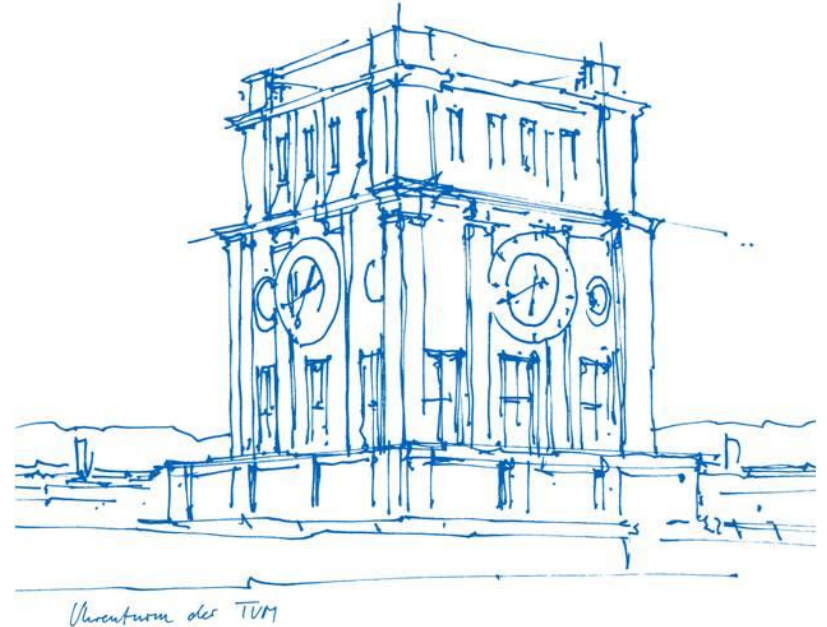


CementHub

Science Hack – Final Presentation

Aaron, Martin, Quirin, Thomas

Data Science for Sustainable Construction Materials



Climate change is the biggest challenge of the 21st century

- Climate change is mainly caused by CO₂
- Concrete production accounts for 8% of world's CO₂ emissions
- Research towards sustainable concrete production
- Scientific data is often stored in multiple Excel files
- Different formats hamper data analytics
- Consistent data drives research forward



- Dozens of Excel files
- Not searchable or filterable
- Different formats and units
- Data analysis impossible

Introducing CementHub

- Responsive web application
- Simple user-friendly UI
- Data organization and filtering
- Enforcing consistent data format
- User Authentication

CementHub

Login

Username:

Password:

Login

[Lost password?](#)

CementHub

Logged in as: aaron

Experiments

Upload

Logout

All Experiments

Filters

Actions	Date Time	Coworker	Lab Journal Code	Cement ID	Cement Name	Clinker Factor	Cement amount (g)	Water amount (g)	W/C	Additional Material 1	Additional Material 1 (g)	Additional Material 2	Additional Material 2 (g)	Additional Parameter
<div>View details</div> <div>Export CSV</div>	04/16/2021 16:49	LAT	LAC_CAL002	LAC_SS001SU02	SynCem	0.69	4.0	2.0	0.5	—	—	—	—	—
<div>View details</div> <div>Export CSV</div>	01/03/2021 19:45	WAT	WAT_CAL021	CEM_1	CEM I	0.69	4.0	2.0	0.5	PCE021	0.2	—	—	—
<div>View details</div> <div>Export CSV</div>	04/29/2015 11:11	Alisa Machner	20150429_C-D-MK-1%\$	60C20D20M	CEMI+40\$Dolomite+20%MK	0.69	3.963	1.783	0.45	Dolomite (Brenntag)	0.792	MK (Metastar 501)	0.792	—

Export selection

Seamless data upload

- Edit data labels on the fly to guarantee a consistent structure
- Convert units to a standardized format
- Organize metadata

CementHub Logged in as: joe Experiments Upload Logout

Select columns

Please select the heatflow and time columns

Time	Temperature [AmbientT (Therm3T)]	Temperature [Temperature]	Heat flow [Signal]	Heat [Signal]	Normalized heat flow [Signal]	Normalized heat [Signal]	Time markers
-	-	-	-	-	-	-	-
x1	x1	x1	x1	x1	x1	x1	x1
-4731.51590824127	19.3190428398275	20.0015298402863	-0.00000126775416703988	nan	-0.000000422584722346627	nan	nan
-4718.67215824127	19.2655531728177	20.0012978067992	-0.00000121096268387632	nan	-0.000000403654227958775	nan	nan
-4699.28153324127	19.1847980916022	20.000947498335	-0.00000133019850793882	nan	-0.000000443399502646274	nan	nan
-4685.43094730377	19.1271153097287	20.0008959201842	-0.00000122401008141751	nan	-0.000000408003360472502	nan	nan
-4671.58036136627	19.0694325278553	20.0008804103574	-0.0000011782165489619	nan	-0.000000372607218298729	nan	nan

Submit

CementHub Logged in as: joe Experiments Upload Logout

Add metadata

Date (mm/dd/yyyy)*:

04/28/2021

Time (h:mm):

Cooperator*:

Alisa Machner

Lab Journal Code*:

20181129_CEMH-S-LL_wc08_Vortex#2

Cement ID*:

EDC-CEMH-D

Cement Name*:

CEM (C-M (S-LL))

Clicker Factor*:

0.5

Cement amount [g]*:

4.000

From data to value

- Data visualization for quick overview
- Connect data to Apache Zeppelin, Jupyter Notebooks and many more
- Export as plain CSV

Zeppelin Notebook Job

Jupyter Demo

```

python,python
import pandas as pd
df = pd.read_csv('http://135.125.219.68:8080/cementhub/experiment/export/2')
df
  
```

	Time	Temperature	Heat flow	Heat	Normalized heat flow	Normalized heat	Time markers
0	-2825.622264	20	NaN	NaN	NaN	NaN	NaN
1	-2825.109154	20	-0.000003	NaN	-7.846946e-07	NaN	NaN
2	-2808.923607	20	-0.000003	NaN	-8.361301e-07	NaN	NaN
3	-2783.609154	20	-0.000004	NaN	-8.939459e-07	NaN	NaN
4	-2776.601342	20	-0.000003	NaN	-7.704543e-07	NaN	NaN

CementHub Logged in as: aaron Experiments Upload Logout

Experiment Detail

Date (mm/dd/yyyy)* Jan. 3, 2021
 Time (hh:mm) 7:45 p.m.
 Coworker* WAT
 Lab Journal Code* WAT_CAL021
 Cement ID* CEM_1
 Cement Name* CEM 1
 Clinker Factor* 0.69
 Cement amount (g)* 4.0
 Water amount (g)* 2.0
 W/C* 0.5
 Additional Material 1 PCE021
 Additional Material 1 (g) 0.2
 Additional Material 2 None
 Additional Material 2 (g) None
 Additional Parameter None
 Additional Parameter (value) None
 Temperature (°C)* 20.0
 Instrument ID* TAMAir_old
 Mixing Time (s)* 130
 Mixing Protocol* in_situ_2
 File WAT_CAL021_woWm5Cr.csv

Heat flow (W)

Time (s)

WAT_CAL021_woWm5Cr.csv

```

python,python
matplotlib,matplotlib
import matplotlib.pyplot as plt
plt.plot(df['Time'], df['Heat Flow'])
[matplotlib.lines.Line2D at 0x7effb8cb69b0]
  
```

Heat flow (W)

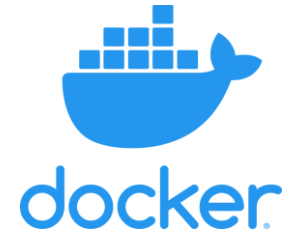
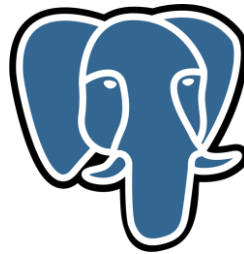
Time (s)

Took 0 sec. Last updated by anonymous at April 25 2021, 12:25:47 PM.

Behind the magic



pandas



Try It



CementHub:

<http://135.125.219.68:8000/cementhub/>

user: joe password: cementhub



Apache Zeppelin:

<http://135.125.219.68:8080>

open “Jupyter Demo” notebook