PLOTTU – Identifying trending Topics

Based on Internet Search History

Aim of the Project

- User narrow down answers to questions often by using internet research
- Knowing the knowlegde gap can help to take action, e.g., trainings or team building
- Interesting topics can be identifyied by
  - search engine key words
  - keywords of HTML pages visited
  - keywords and phrases extracted from webpages visited

Proof of Concept Data Flow

Data Collection Scenario

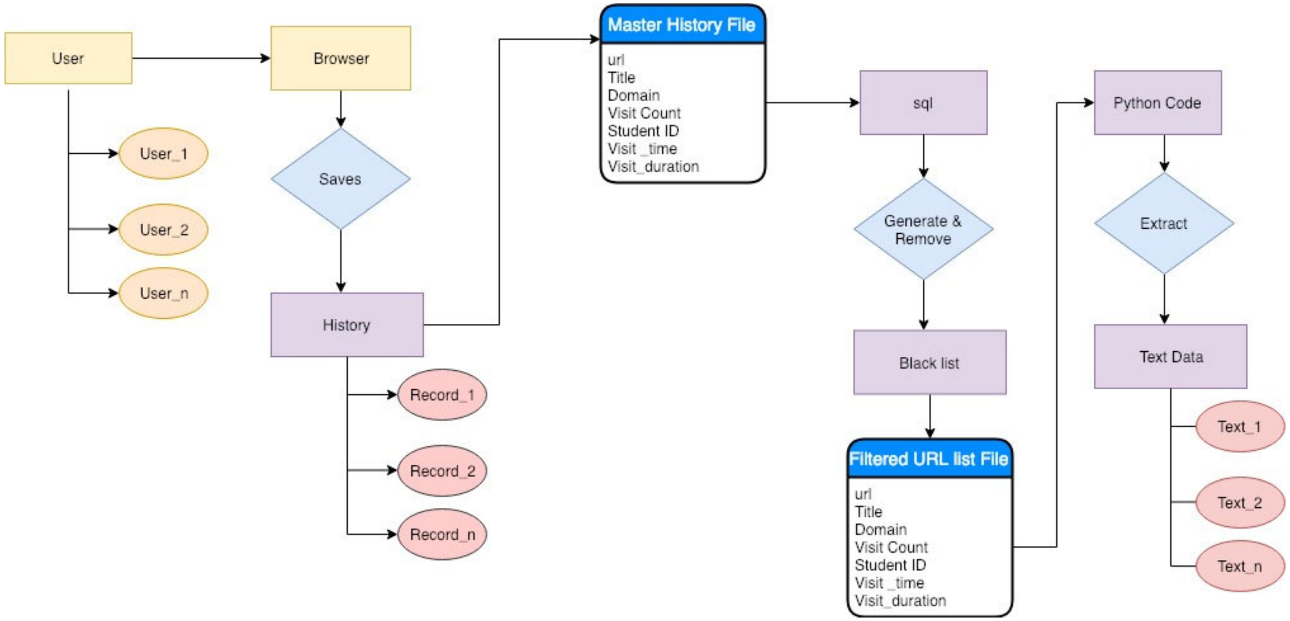
- no relevant downloads available
- students workgroup (n=34) with SPECIFIC data science question „How to assess a linear regression model?“
- Google search with Google Chorme browser
- duration approx. 15 minutes

Dataset reduction

- 104 queries extracted
- preprocessing and keyword analysis using Python

Proof of Concept Data Flow

- Data Flow Part 1



User

User_1

User_2

User_n

Browser

Saves

History

Record_1

Record_2

Record_n

Master History File

url
Title
Domain
Visit Count
Student ID
Visit _time
Visit_duration

sql

Generate & Remove

Black list

Filtered URL list File

url
Title
Domain
Visit Count
Student ID
Visit _time
Visit_duration

Python Code

Extract

Text Data

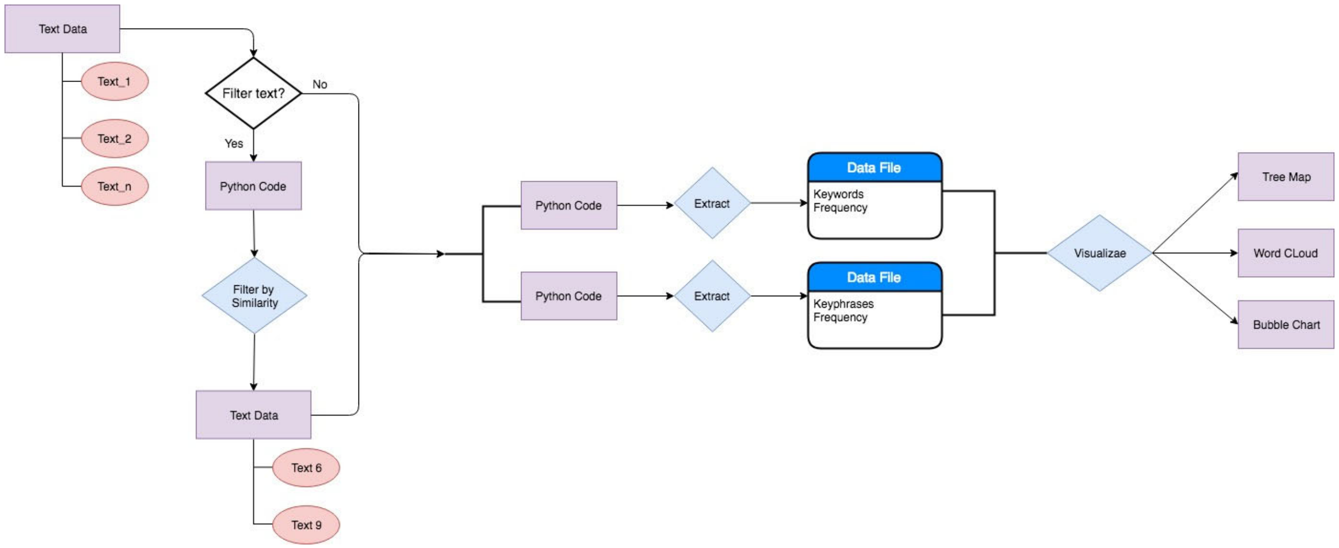
Text_1

Text_2

Text_n

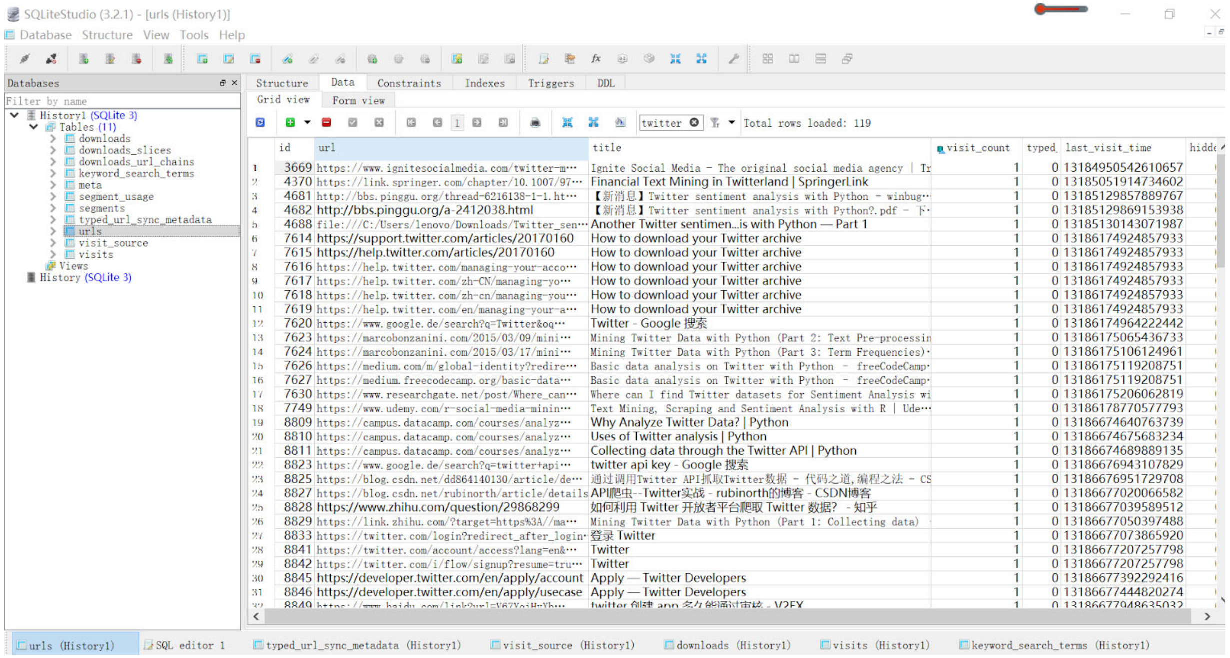
Proof of Concept Data Flow

- Data Flow Part 2



Steps to Analyse Data

Extracting Google Chrome Data



Total rows loaded: 119

	id	url	title	visit_count	typed	last_visit_time	hidde
1	3669	https://www.ignitesocialmedia.com/twitter-m…	Ignite Social Media - The original social media agency | Tr	1	0	13184950542610657	
2	4370	https://link.springer.com/chapter/10.1007/97…	Financial Text Mining in Twitterland | SpringerLink	1	0	13185051914734602	
3	4681	http://bbs.pinggu.org/thread-6216138-1-1.ht…	【新消息】Twitter sentiment analysis with Python - winbug…	1	0	13185129857889767	
4	4682	http://bbs.pinggu.org/a-2412038.html	【新消息】Twitter sentiment analysis with Python?.pdf - 下·	1	0	13185129869153938	
5	4688	file:///C:/Users/lenovo/Downloads/Twitter_sen…	Another Twitter sentimen...is with Python — Part 1	1	0	13185130143071987	
6	7614	https://support.twitter.com/articles/20170160	How to download your Twitter archive	1	0	13186174924857933	
7	7615	https://help.twitter.com/articles/20170160	How to download your Twitter archive	1	0	13186174924857933	
8	7616	https://help.twitter.com/managing-your-acco…	How to download your Twitter archive	1	0	13186174924857933	
9	7617	https://help.twitter.com/zh-CN/managing-yo…	How to download your Twitter archive	1	0	13186174924857933	
10	7618	https://help.twitter.com/zh-cn/managing-you…	How to download your Twitter archive	1	0	13186174924857933	
11	7619	https://help.twitter.com/en/managing-your-a…	How to download your Twitter archive	1	0	13186174924857933	
12	7620	https://www.google.de/search?q=Twitter&oq…	Twitter - Google 搜索	1	0	13186174964222442	
13	7623	https://marcobonzanini.com/2015/03/09/mini…	Mining Twitter Data with Python (Part 2: Text Pre-processin	1	0	13186175065436733	
14	7624	https://marcobonzanini.com/2015/03/17/mini…	Mining Twitter Data with Python (Part 3: Term Frequencies)·	1	0	13186175106124961	
15	7626	https://medium.com/m/global-identity?redire…	Basic data analysis on Twitter with Python - freeCodeCamp·	1	0	13186175119208751	
16	7627	https://medium.freecodecamp.org/basic-data…	Basic data analysis on Twitter with Python - freeCodeCamp·	1	0	13186175119208751	
17	7630	https://www.researchgate.net/post/Where_can…	Where can I find Twitter datasets for Sentiment Analysis wi	1	0	13186175206062819	
18	7749	https://www.udemy.com/r-social-media-minin…	Text Mining, Scraping and Sentiment Analysis with R | Ude…	1	0	13186178770577793	
19	8809	https://campus.datacamp.com/courses/analyz…	Why Analyze Twitter Data? | Python	1	0	13186674640763739	
20	8810	https://campus.datacamp.com/courses/analyz…	Uses of Twitter analysis | Python	1	0	13186674675683234	
21	8811	https://campus.datacamp.com/courses/analyz…	Collecting data through the Twitter API | Python	1	0	13186674689889135	
22	8823	https://www.google.de/search?q=twitter+api…	twitter api key - Google 搜索	1	0	13186676943107829	
23	8825	https://blog.csdn.net/dd864140130/article/de…	通过调用Twitter API抓取Twitter数据 - 代码之道,编程之法 - CS	1	0	13186676951729708	
24	8827	https://blog.csdn.net/rubinorth/article/details	API爬虫--Twitter实战 - rubinorth的博客 - CSDN博客	1	0	13186677020066582	
25	8828	https://www.zhihu.com/question/29868299	如何利用 Twitter 开放者平台爬取 Twitter 数据? - 知乎	1	0	13186677039589512	
26	8829	https://link.zhihu.com/?target=https%3A//ma…	Mining Twitter Data with Python (Part 1: Collecting data)	1	0	13186677050397488	
27	8833	https://twitter.com/login?redirect_after_login·	登录 Twitter	1	0	13186677073865920	
28	8841	https://twitter.com/account/access?lang=en&…	Twitter	1	0	13186677207257798	
29	8842	https://twitter.com/i/flow/signup?resume=tru…	Twitter	1	0	13186677207257798	
30	8845	https://developer.twitter.com/en/apply/account	Apply — Twitter Developers	1	0	13186677392292416	
31	8846	https://developer.twitter.com/en/apply/usecase	Apply — Twitter Developers	1	0	13186677444820274	
32	8849	https://www.baidu.com/link?url=V67YoiHvYh…	twitter 创建 app 多久能通过审核 - V2EX	1	0	13186677948635032	

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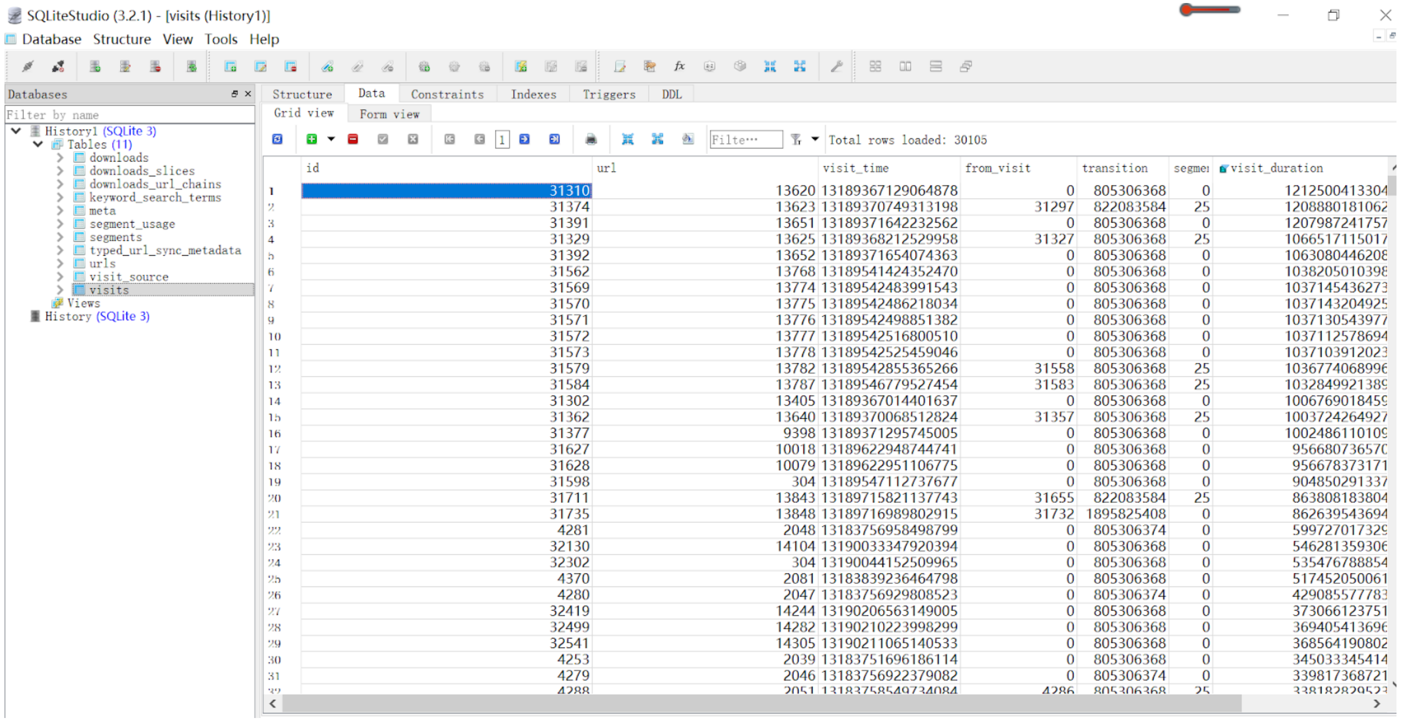
Steps to Analyse Data

Extracting Google Chrome Data

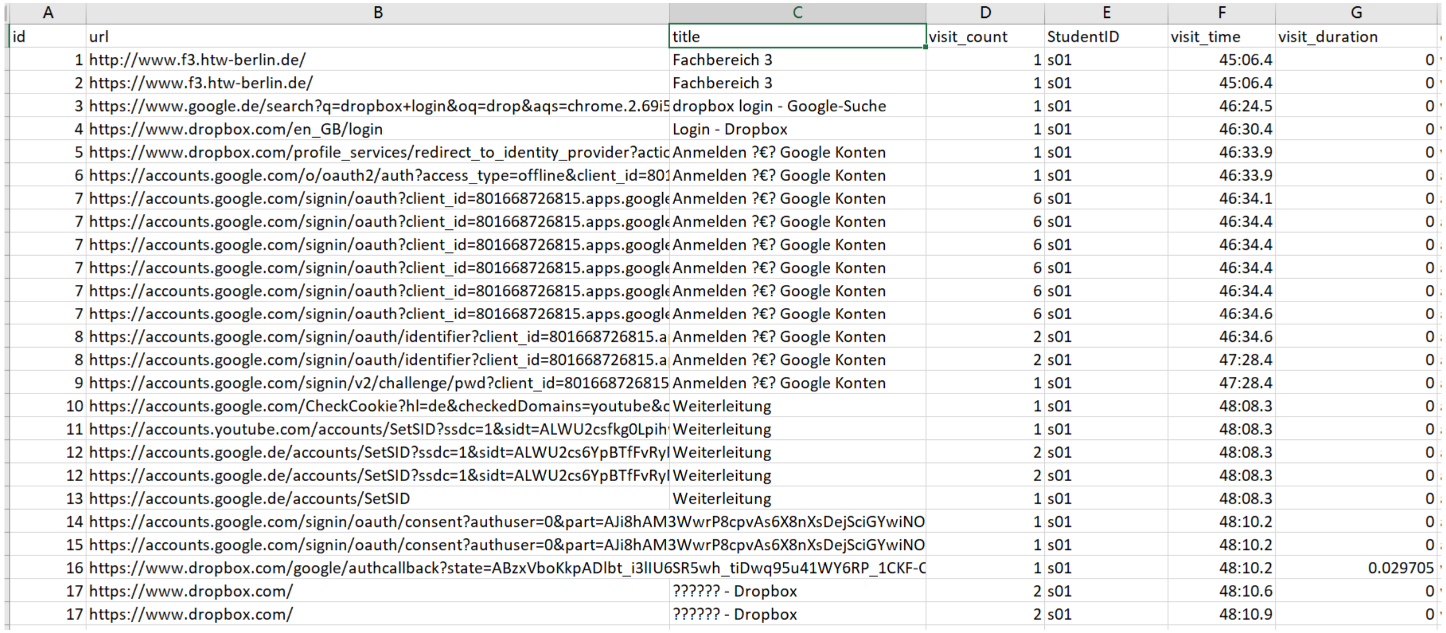


Total rows loaded: 30105

	id	url	visit_time	from_visit	transition	segme	visit_duration
1	31310	13620	13189367129064878	0	805306368	0	1212500413304
2	31374	13623	13189370749313198	31297	822083584	25	1208880181062
3	31391	13651	13189371642232562	0	805306368	0	1207987241757
4	31329	13625	13189368212529958	31327	805306368	25	1066517115017
5	31392	13652	13189371654074363	0	805306368	0	1063080446208
6	31562	13768	13189541424352470	0	805306368	0	1038205010398
7	31569	13774	13189542483991543	0	805306368	0	1037145436273
8	31570	13775	13189542486218034	0	805306368	0	1037143204925
9	31571	13776	13189542498851382	0	805306368	0	1037130543977
10	31572	13777	13189542516800510	0	805306368	0	1037112578694
11	31573	13778	13189542525459046	0	805306368	0	1037103912023
12	31579	13782	13189542855365266	31558	805306368	25	1036774068996
13	31584	13787	13189546779527454	31583	805306368	25	1032849921389
14	31302	13405	13189367014401637	0	805306368	0	1006769018459
15	31362	13640	13189370068512824	31357	805306368	25	1003724264927
16	31377	9398	13189371295745005	0	805306368	0	1002486110109
17	31627	10018	13189622948744741	0	805306368	0	956680736570
18	31628	10079	13189622951106775	0	805306368	0	956678373171
19	31598	304	13189547112737677	0	805306368	0	904850291337
20	31711	13843	13189715821137743	31655	822083584	25	863808183804
21	31735	13848	13189716989802915	31732	1895825408	0	862639543694
22	4281	2048	13183756958498799	0	805306374	0	599727017329
23	32130	14104	13190033347920394	0	805306368	0	546281359306
24	32302	304	13190044152509965	0	805306368	0	535476788854
25	4370	2081	13183839236464798	0	805306368	0	517452050061
26	4280	2047	13183756929808523	0	805306374	0	429085577783
27	32419	14244	13190206563149005	0	805306368	0	373066123751
28	32499	14282	13190210223998299	0	805306368	0	369405413696
29	32541	14305	13190211065140533	0	805306368	0	368564190802
30	4253	2039	13183751696186114	0	805306368	0	345033345414
31	4279	2046	13183756922379082	0	805306374	0	339817368721
32	4288	2051	13183758549734084	4286	805306368	25	338182829523

Steps to Analyse Data

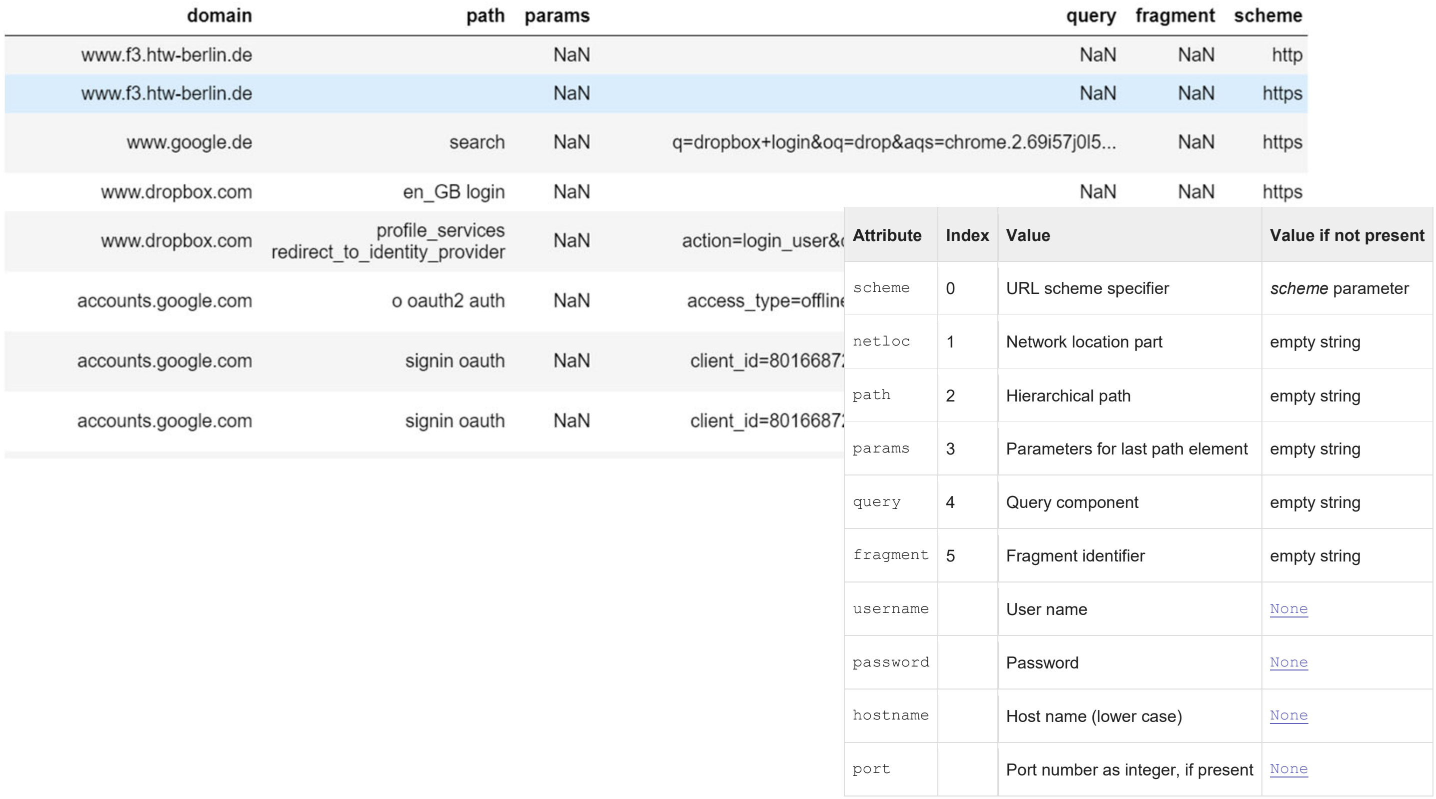
Extracting Google Chrome Data



id	url	title	visit_count	StudentID	visit_time	visit_duration
1	http://www.f3.htw-berlin.de/	Fachbereich 3	1	s01	45:06.4	0
2	https://www.f3.htw-berlin.de/	Fachbereich 3	1	s01	45:06.4	0
3	https://www.google.de/search?q=dropbox+login&oq=drop&aqs=chrome.2.69i5	dropbox login - Google-Suche	1	s01	46:24.5	0
4	https://www.dropbox.com/en_GB/login	Login - Dropbox	1	s01	46:30.4	0
5	https://www.dropbox.com/profile_services/redirect_to_identity_provider?actic	Anmelden ?€? Google Konten	1	s01	46:33.9	0
6	https://accounts.google.com/o/oauth2/auth?access_type=offline&client_id=801	Anmelden ?€? Google Konten	1	s01	46:33.9	0
7	https://accounts.google.com/signin/oauth?client_id=801668726815.apps.googl	Anmelden ?€? Google Konten	6	s01	46:34.1	0
7	https://accounts.google.com/signin/oauth?client_id=801668726815.apps.googl	Anmelden ?€? Google Konten	6	s01	46:34.4	0
7	https://accounts.google.com/signin/oauth?client_id=801668726815.apps.googl	Anmelden ?€? Google Konten	6	s01	46:34.4	0
7	https://accounts.google.com/signin/oauth?client_id=801668726815.apps.googl	Anmelden ?€? Google Konten	6	s01	46:34.4	0
7	https://accounts.google.com/signin/oauth?client_id=801668726815.apps.googl	Anmelden ?€? Google Konten	6	s01	46:34.4	0
7	https://accounts.google.com/signin/oauth?client_id=801668726815.apps.googl	Anmelden ?€? Google Konten	6	s01	46:34.6	0
8	https://accounts.google.com/signin/oauth/identifier?client_id=801668726815.a	Anmelden ?€? Google Konten	2	s01	46:34.6	0
8	https://accounts.google.com/signin/oauth/identifier?client_id=801668726815.a	Anmelden ?€? Google Konten	2	s01	47:28.4	0
9	https://accounts.google.com/signin/v2/challenge/pwd?client_id=801668726815	Anmelden ?€? Google Konten	1	s01	47:28.4	0
10	https://accounts.google.com/CheckCookie?hl=de&checkedDomains=youtube&c	Weiterleitung	1	s01	48:08.3	0
11	https://accounts.youtube.com/accounts/SetSID?ssdc=1&sidt=ALWU2csfkg0Lpih	Weiterleitung	1	s01	48:08.3	0
12	https://accounts.google.de/accounts/SetSID?ssdc=1&sidt=ALWU2cs6YpBTfFvRyl	Weiterleitung	2	s01	48:08.3	0
12	https://accounts.google.de/accounts/SetSID?ssdc=1&sidt=ALWU2cs6YpBTfFvRyl	Weiterleitung	2	s01	48:08.3	0
13	https://accounts.google.de/accounts/SetSID	Weiterleitung	1	s01	48:08.3	0
14	https://accounts.google.com/signin/oauth/consent?authuser=0&part=AJi8hAM3WwrP8cpvAs6X8nXsDejSciGYwiNO		1	s01	48:10.2	0
15	https://accounts.google.com/signin/oauth/consent?authuser=0&part=AJi8hAM3WwrP8cpvAs6X8nXsDejSciGYwiNO		1	s01	48:10.2	0
16	https://www.dropbox.com/google/authcallback?state=ABzxVboKkpADlbt_i3lIU6SR5wh_tiDwq95u41WY6RP_1CKF-C		1	s01	48:10.2	0.029705
17	https://www.dropbox.com/	?????? - Dropbox	2	s01	48:10.6	0
17	https://www.dropbox.com/	?????? - Dropbox	2	s01	48:10.9	0

Steps to Analyse Data

Extracting Google Chrome Data

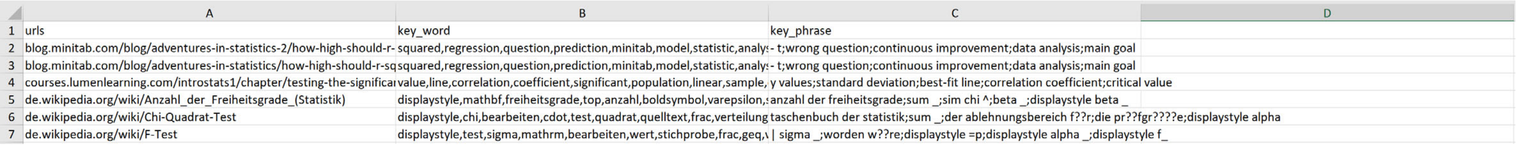


domain	path	params	query	fragment	scheme
www.f3.htw-berlin.de		NaN	NaN	NaN	http
www.f3.htw-berlin.de		NaN	NaN	NaN	https
www.google.de	search	NaN	q=dropbox+login&oq=drop&aqs=chrome.2.69i57j0l5...	NaN	https
www.dropbox.com	en_GB login	NaN	NaN	NaN	https
www.dropbox.com	profile_services redirect_to_identity_provider	NaN	action=login_user&		
accounts.google.com	o oauth2 auth	NaN	access_type=offline		
accounts.google.com	signin oauth	NaN	client_id=8016687		
accounts.google.com	signin oauth	NaN	client_id=8016687		

Attribute	Index	Value	Value if not present
scheme	0	URL scheme specifier	*scheme* parameter
netloc	1	Network location part	empty string
path	2	Hierarchical path	empty string
params	3	Parameters for last path element	empty string
query	4	Query component	empty string
fragment	5	Fragment identifier	empty string
username		User name	None
password		Password	None
hostname		Host name (lower case)	None
port		Port number as integer, if present	None

Extracted Relevant Content

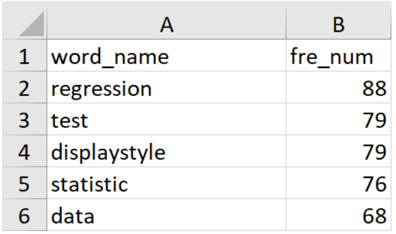
Result of Python scripts:



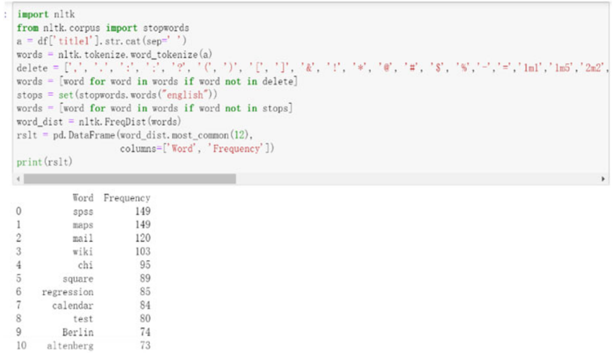
	A	B	C	D
1	urls	key_word	key_phrase	
2	blog.minitab.com/blog/adventures-in-statistics-2/how-high-should-r-	squared,regression,question,prediction,minitab,model,statistic,analy:	- t;wrong question;continuous improvement;data analysis;main goal	
3	blog.minitab.com/blog/adventures-in-statistics/how-high-should-r-sq	squared,regression,question,prediction,minitab,model,statistic,analy:	- t;wrong question;continuous improvement;data analysis;main goal	
4	courses.lumenlearning.com/introstats1/chapter/testing-the-significai	value,line,correlation,coefficient,significant,population,linear,sample,	y values;standard deviation;best-fit line;correlation coefficient;critical value	
5	de.wikipedia.org/wiki/Anzahl_der_Freiheitsgrade_(Statistik)	displaystyle,mathbf,freiheitsgrade,top,anzahl,boldsymbol,varepsilon,:	anzahl der freiheitsgrade;sum _;sim chi ^;beta _;displaystyle beta _	
6	de.wikipedia.org/wiki/Chi-Quadrat-Test	displaystyle,chi,bearbeiten,cdot,test,quadrat,quelltext,frac,verteilung	taschenbuch der statistik;sum _;der ablehnungsbereich f??r;die pr??fgr????e;displaystyle alpha	
7	de.wikipedia.org/wiki/F-Test	displaystyle,test,sigma,mathrm,bearbeiten,wert,stichprobe,frac,geq,\	| sigma _;worden w??re;displaystyle =p;displaystyle alpha _;displaystyle f_	

Extracted Data:

- frequency of keywords -> word cloud
- key word -> related key phrase



	A	B
1	word_name	fre_num
2	regression	88
3	test	79
4	displaystyle	79
5	statistic	76
6	data	68

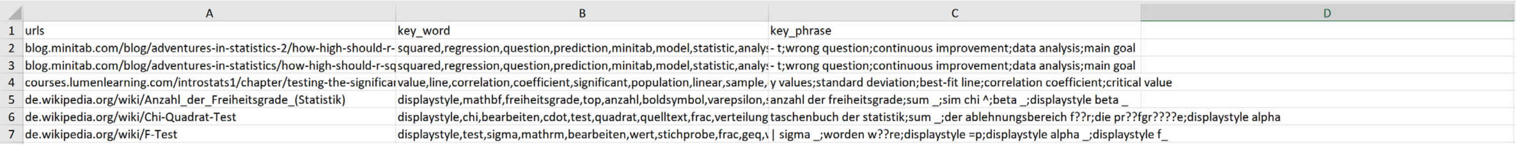


```
import nltk
from nltk.corpus import stopwords
a = df['title1'].str.cat(sep=' ')
words = nltk.tokenize.word_tokenize(a)
delete = [',', '.', ':', ';', '?', '(', ')', '[', ']', '&', '!', '*', '@', '#', '$', '%','-','=','1m1','1m5','2m2',
words = [word for word in words if word not in delete]
stops = set(stopwords.words("english"))
words = [word for word in words if word not in stops]
word_dist = nltk.FreqDist(words)
rslt = pd.DataFrame(word_dist.most_common(12),
                    columns=['Word', 'Frequency'])
print(rslt)
```

```
          Word  Frequency
0         spss        149
1         maps        149
2         mail        120
3         wiki        103
4          chi         95
5       square         89
6   regression         85
7     calendar         84
8         test         80
9       Berlin         74
10  altenberg          73
```

Extracted Relevant Content

Result of Python scripts:



	A	B	C	D
1	urls	key_word	key_phrase	
2	blog.minitab.com/blog/adventures-in-statistics-2/how-high-should-r-	squared,regression,question,prediction,minitab,model,statistic,analy:	- t;wrong question;continuous improvement;data analysis;main goal	
3	blog.minitab.com/blog/adventures-in-statistics/how-high-should-r-sq	squared,regression,question,prediction,minitab,model,statistic,analy:	- t;wrong question;continuous improvement;data analysis;main goal	
4	courses.lumenlearning.com/introstats1/chapter/testing-the-significai	value,line,correlation,coefficient,significant,population,linear,sample,	y values;standard deviation;best-fit line;correlation coefficient;critical value	
5	de.wikipedia.org/wiki/Anzahl_der_Freiheitsgrade_(Statistik)	displaystyle,mathbf,freiheitsgrade,top,anzahl,boldsymbol,varepsilon,:	anzahl der freiheitsgrade;sum _;sim chi ^;beta _;displaystyle beta _	
6	de.wikipedia.org/wiki/Chi-Quadrat-Test	displaystyle,chi,bearbeiten,cdot,test,quadrat,quelltext,frac,verteilung	taschenbuch der statistik;sum _;der ablehnungsbereich f??r;die pr??fgr????e;displaystyle alpha	
7	de.wikipedia.org/wiki/F-Test	displaystyle,test,sigma,mathrm,bearbeiten,wert,stichprobe,frac,geq,\	| sigma _;worden w??re;displaystyle =p;displaystyle alpha _;displaystyle f_	

Extracted Data:

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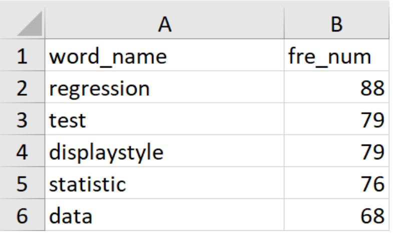

	A	B
1	word_name	fre_num
2	regression	88
3	test	79
4	displaystyle	79
5	statistic	76
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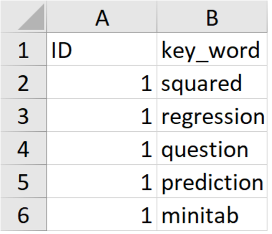
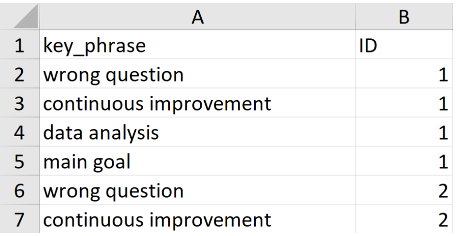
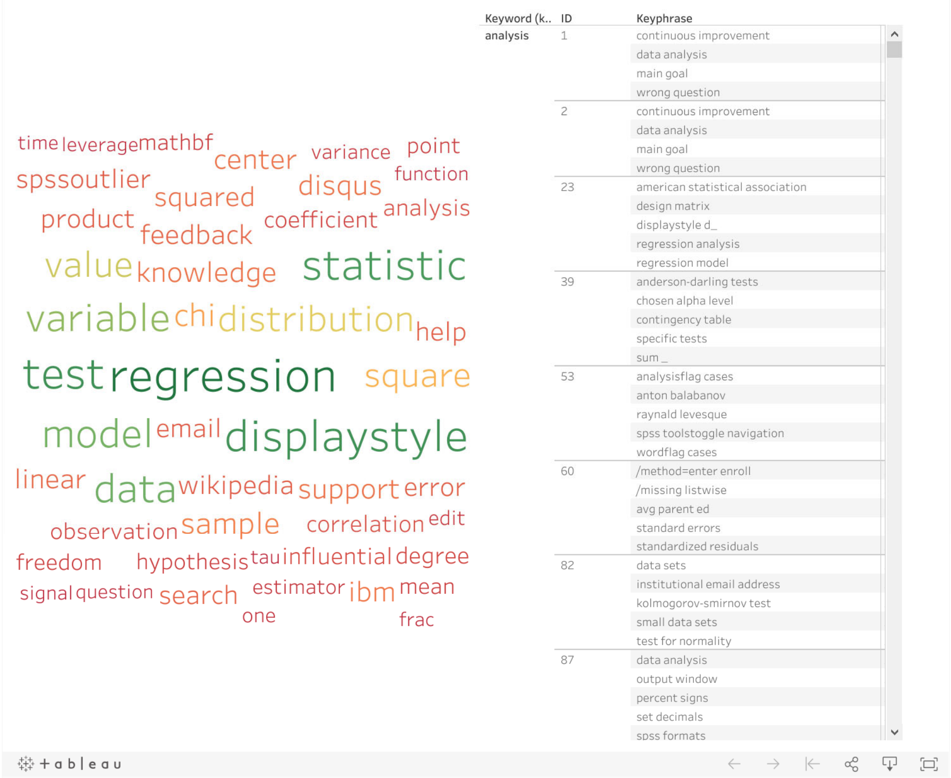


	A	B
1	ID	key_word
2	1	squared
3	1	regression
4	1	question
5	1	prediction
6	1	minitab



	A	B
1	key_phrase	ID
2	wrong question	1
3	continuous improvement	1
4	data analysis	1
5	main goal	1
6	wrong question	2
7	continuous improvement	2

Identifying Trending Topics - VISUALIZATION


time leverage mathbf center variance point
spssoutlier squared disqus function
product feedback coefficient analysis
value knowledge statistic
variable chi distribution help
test regression square
model email displaystyle
linear data wikipedia support error
observation sample correlation edit
freedom hypothesis tau influential degree
signal question search estimator ibm mean
one frac
tableau

Keyword (k..	ID	Keyphrase
analysis	1	continuous improvement
		data analysis
		main goal
		wrong question
	2	continuous improvement
		data analysis
		main goal
		wrong question
	23	american statistical association
		design matrix
		displaystyle d_
		regression analysis
		regression model
	39	anderson-darling tests
		chosen alpha level
		contingency table
		specific tests
		sum _
	53	analysisflag cases
		anton balabanov
		raynald levesque
		spss toolstoggle navigation
		wordflag cases
	60	/method=enter enroll
		/missing listwise
		avg parent ed
		standard errors
		standardized residuals
	82	data sets
		institutional email address
		kolmogorov-smirnov test
		small data sets
		test for normality
	87	data analysis
		output window
		percent signs
		set decimals
		spss formats

https://public.tableau.com/profile/anuj.dixit#!/vizhome/shared/J7PW25C8G

Further Improvements

Possible improvements

- implementing a black list of pages visited helps to block not relevant content, e.g., weather, news pages, ...
- company structure can provide additional context:
  searches based on department structure or job descriptions should be similar
- After tracking down certain content, similarity between pages can help to provide relevant similar pages to look at
- Twitter introduced also an algorithm to identify trending topics.
  - Get trends near a location
  - Get locations with trending topics
  - Basically the algorithms works as follows:
    - extract keywords
    - determine the number of occurrences in tweeds
    - number of occurrences -> time series
    - if slope in time series is large -> arising / trending topic