

Freie Universität

Berlin

Kommunikationsforschung mit APIs: Eine ~~nicht~~ technische Einführung

Vorlesung: Methoden der empirischen Kommunikations- und Medienforschung I /
Datenerhebung, Wintersemester 2023/2024

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15. 01. 2024

Hallo

ARBEITSSTELLE DIGITALE FORSCHUNGSMETHODEN



dall-e-3, Prompt: A team of communication researchers using digital research methods and computational methods, cyberpunk style

DIESES BILD HABE ICH MIT EINER API ERSTELLT

```
library(httr)
library(jsonlite)
key = readLines("openai_key.txt")
url <- "https://api.openai.com/v1/images/generations"
headers <- c(
  "Content-Type" = "application/json",
  "Authorization" = paste0("Bearer ", key)
)
body <- list(
  model = "dall-e-3",
  prompt = "A team of communication researchers using digital research methods and computational methods, cyber",
  n = 1,
  size = "1024x1024"
)
response <- POST(url, body = toJSON(body, auto_unbox = TRUE), encode = "json", add_headers(.headers=headers))
download.file(url = content(response)$data[[1]]$url, destfile = "images/as_digimeth.png")
```

Nachmachen:  [bsp_dall-e.R](#) (mit OpenAI-Account, kostet \$0.04/Bild)

PRÄSENTATION UND CODE



Präsentation: https://bachl.github.io/methodenvl_ma/

Code: https://github.com/bachl/methodenvl_ma

AGENDA

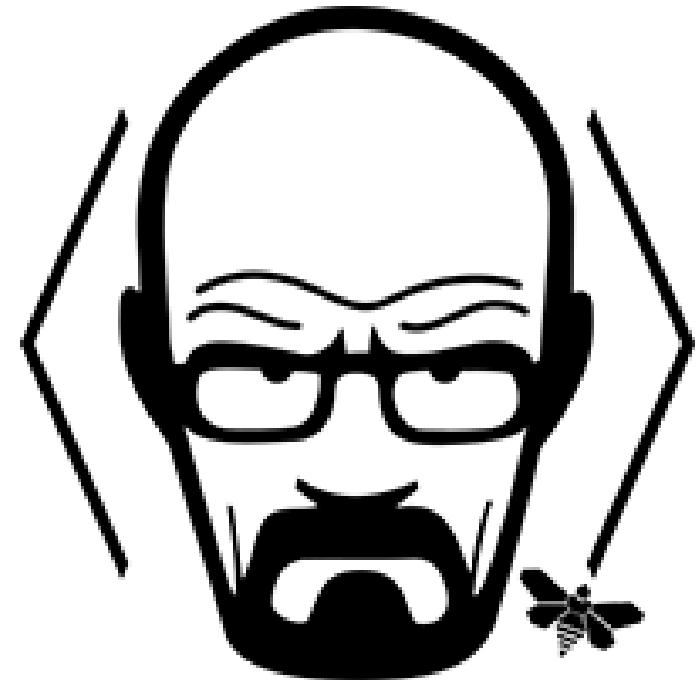
1. Was ist eine API?
2. Verbreiteter Einsatz in PuK: Erhebung digitaler Inhalte
 - a. Vor und nach der *APIcalypse*
 - b. Umsetzung mit **R** und **{httr2}**
3. Neuerer Einsatz in PuK: Nutzung von Cloud-Diensten (z.B. KI)
 - a. Zero-shot classification: Kurze Einführung
 - b. Zero-shot classification: Umsetzung mit der OpenAI-API

Was ist eine API?

WAS IST EINE API?

- **Application Programming Interface** = Programmierschnittstelle
 - Austausch maschinenlesbarer Daten zwischen verschiedenen Programmen/Computern
- **Web-APIs** nutzen die gleichen Protokolle wie Browser, aber liefern anderen Datenstrukturen
 - Formate sind standardisiert (z.B. XML oder JSON), Inhalte variieren
 - oft nutzen Plattformen für ihre eigenen (Mobil-) Apps ebenfalls APIs

EIN EINFACHES BEISPIEL



[B]reaking [B]ad Quotes API

A free API to retrieve some quotes of Breaking Bad, bitch!

Star

*Shut the f*ck up and let me die in peace.*

Mike Ehrmantraut

[Breaking Bad Quotes API](#)

EIN EINFACHES BEISPIEL

Anfrage

```
bb_quote <- readLines("https://api.breakingbadquotes.xyz/v1/quotes")
```

Antwort

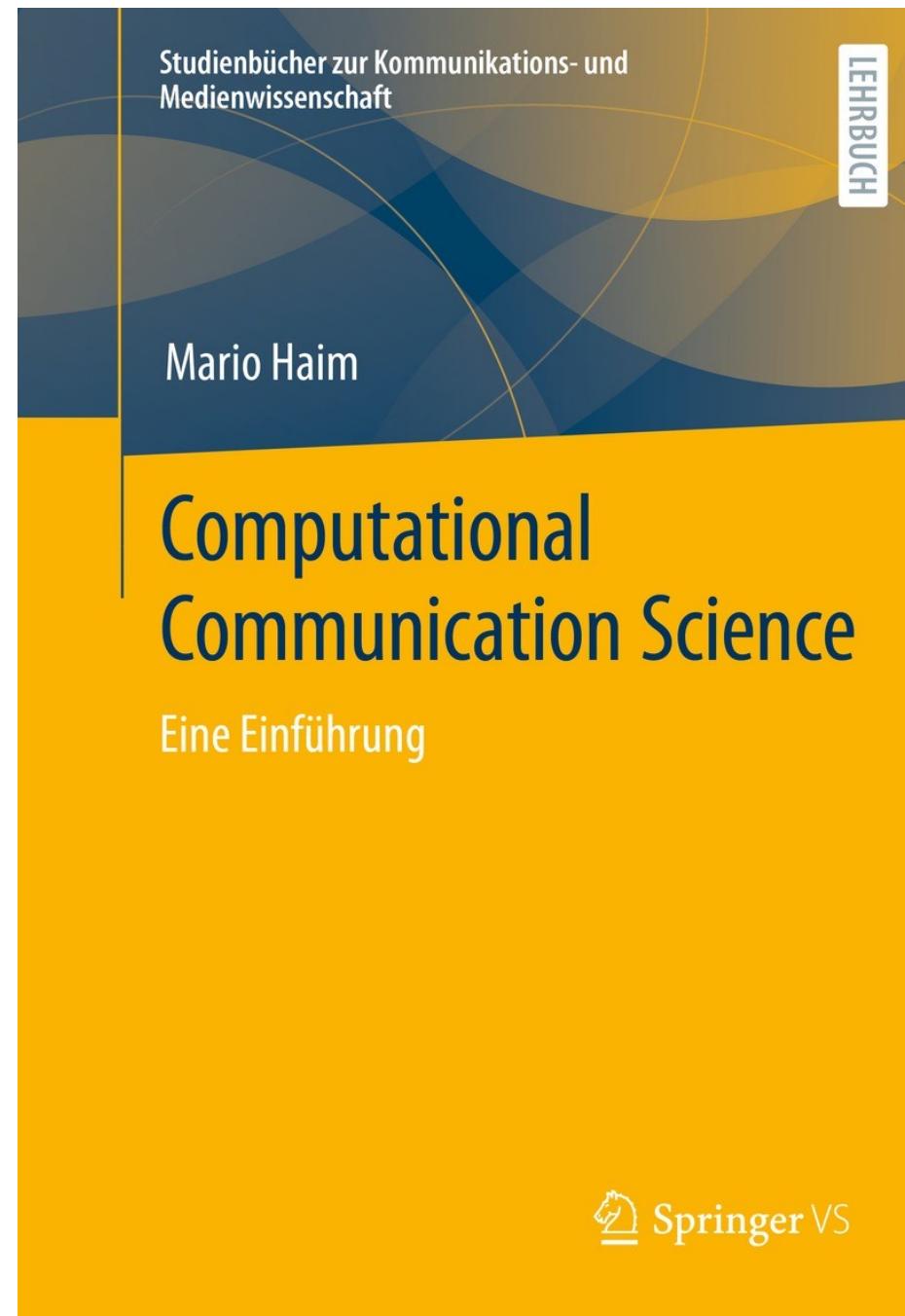
```
bb_quote |> jsonlite::prettify()
```

```
[  
  {  
    "quote": "So you do have a plan? Yeah, Mr. White! Yeah, science!",  
    "author": "Jesse Pinkman"  
  }  
]
```

GRUNDBEGRIFFE

- Server-Client-Prinzip: Server definiert Schnittstelle, Client kann diese abfragen
- REST API: **R**epresentational **s**tate **t**ransfer, Wortneuschöpfung; beschreibt abstrakt den Aufbau eines Datennetzwerks (z.B. des WWW); *stateless*, d.h., es passiert nur bei einer Anfrage etwas.
- Streaming API: Verbindung bleibt über einen Zeitraum bestehen, wenn auf dem Server etwas passiert, wird es an Client gesendet.
- Endpoint: URL, mit der ein API-Aufruf beginnt; Die meisten APIs haben mehrere Endpoints, in die sie verschiedene Inhalte und Dienste sortieren.
- Parameter: Möglichkeit, weiter zu spezifizieren, was der API-Endpoint liefern soll.

NACHLESEN

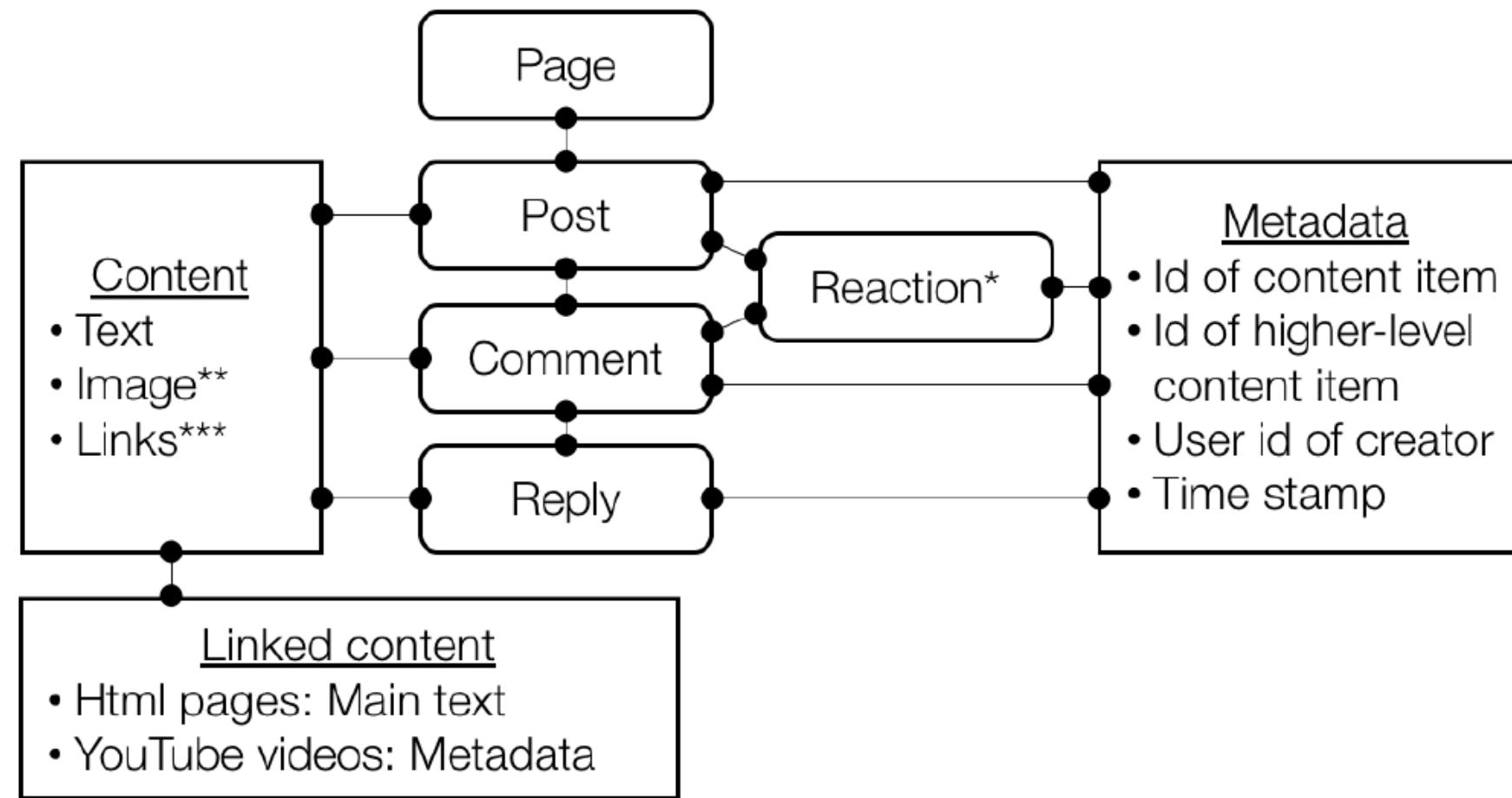


(Haim, 2023, Kapitel 5.3)

Verbreiteter Einsatz in PuK: Erhebung digitaler Inhalte

Vor der *APIcalypse*: Kommunikationsspuren auf Social Media

BUNDESTAGSWAHLKAMPF 2017 AUF FACEBOOK



Datenstruktur des Projekts Multilevel Flows of Political Communication on Facebook (Bachl & Scharkow, 2020-2023)

- Facebook Graph API, zusätzlich YouTube Data API und Scraping
- Abfrage von ca. 400 politischen FB-Seiten alle 6 Stunden über ca. ein Jahr

DIGITALE VERHALTENSSPUREN AUF INDIVIDUALEBENE

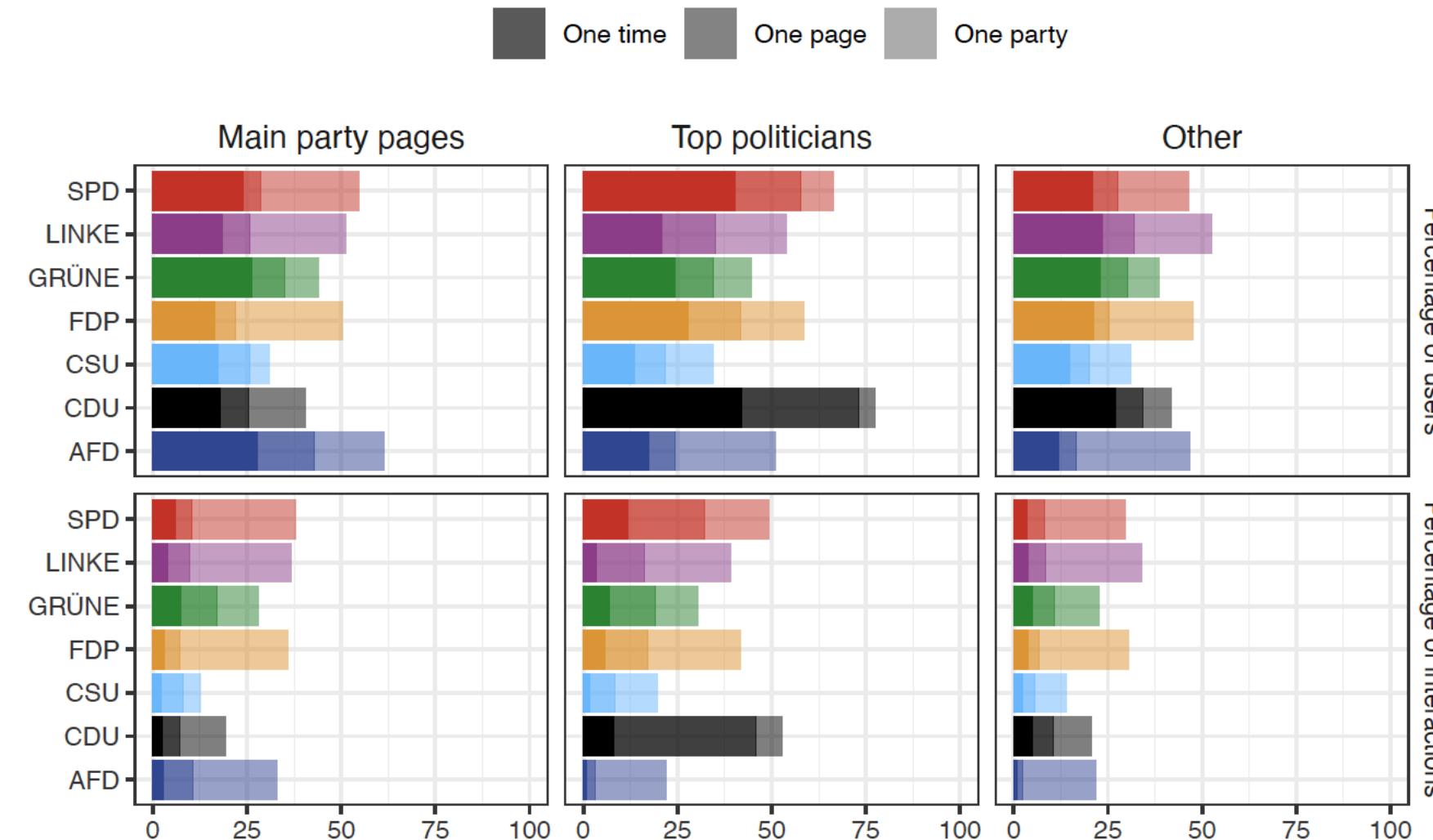
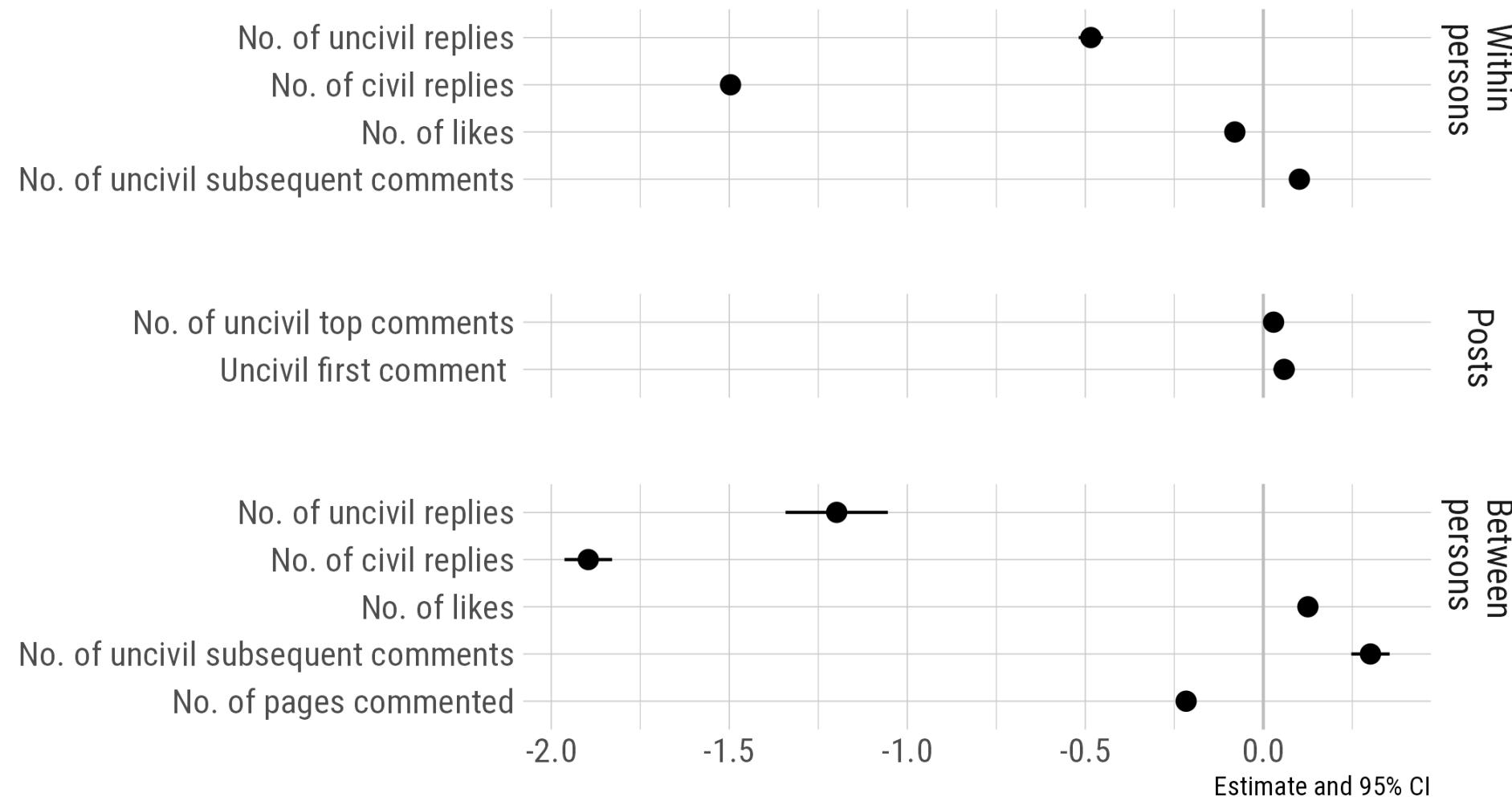


Figure 1. User types per party and page type (in percent)

Notes. The top row shows the proportions of users with only one interaction, users with interactions on one page, and users with interactions on multiple pages of the same party for each party. The bottom row shows the proportions of interactions per party which originated from the users in each category.

DIGITALE VERHALTENSSPUREN AUF INDIVIDUALEBENE

Vorhersage des Ausstiegs aus der Diskussion



(Winkler, Scharkow, Bachl & Jürgens, working paper)

POST-API-AGE & APICALYPSE



The Forum

Computational Research in the Post-API Age

DEEN FREELON

Keywords API, computational, Facebook, Twitter, social media

On April 4, 2018, the post-API age reached a milestone. On that day, Facebook closed access to its Pages API, which had allowed researchers to extract posts, comments, and associated metadata from public Facebook pages (Schroepfer, 2018). This decision followed the company's April 2015 closure of its public search Application Programming Interface (API), which provided searchable access to all public posts within a rolling two-week window (Facebook, n.d.). The closure of the Pages API eliminated all terms of service (TOS)-compliant access to Facebook content. Let me underscore the magnitude of this shift: There is currently no way to independently extract content from Facebook without violating its TOS.

(Freelon, 2018)

After the 'APIcalypse': social media platforms and their fight against critical scholarly research

Axel Bruns

Digital Media Research Centre, Queensland University of Technology, Brisbane, Australia

ABSTRACT

In the aftermath of the Cambridge Analytica controversy, social media platform providers such as *Facebook* and *Twitter* have severely restricted access to platform data via their Application Programming Interfaces (APIs). This has had a particularly critical effect on the ability of social media researchers to investigate phenomena such as abuse, hate speech, trolling, and disinformation campaigns, and to hold the platforms to account for the role that their affordances and policies might play in facilitating such dysfunction. Alternative data access frameworks, such as *Facebook*'s partnership with the controversial Social Science One initiative, represent an insufficient replacement for fully functional APIs, and the platform providers' actions in responding to the Cambridge Analytica scandal raise suspicions that they have instrumentalised it to actively frustrate critical, independent, public interest scrutiny by scholars. Building on a critical review of *Facebook*'s public statements through its own platforms and the mainstream media, and of the scholarly responses these have drawn, this article outlines the societal implications of the 'APIcalypse', and reviews potential options for scholars in responding to it.

ARTICLE HISTORY

Received 24 November 2018
Accepted 6 June 2019

KEYWORDS

Cambridge Analytica; Social Science One; Facebook; Twitter; Application Programming Interface; social media

(Bruns, 2019)

POST-API-AGE & APICALYPSE

- APIs der meisten großen Social-Media-Plattformen mehr oder weniger geschlossen
 - Keine (praktikablen) Zugänge zu Facebook, Instagram, Twitter
 - Eingeschränkter Zugang zu TikTok, YouTube (aber kaum zu SN-Features)
 - Zugang zu kleineren Plattformen, z.B. BlueSky, Mastodon
- Problem: Willkür der Anbieter
- Hoffnung: EU Digital Services Act (DSA)

APIS ARE ALIVE AND WELL

- Trotzdem: APIs bleiben wichtiges Werkzeug für digitale Forschungsmethoden, wenn auch (aktuell) weniger für Social-Media-Forschung
- Datenzugang: [Bundestag](#), [MediaWiki Action API](#) (u.a. [Wikipedia](#)), [Wikimedia REST API](#), [YouTube](#), [Telegram](#), [Tagesschau](#), [The Guardian](#), [DESTATIS](#), ...
- Kommunikation mit Cloud-Diensten (2. Teil der Sitzung)

Umsetzung mit **R** und **{httr2}**

UMSETZUNG MIT R UND {httr2}

- Beispiel: Aufmerksamkeit für Olaf Scholz, Robert Habeck und Christian Lindner in den letzten drei Wochen – gemessen an den Aufrufen ihrer Wikipedia-Seiten
- Umsetzung mit [MediaWiki Action API](#), Endpoint [PageViewInfo](#)
- Nachmachen: ➡ [bsp_wikipedia.R](#)



<https://httr2.r-lib.org/>

GENUTZTE PAKETE

```
library(httr2) # Kommunikation mit API über HTTP  
library(jsonlite) # JSON-Dateien  
library(tidyverse) # Datenmanipulation und Grafik
```

ANFRAGE AN DIE API

```
req = request(
  base_url = "https://de.wikipedia.org/w/api.php"
) |>
  req_url_query(!!!!list(
    action = "query",
    format = "json",
    prop = "pageviews",
    titles = c("Olaf_Scholz",
              "Robert_Habeck",
              "Christian_Lindner"),
    pvipdays = 21),
    .multi = "pipe")
req |>
  req_dry_run()
```

```
GET /w/api.php?
action=query&format=json&prop=pageviews&titles=Olaf_Scholz|Robert_Habeck|Christian_Lindner&pvipdays=21
HTTP/1.1
Host: de.wikipedia.org
User-Agent: httr2/1.0.0 r-curl/5.2.0 libcurl/8.1.2
Accept: */*
Accept-Encoding: deflate, gzip
```

ANTWORT DER API

```
resp = req|>
    req_perform()

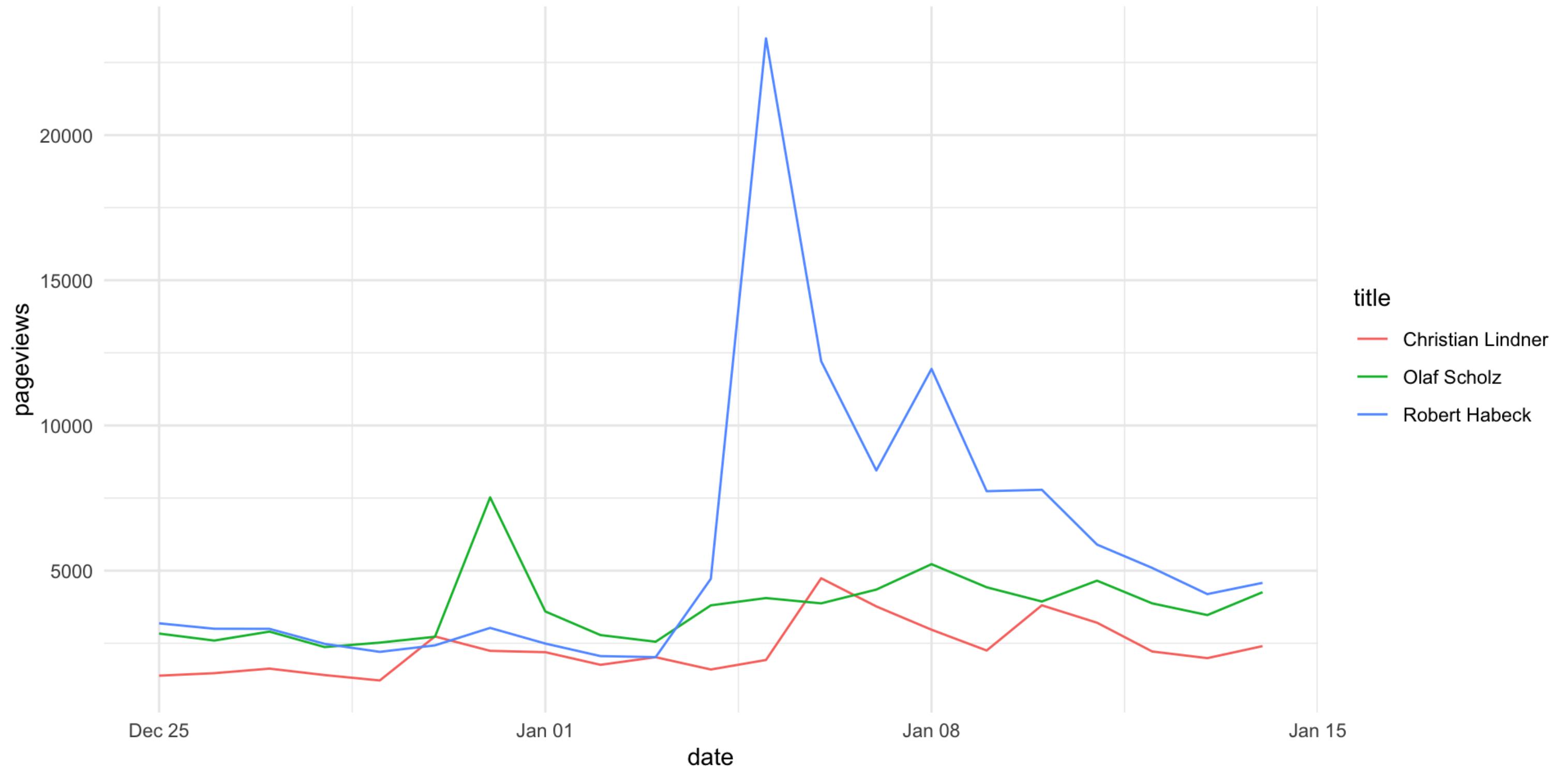
resp |>
    resp_body_string() |>
    jsonlite::prettify()
```

```
{
  "batchcomplete": "",
  "query": {
    "normalized": [
      {
        "from": "Olaf_Scholz",
        "to": "Olaf Scholz"
      },
      {
        "from": "Robert_Habeck",
        "to": "Robert Habeck"
      },
      {
        "from": "Christian_Lindner",
```

ANTWORT KONVERTIEREN UND PLOTTEN

```
resp |>
  resp_body_json() |>
  _$query |>
  _$pages |>
  map_dfr(as_tibble) |>
  mutate(date = as_date(names(pageviews))) |>
  unnest(pageviews) |>
  ggplot(aes(date, pageviews, color = title)) +
  geom_line() +
  theme_minimal()
```

ANTWORT KONVERTIEREN UND PLOTTEN



UMSETZUNG MIT R UND {httr2}

- Workflow: API finden, Dokumentation verstehen, Daten abfragen, aufbereiten, analysieren
- Einschränkung der MediaWiki Action API: Nur letzte 60 Tage
- Alternative: Wikimedia REST API  `bsp_wikipedia_rest.R`

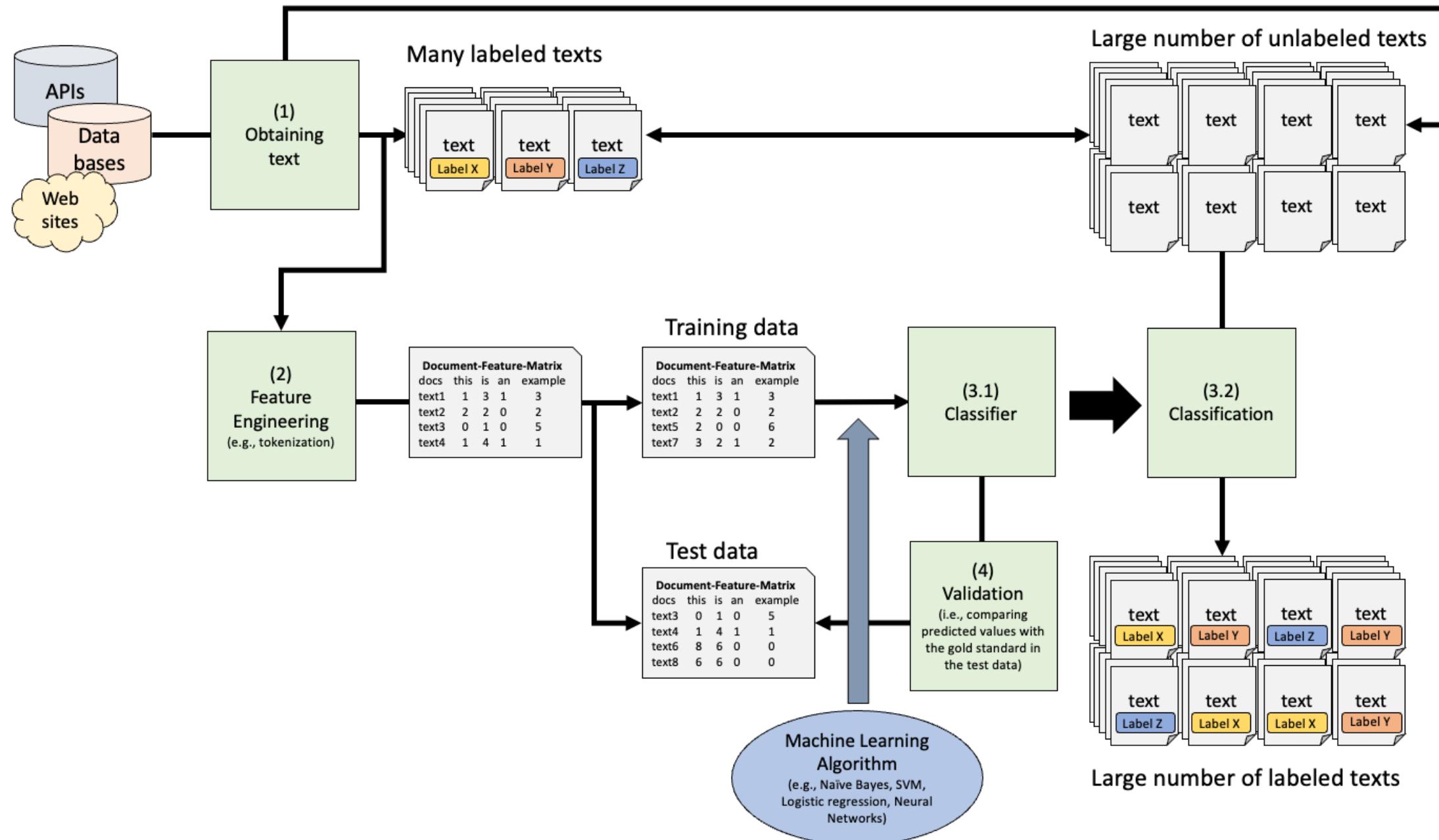
Neuerer Einsatz in PuK: Nutzung von
Cloud-Diensten (z.B. KI)

NUTZUNG VON CLOUD-DIENSTEN

- Viele Cloud-Dienste lassen sich über APIs verwenden
- Beispiele aus dem Bereich KI: [Huggingface Inference API](#), [OpenAI API](#), [Perspective API](#)
- Workflow ist ähnlich: Anfrage senden, Antwort erhalten
- Unterschiede: Erfordert fast immer Authentifizierung, häufig kostenpflichtig

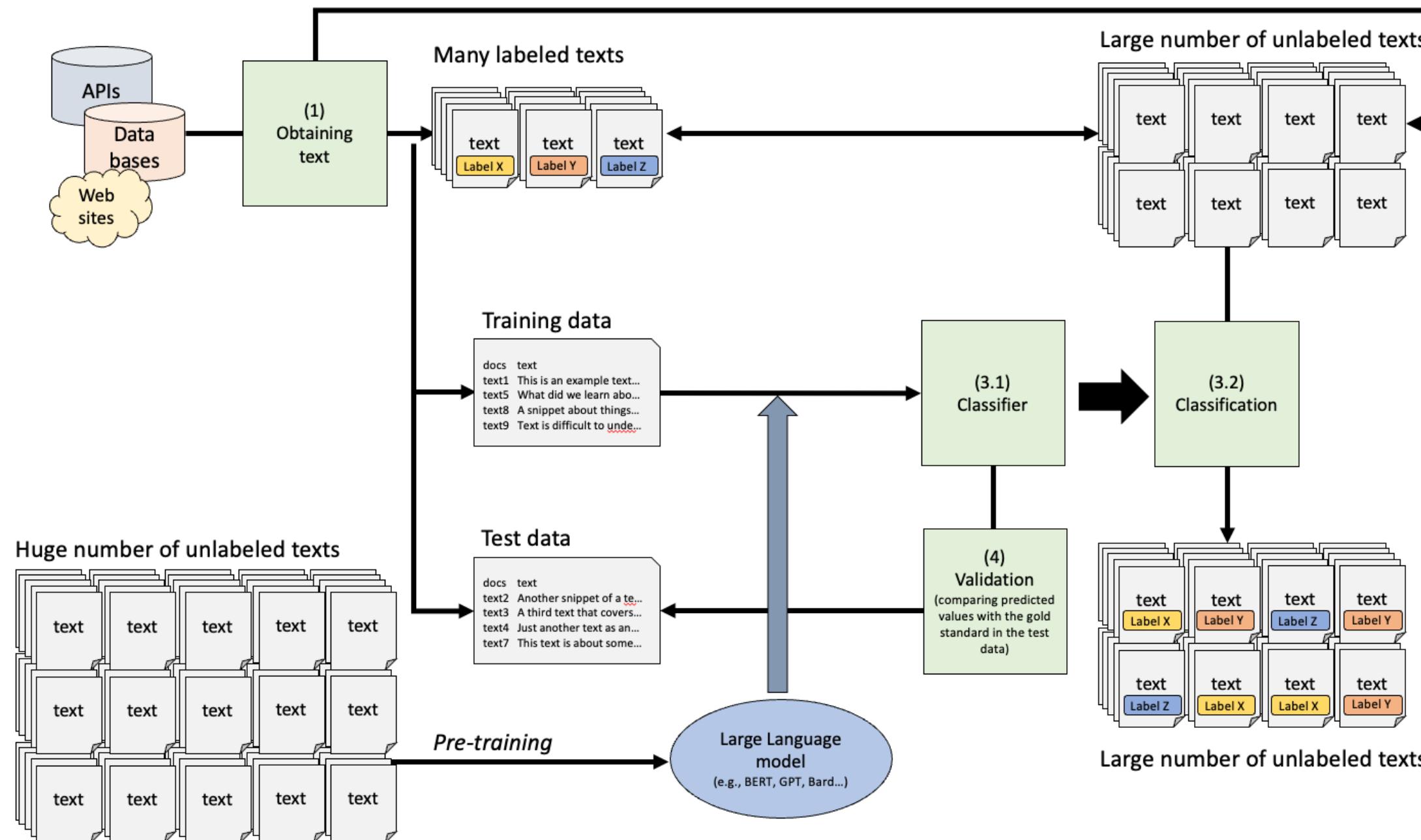
Zero-shot classification: Kurze Einführung

BAG-OF-WORDS MACHINE LEARNING



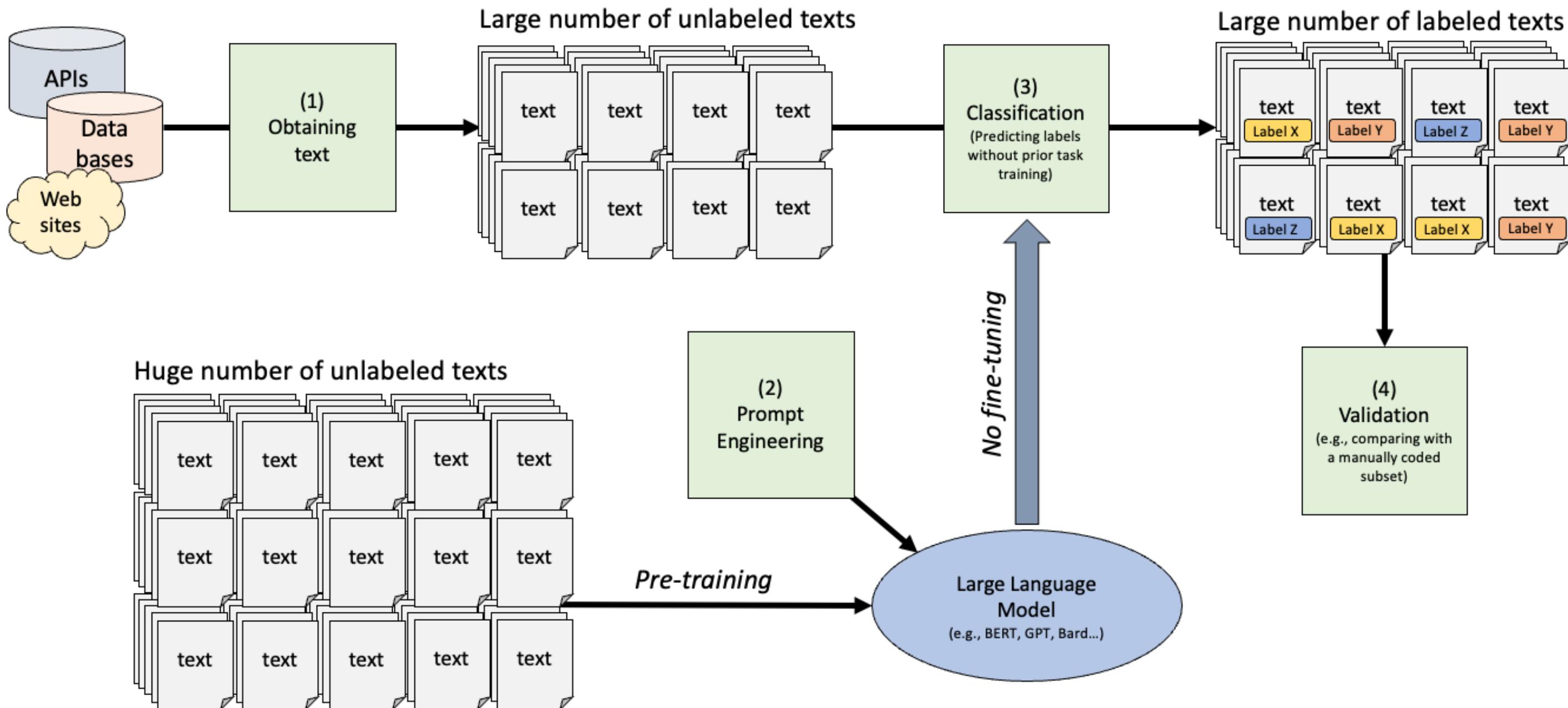
Abbildungen von Philipp K. Masur

TRANSFER LEARNING



Abbildungen von Philipp K. Masur

ZERO-SHOT CLASSIFICATION



Abbildungen von Philipp K. Masur

ZERO-SHOT CLASSIFICATION: HYPE (?)

PNAS

BRIEF REPORT

POLITICAL SCIENCES

OPEN ACCESS



ChatGPT outperforms crowd workers for text-annotation tasks

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Edited by Mary Waters, Harvard University, Cambridge, MA; received March 27, 2023; accepted June 2, 2023

Many NLP applications require manual text annotations for a variety of tasks, notably to train classifiers or evaluate the performance of unsupervised models. Depending on the size and degree of complexity, the tasks may be conducted by crowd workers on platforms such as MTurk as well as trained annotators, such as research assistants. Using four samples of tweets and news articles ($n = 6,183$), we show that ChatGPT outperforms crowd workers for several annotation tasks, including relevance, stance, topics, and frame detection. Across the four datasets, the zero-shot accuracy of ChatGPT exceeds that of crowd workers by about 25 percentage points on average, while ChatGPT's intercoder agreement exceeds that of both crowd workers and trained annotators for all tasks. Moreover, the per-annotation cost of ChatGPT is less than \$0.003—about thirty times cheaper than MTurk. These results demonstrate the potential of large language models to drastically increase the efficiency of text classification.

ChatGPT | text classification | large language models | human annotations | text as data

GPT is an effective tool for multilingual psychological text analysis

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(Gilardi et al., 2023)

(Rathje et al., 2023)

Keywords: GPT, Text Analysis, Large Language Models, Machine Learning, Artificial Intelligence

Zero-shot classification: Umsetzung mit der OpenAI-API

ZERO-SHOT CLASSIFICATION: OPENAI-API

- Beispiel: Klassifikation von Inzivilität in Social-Media-Kommentaren
- Klassifikation mit OpenAI GPT-4 (bekannt aus ChatGPT Premium) und `httr2`
- Nachmachen:  `bsp_zero_shot_openai.R` (mit OpenAI-Account)

Genutzte Pakete

```
library(httr2) # Kommunikation mit API über HTTP
library(jsonlite) # JSON-Dateien
library(tidyverse) # Datenmanipulation und Grafik
```

ERKENNEN VON INZIVILITÄT IN SOCIAL-MEDIA-KOMMENTAREN (STOLL ET AL., 2023)

Kommentar mit mindestens einer der folgenden Eigenschaften gilt als inzivil:

- Vulgäre, unangemessene Sprache, Fluchen
- Beleidigung, Profanität
- Entmenschlichung
- Sarkasmus, Spott, Zynismus
- Negative Stereotype
- Diskriminierung
- Androhung von Gewalt
- Verweigerung von Rechten
- Vorwurf der Lüge
- Erniedrigung, fehlender Respekt, Abwertung

UNTERSUCHUNGSMATERIAL

Wir brauchen ein paar Kommentare zum Testen:

- Einen klar inzivilen Kommentar
- Einen klar nicht inzivilen Kommentar
- Zwei mehrdeutige Kommentare:
 - Einen *nicht* inzivilen Kommentar, der fälschlicherweise als inzivil klassifiziert wird
 - Einen inzivilen Kommentar, der fälschlicherweise als *nicht* inzivil klassifiziert wird

URL FÜR ANFRAGE

```
req = request(base_url = "https://api.openai.com/v1/chat/completions")
req |>
  req_dry_run()
```

```
GET /v1/chat/completions HTTP/1.1
Host: api.openai.com
User-Agent: httr2/1.0.0 r-curl/5.2.0 libcurl/8.1.2
Accept: */*
Accept-Encoding: deflate, gzip
```

KEY ZUR ANMELDUNG BEI OPENAI

❗ Schlüssel und Token niemals öffentlich teilen!

```
key = readLines("openai_key.txt")  
  
req |>  
  req_auth_bearer_token(key) |>  
  req_dry_run()
```

```
GET /v1/chat/completions HTTP/1.1  
Host: api.openai.com  
User-Agent: httr2/1.0.0 r-curl/5.2.0 libcurl/8.1.2  
Accept: */*  
Accept-Encoding: deflate, gzip  
Authorization: <REDACTED>
```

PROMPT (1)

Codieranweisung: Was soll KI-Assistent tun?

```
instr = paste(readLines("instr_nodef_reason.txt"), collapse = "\n")
cat(instr)
```

Your task is to evaluate whether a comment contains incivility.

You should assign the comment a numeric label, 1 or 0.

- 1. The comment contains incivility.
- 0. The comment does not contain incivility.

Answer with the number 0 or the number 1, followed by a semi-colon and then a brief motivation. For instance:
"1; The comment is clearly incivil. It has many elements of an incivil comment, such as ..." Do not use quotation marks.

(Törnberg, 2023)

PROMPT (2)

Codiereinheiten: Was soll klassifiziert werden?

```
cod = readLines("comments.txt")
cat(cod, sep = "\n")
```

Get back where you came from!!!!
What a nice foto of you! Love it <3
You look better on fotos.
Sure, let's all go out and kill babies.
For a woman, you almost made sense here.

ANFRAGE

```
req |>
  req_auth_bearer_token(key) |>
  req_body_json(list(
    model = "gpt-4",
    messages = list(
      list(role = "system", content = instr),
      list(role = "user", content = cod[1]))
  ),
  temperature = 0,
  max_tokens = 50
)) |>
req_dry_run()
```

```
POST /v1/chat/completions HTTP/1.1
Host: api.openai.com
User-Agent: httr2/1.0.0 r-curl/5.2.0 libcurl/8.1.2
Accept: */*
Accept-Encoding: deflate, gzip
Authorization: <REDACTED>
Content-Type: application/json
Content-Length: 593
```

```
{"model":"gpt-4","messages":[{"role":"system","content":"Your task is to evaluate whether a comment contains incivility.\n\nYou should assign the comment a numeric label, 1 or 0.\n1. The comment contains incivility.\n0. The comment does not contain incivility.\n\nAnswer with the number 0 or the number 1, followed by a semi-colon and then a brief motivation. For instance: \"1; The comment is clearly incivil. It has many elements of an
```

ANTWORT

```
resp = req |>
    req_auth_bearer_token(key) |>
    req_body_json(list(
        model = "gpt-4",
        messages = list(
            list(role = "system", content = instr),
            list(role = "user", content = cod[1]))
        ),
        temperature = 0,
        max_tokens = 50
    )) |>
    req_perform()

resp |>
    resp_body_string() |>
    prettyify()
```

```
{
    "id": "chatcmpl-8giNlEym3eWA6oAZvrJ1dc3ip7hoD",
    "object": "chat.completion",
    "created": 1705191073,
    "model": "gpt-4-0613",
    "choices": [
        {
            "index": 0,
            "message": {
                "role": "assistant",
                "content": "1; The comment is incivil  
as it is disrespectful and offensive, suggesting the  
person should leave or is not welcome."
            }
        }
    ]
}
```

ALLE KOMMENTARE

► Code

Kommentar	Klassifikation
Get back where you came from!!!!	1; The comment is incivil as it is disrespectful and offensive, suggesting a hostile attitude towards the recipient.
What a nice foto of you! Love it <3	0; The comment is positive and complimentary, showing no signs of incivility.
You look better on fotos.	1; The comment is incivil as it implies that the person does not look good in person, which can be considered as a form of insult.

Sure, let's all go out and kill babies.

1; The comment is incivil as it promotes violence and harm, which is inappropriate and offensive.

For a woman, you almost made sense here.

1; The comment is incivil as it contains a sexist remark, implying that women generally do not make sense.

ZERO-SHOT CLASSIFICATION

- Generative LLMs und Natural language inference (NLI) ([Laurer et al., 2023](#))
- Rasant entwickelndes Forschungsfeld:
 - Verbesserungen durch weiterentwickelte Modelle
 - Evaluation der Performance: Was geht, was (noch) nicht?
 - Prompt engineering: Welche Codieranweisungen sind besser?
 - Forschungethische Fragen: Biases, Reproduzierbarkeit, Abhängigkeit von proprietären Modellen
- Wenn Sie sich für Inhaltsanalyse interessieren: Jetzt einsteigen!

Fragen?

Vielen Dank

Marko Bachl

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LITERATUR

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