Agenda for the week

	PulseOx Dataset
	Your own Project

Day	**Goals**	**Materials**
Monday	- How to navigate MIMIC and BigQuery - Explore the Pulse Oximetry dataset	Pulling Data Workshop RMarkdown: *Introduction*
Tuesday	- Build a study cohort for Pulse Oximetry - Explore the data distributions	RMarkdown: *Cohort* RMarkdown: *Tableone*
Wednesday	- Dive into your own project! - Define the question, dataset, cohort	Build you own RMarkdown!
Thursday	- Explore data distributions - Prepare the final presentation	Build you own RMarkdown!
Friday	- Final Presentations	Slide Deck

Please address this questions in your presentation, 1 minute each

- Problem definition: Specifically, how would the model improve patient outcomes?

- What **database** are you going to use? Please identify potential issues with the database. How did patients get into the database? Who got excluded?

- Inclusion and **exclusion** criteria: Consider sampling selection bias that can seep into the study design as a result of these criteria.

- List of **features** and their definition: Consider bias with the use of these features and their definition.

- Outcome or event of interest: How is this defined? Consider bias in how the outcome or the event of interest is defined.

- Evaluation of in silico model performance How will the model be incorporated in practice? Any unintended consequence of the algorithm when employed.

pulling **data**, not teeth

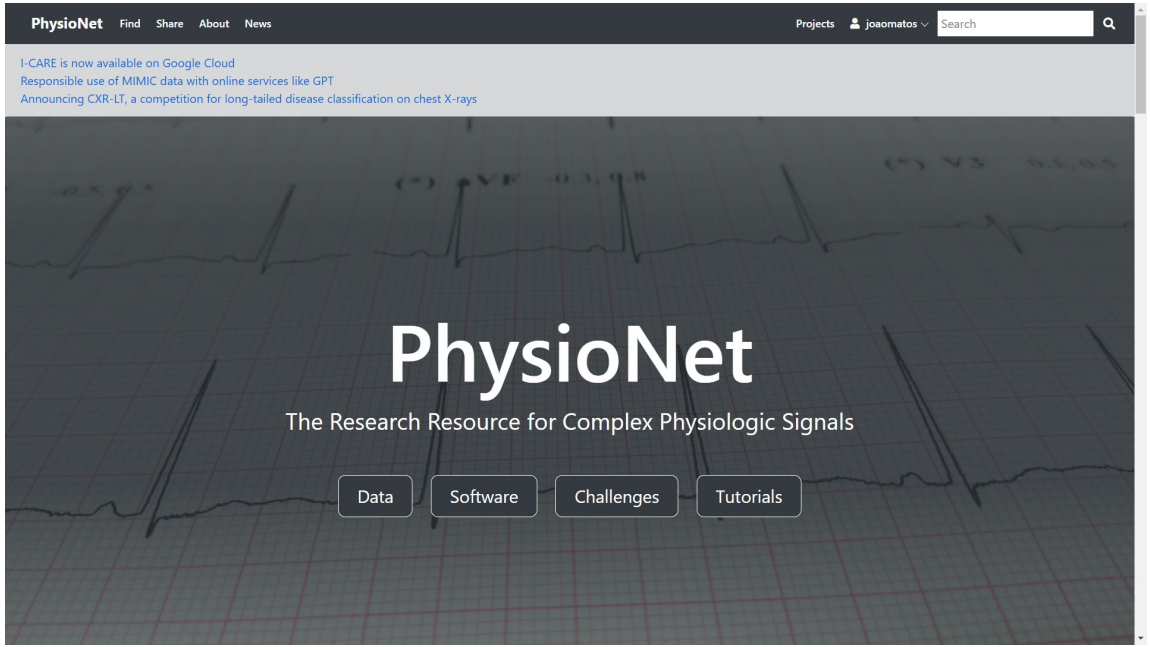
João Matos, Aug 14th 2023

How to navigate MIMIC and BigQuery – 101

Why a workshop on something upstream to Data Science?

- MIMIC is really well constructed
- Several groups across the world are following its schema / rationale
- You may come across different databases similar to MIMIC
- Data Science starts before a ***data <- read.csv("path")***
- You will need to navigate through complex databases to answer your research questions in the future
- Understanding the data is 95% of a ML task, and most biases are probably encoded in the Data Engineering step of the process

MIMIC-IV is shared on PhysioNet



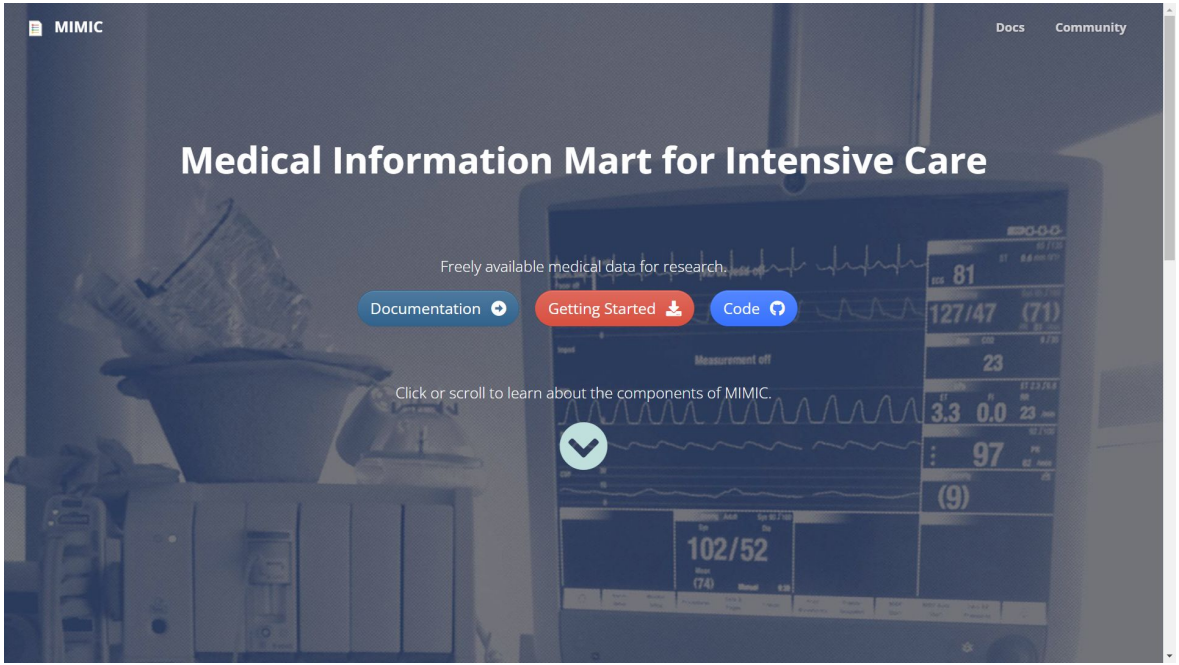
https://physionet.org/

The databases in PhysioNet contain real patient data

- Data has been de-identified
- Users must be credentialed and have a reference
- CITI training must be taken
- A data use agreement must be signed for each dataset

Checkpoint:
has everyone completed credentialing and the CITI training?

MIMIC-IV has a web page with detailed information



https://mimic.mit.edu/

How to get PhysioNet data on BigQuery

A) Add a GMAIL email to PhysioNet in “Emails “and select it in “Cloud Details”

B) “Request access using Google BigQuery” in the dataset page

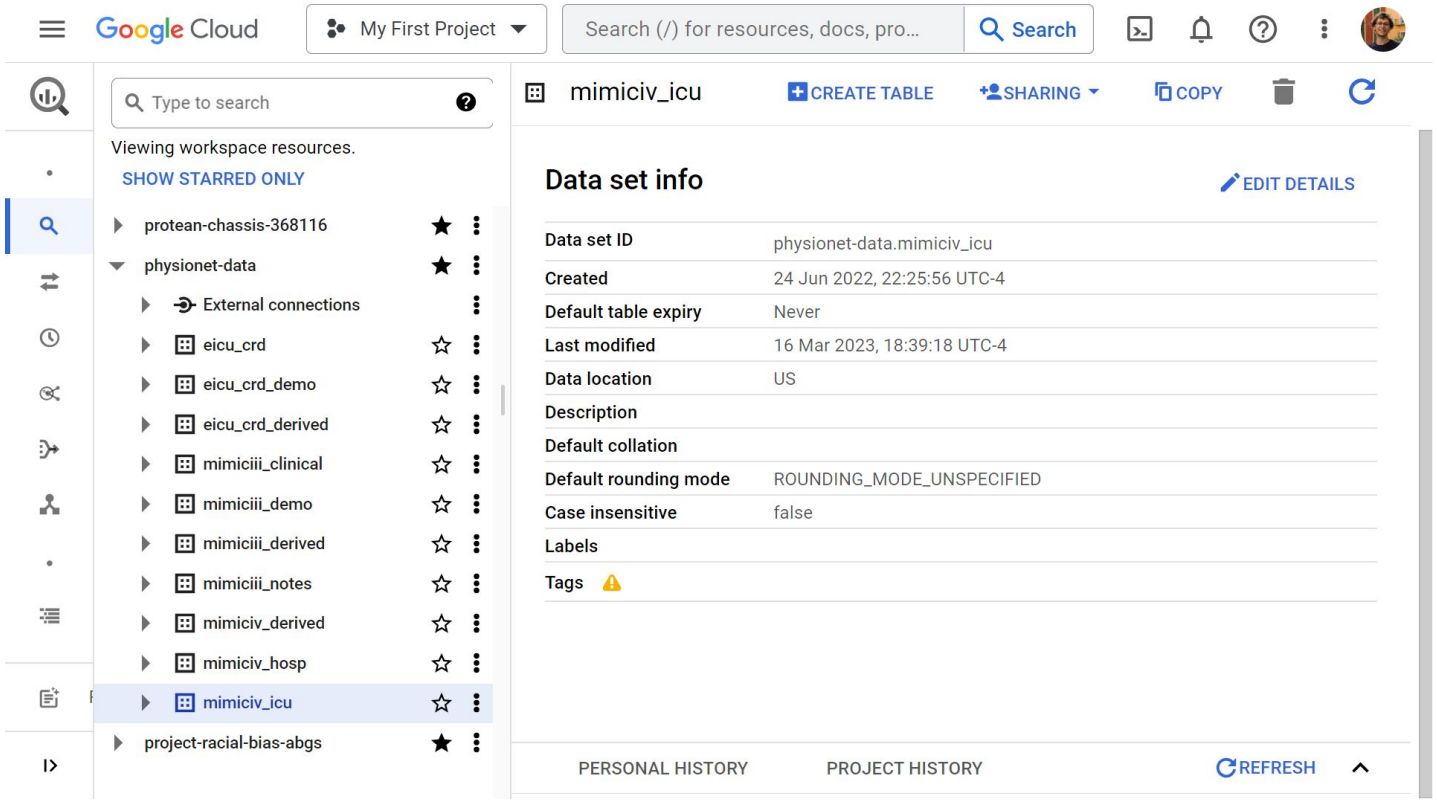
C) Go to your GMAIL inbox and follow instructions:

   a) Navigate to: https://console.cloud.google.com/bigquery

   b) Click the "+ADD DATA" button

   c) Select "Star a project by name", then enter "physionet-data".

BigQuery is a convenient way of navigating MIMIC



Checkpoint:
has everyone set BigQuery up?

The MIMIC Code Repository has open-source code to crowdsource the process of curating the data

JOURNAL ARTICLE

The MIMIC Code Repository: enabling reproducibility in critical care research

Alistair E W Johnson, David J Stone, Leo A Celi, Tom J Pollard

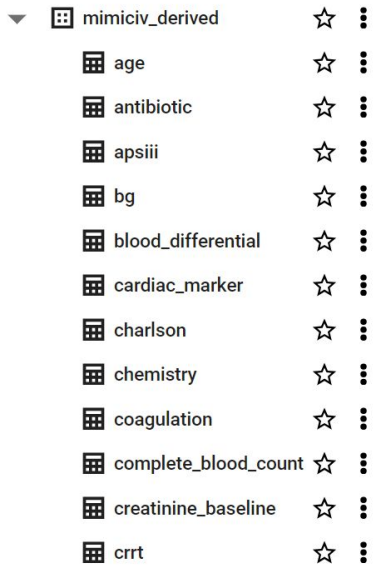
Journal of the American Medical Informatics Association, Volume 25, Issue 1, January 2018, Pages 32–39, https://doi.org/10.1093/jamia/ocx084

Published: 27 September 2017 **Article history** ▾

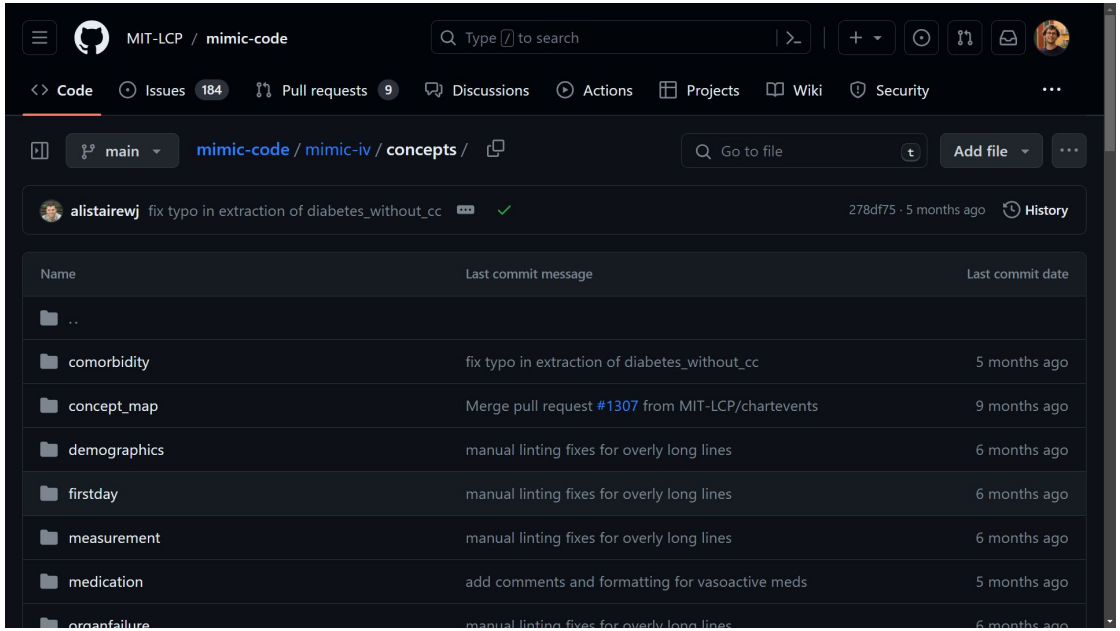
https://academic.oup.com/jamia/article/25/1/32/4259424

No one starts from scratch as there are derived tables

Findable on BigQuery

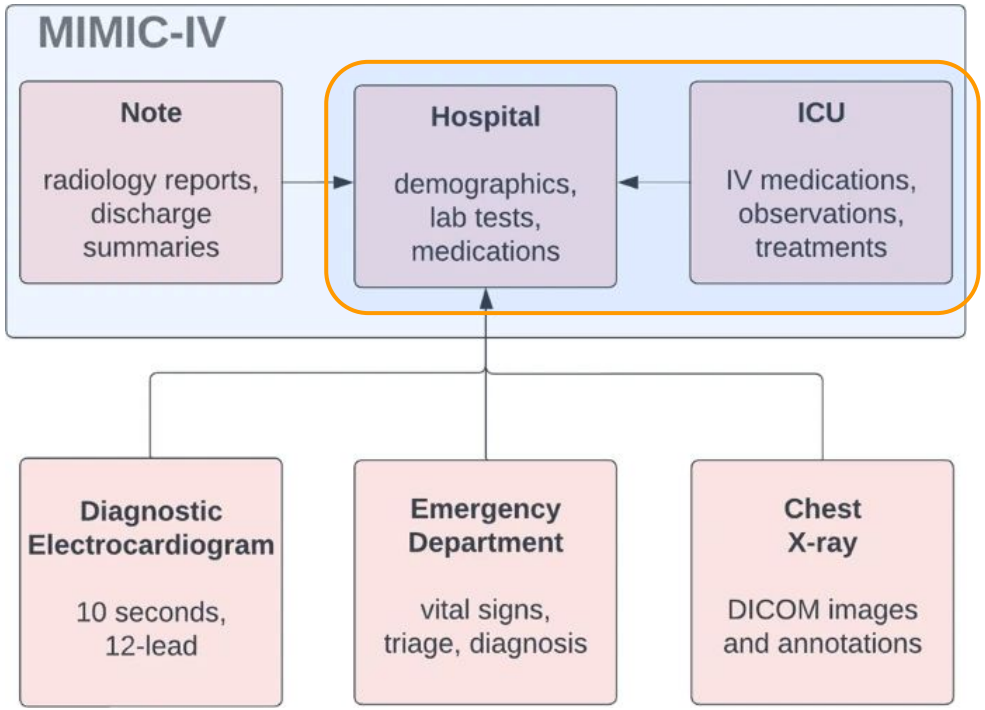


With the SQL code that generated them on GitHub



https://github.com/MIT-LCP/mimic-code/tree/main/mimic-iv/concepts

MIMIC-IV has several modules, we'll be looking at two



https://www.nature.com/articles/s41597-022-01899-x

Live Coding:
let’s extract ICU stays and patient information on race and gender

Possible solution

```sql
SELECT
    icu.subject_id
  , icu.hadm_id
  , icu.intime
  , icu.outtime
  , adm.race
  , pat.gender

FROM `physionet-data.mimiciv_icu.icustays`AS icu

LEFT JOIN `physionet-data.mimiciv_hosp.admissions` AS adm
ON icu.hadm_id = adm.hadm_id

LEFT JOIN `physionet-data.mimiciv_hosp.patients` AS pat
ON icu.subject_id = pat.subject_id
```

1 – 50 of 73181

Live Coding:
let’s extract patients who are, e.g,
Female and Native American

Possible solution

```
SELECT *
FROM `physionet-data.mimiciv_derived.icustay_detail`
WHERE gender = "F"
AND LOWER(race) LIKE "%native%"
```

Results per page: 50 ▾ 1 – 50 of 111

Live Coding:
let’s extract transfusion data

Possible solution

```
SELECT label, itemid
FROM `physionet-data.mimiciv_icu.d_items`
WHERE LOWER(label) LIKE "%red blood cell%"
```

Query results

JOB INFORMATION | RESULTS | JSON | EXEC

Row	label	itemid
1	Packed Red Blood Cells	225168

```
SELECT
    stay_id
  , SUM(amount) AS total_amount
FROM `physionet-data.mimiciv_icu.inputevents`
WHERE itemid = 225168
GROUP BY stay_id
```

Query results

JOB INFORMATION | RESULTS | JS

Row	stay_id	total_amount
1	38337741	1000.000026...
2	39791680	1725.0
3	31946853	374.9999866...
4	33410078	2475.000010...
5	37771327	6524.000065...
6	32944882	425.0

This week, we will be working with a derived dataset

Challenge | Credentialed Access

MIT Critical Datathon 2023: a MIMIC-IV Derived Dataset for Pulse Oximetry Correction Models

João Matos, Tristan Struja, David S Restrepo, Luis Filipe Nakayama, Jack Gallifant, Luca Weishaupt, Nikita Mullangi, Maria Loureiro, Skyler Shapiro, Adrien Carrel, Leo Anthony Celi

Published: May 8, 2023. Version: 1.0.0

When using this resource, please cite: (show more options)
Matos, J., Struja, T., Restrepo, D. S., Nakayama, L. F., Gallifant, J., Weishaupt, L., Mullangi, N., Loureiro, M., Shapiro, S., Carrel, A., & Celi, L. A. (2023). MIT Critical Datathon 2023: a MIMIC-IV Derived Dataset for Pulse Oximetry Correction Models (version 1.0.0). *PhysioNet*. https://doi.org/10.13026/jfpc-pz79.

Please include the standard citation for PhysioNet: (show more options)
Goldberger, A., Amaral, L., Glass, L., Hausdorff, J., Ivanov, P. C., Mark, R., ... & Stanley, H. E. (2000). PhysioBank, PhysioToolkit, and PhysioNet: Components of a new research resource for complex physiologic signals. Circulation [Online]. 101 (23), pp. e215–e220.

Contents

Parent Projects

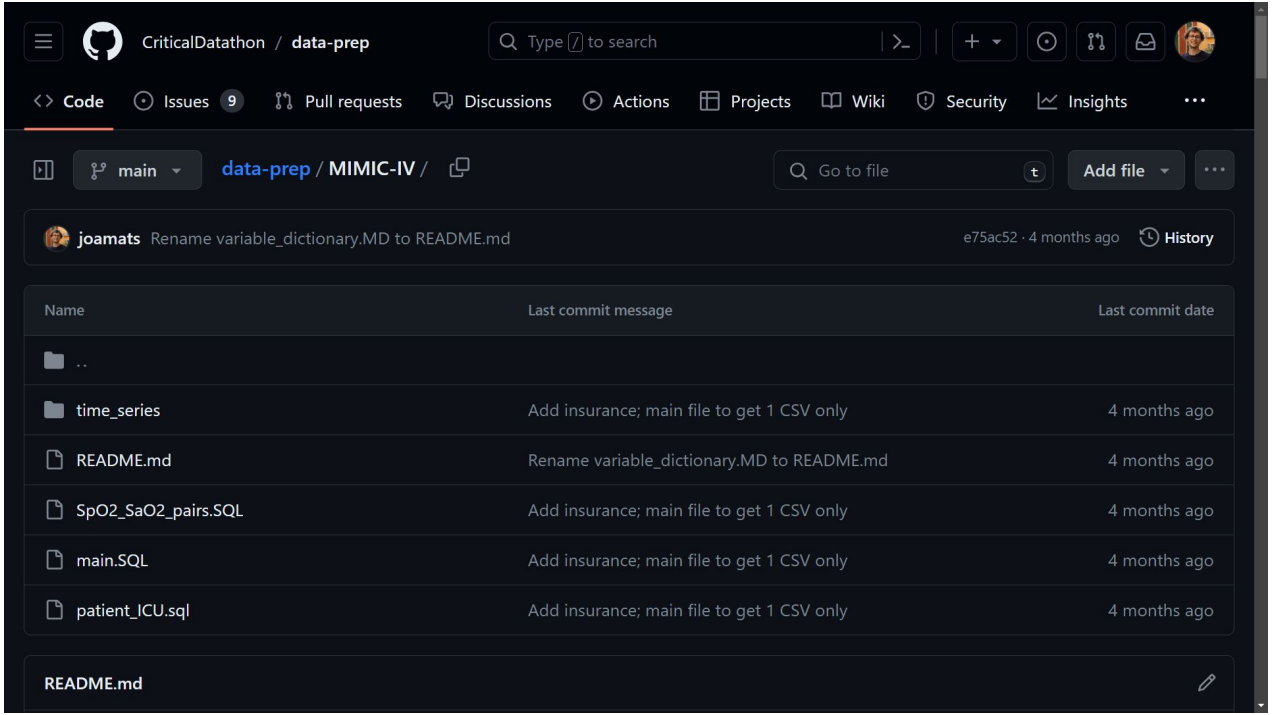
MIT Critical Datathon 2023: a MIMIC-IV Derived Dataset for Pulse Oximetry Correction Models was derived from:

- MIMIC-IV v2.2

Please cite them when using this project.

https://physionet.org/content/mit-critical-datathon-2023/1.0.0/

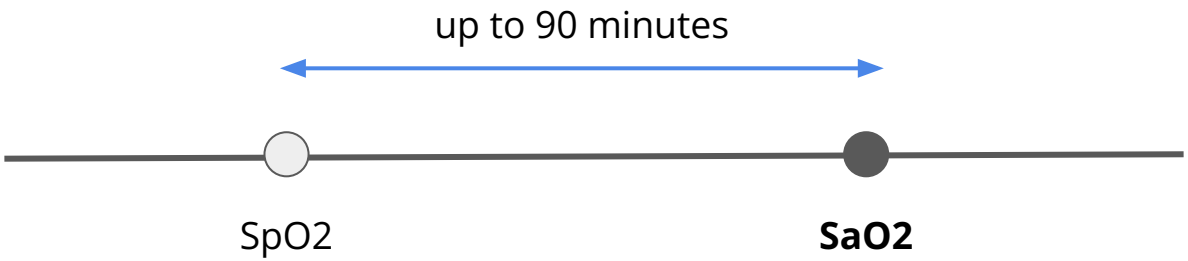
All the code behind is open-source on GitHub



https://github.com/CriticalDatathon/data-prep

The dataset contains pairs of SpO2 and SaO2 values

- 81,797 $SaO_2 - SpO_2$ pairs from the ICU, derived from MIMIC-IV
- Aligns the pairs with patient information, closest vital signs, laboratory values, SOFA scores, and treatment information



Explore!
a preview of the dataset

https://physionet.org/content/mit-critical-datathon-2023/1.0.0/

Download the dataset from PhysioNet

Files

Total uncompressed size: 50.1 MB.

Access the files

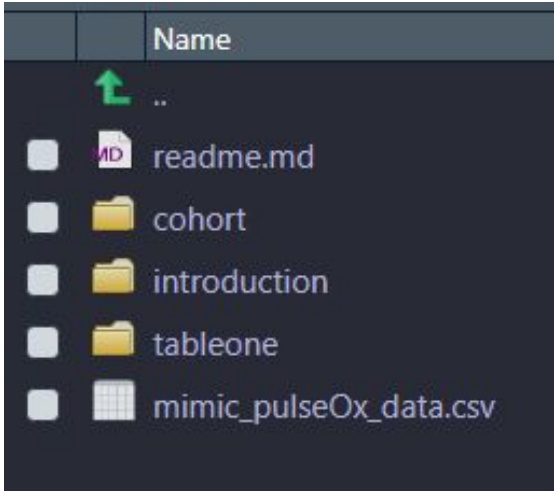
- Download the ZIP file (12.8 MB)
- Request access using Google BigQuery.
- Download the files using your terminal:

```
wget -r -N -c -np --user joaomatos --ask-password https://physionet.org/files/mit-critical-datathon-2023/1.0.0/
```

Folder Navigation: <base>

Name	Size	Modified
LICENSE.txt	2.5 KB	2023-05-07
SHA256SUMS.txt	259 B	2023-05-08
mimic_pulseOx_data.csv	50.0 MB	2023-05-04
mimic_pulseOx_dictionary.csv	9.1 KB	2023-05-04

Make sure to place the CSV in your *datathon* folder



Explore!

the RMarkdown called “introduction”

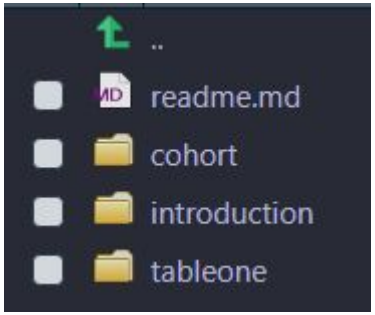
The goal for today is to set up and explore the data

Workshop0

2023-07-27

Workshop 0 Preparatory Materials

Please go through these materials before attending further Workshops.



What is a Datathon?

A datathon is a collaborative event designed to bring clinicians and data scientists together in the development of data-driven models. This process involves the use of de-identified datasets from different sources, such as electronic health records. The main objective is to analyze these datasets using both data science and medical knowledge.

A datathon combines medical science and data science to solve real-world problems with existing datasets. It encourages participants from diverse