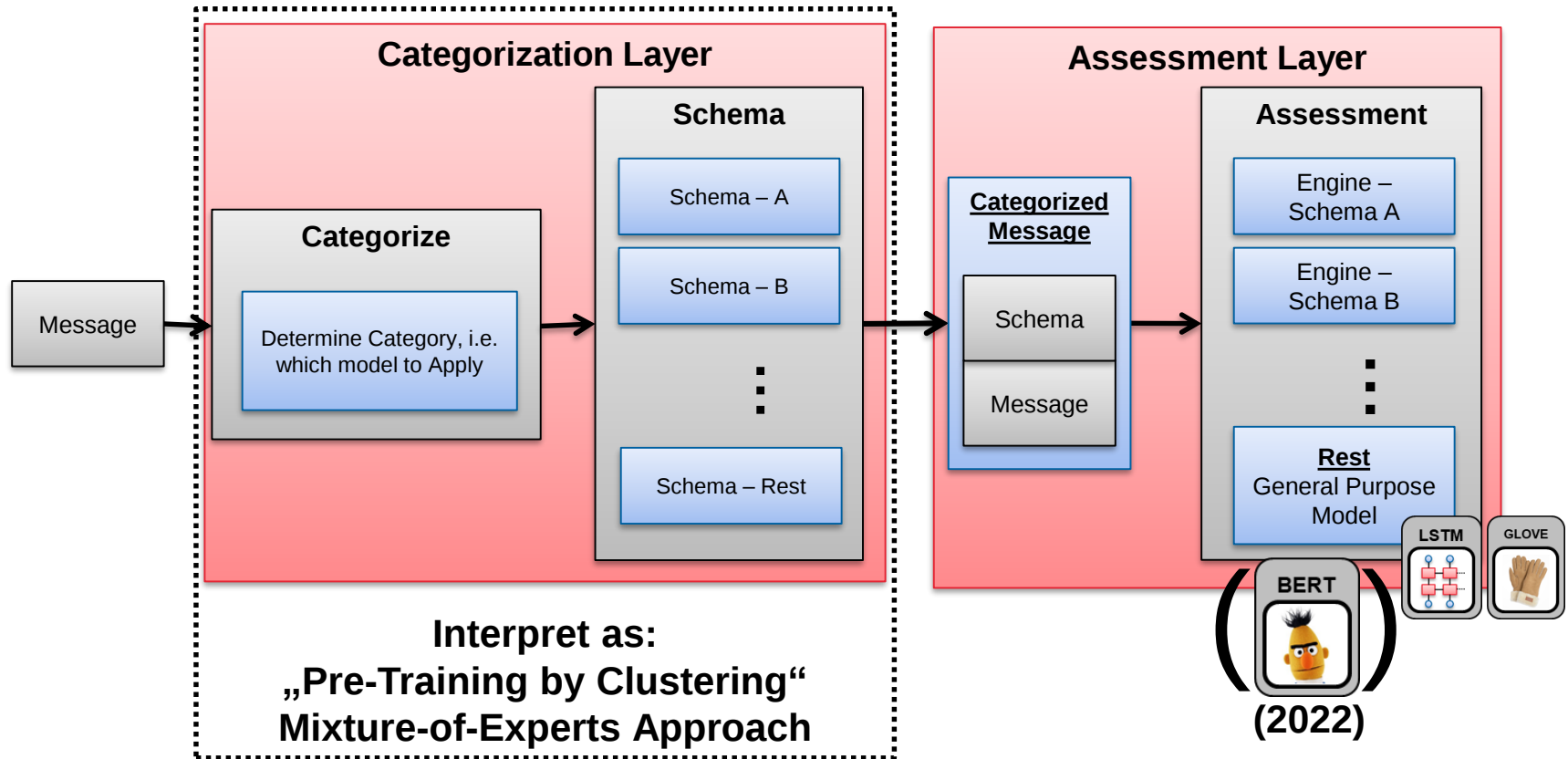
- Potential benefit: You lower the workload for the analyst
- Potential benefit: You raise the consistency of the process output
- Potential cost: You might lose some of the interesting messages.

ML-Dev Task.

- Find a sensible sweet-spot in the Cost/Benefit regime and optimize your system towards it

Financial Sentiment Analysis of News Data

The Model Concept



Financial Sentiment Analysis of News Data

A Screenshot



News Assessment and Lookup

Current User: [Redacted]

Assessment and Lookup

FileNo	No.	ImportTime Stamp	MessageDate	Section	Title	Message	Source	SystemAss	YourAss
2739	47356	02.12.2021 10:06:59	02.12.2021	BANKING		Fitch Ratings removed Banca Monte dei Paschi di Siena's long-t...	Feature AI...	Negative	Not Set
2739	47357	02.12.2021 10:06:59	02.12.2021	BANKING		KBC Bank Ireland PLC is engaging in detailed talks with Bank of ...	Feature AI...	Negative	Not Set
2741	47372	03.12.2021 12:56:44	02.12.2021	Capital Markets	Leveraged Commentary and Data: B2Holding postpones €300M ...	The deal is the second transaction in European high-yield to be p...	SNL MyS...	Negative	Not Set
2741	47375	03.12.2021 12:56:44	02.12.2021	Capital Markets	Leveraged Finance Trends: Sustainability-linked leveraged finan...	Fears regarding greenwashing have increased as the rate of Eur...	SNL MyS...	Negative	Not Set
2741	47378	03.12.2021 12:56:44	02.12.2021	Regulation, Policy & Law	Leveraged Commentary and Data: LMA and ELFA update best p...	Updates reflect important new guidance on sustainability provisio...	SNL MyS...	Negative	Not Set
2742	47379	03.12.2021 12:56:44	03.12.2021	TOP NEWS IN EUROPEAN ...		The European Commission fined HSBC Holdings PLC, Credit Su...	Feature AI...	Negative	Negative
2742	47382	03.12.2021 12:56:44	03.12.2021	MARKET INTELLIGENCE IN...		Insurers make progress on climate resilience at COP26, face fos...	Feature AI...	Negative	Not Set
2742	47387	03.12.2021 12:56:44	03.12.2021	BANKING		HSBC CEO Noel Quinn warned of increased costs for banks und...	Feature AI...	Negative	Not Set
2742	47391	03.12.2021 12:56:44	03.12.2021	POLICY AND REGULATION		The U.K. Financial Conduct Authority confirmed proposed chang...	Feature AI...	Negative	Not Set
2742	47392	03.12.2021 12:56:44	03.12.2021	POLICY AND REGULATION		The latest stress test of Denmark's systemically important banks ...	Feature AI...	Negative	Not Set
2742	47393	03.12.2021 12:56:44	03.12.2021	POLICY AND REGULATION		The Irish central bank fined Bank of Ireland Group PLC €24.5 mil...	Feature AI...	Negative	Not Set

Purge Data from GUI

Load Messages

Date Selection

Selection: Date

Date Type: MessageDate

from: 01.12.2021

till: 27.12.2021

Filter Properties

Sample: All

Checked: Yes

YourAss: All

Relevance: All

SystemAss: All

Counterparty Filter

CntrptNo: CntrptName

Query

Reset

Chosen Counterparty: 0

Message Details

Positive	Neutral	Negative	SystemAss
16.6%	18.2%	65.2%	Negative

Title

--

Message

The European Commission fined HSBC Holdings PLC, Credit Suisse Group AG, Barclays PLC and NatWest Group PLC a combined €261 million for participating in a foreign exchange spot trading cartel. Swiss bank UBS Group AG, which revealed the existence of the cartel, received full immunity and avoided a roughly €94 million fine, while U.K.-based peers HSBC, Barclays and NatWest Group received reduced fines for cooperating with the investigation. HSBC was hit with the largest fine at €174.3 million.

Edit Title Edit Message Mark for Deletion Remove Mark

File Summary

Open File in Browser

Visualize: Message

Down Up

Nothing to Save...

Relevance

Relevant

Not Relevant

Not Set

Sentiment

Positive

Neutral

Negative

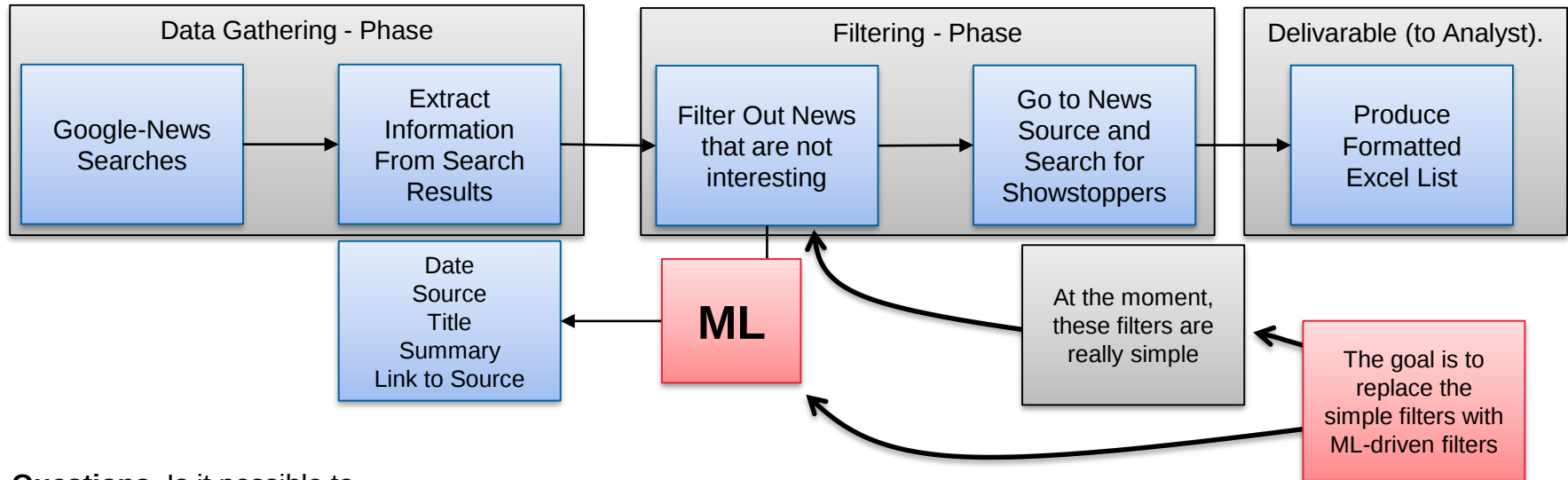
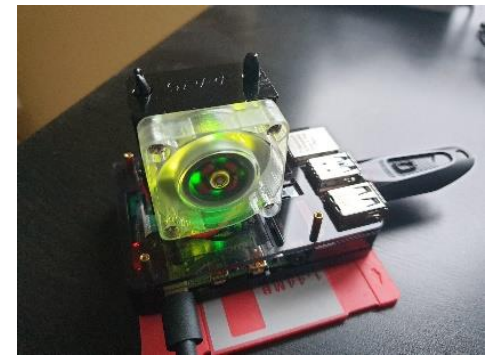
Not Set

Filtering Techniques for Web scraping of News

Filtering Techniques for Web scraping of News

Volume per Run (currently):

- ~15000 search results are scanned
- ~900 website jumps



Questions. Is it possible to...

ML

- ... distinguish „useful“ from „non-useful“ sources by just looking at their name, and is this a learnable task?
- ... distinguish „useful“ from „non-useful“ sources by using frequency-measures?
- ... distinguish „useful“ from „non-useful“ messages by looking at the titles?
- ... distinguish „useful“ from „non-useful“ messages by looking at the summary?

Answer.
YES!



The End