

# BST-209: Collaborative Data Science in Healthcare

Summer Program in Clinical Effectiveness

31 July 2023



# Become familiar with machine learning concepts

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## Scalable and accurate deep learning with electronic health records

[Alvin Rajkomar](#) ✉, [Eyal Oren](#), ... [Jeffrey Dean](#) + Show authors

[npj Digital Medicine](#) **1**, Article number: 18 (2018) | [Cite this article](#)

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### Abstract

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### Editorial Summary

**Artificial intelligence: Algorithm predicts clinical outcomes for hospital inpatients**

Artificial intelligence outperforms traditional statistical models at predicting a range of clinical outcomes from a patient's entire raw electronic health record (EHR). A team led by Alvin Raikomar and Eval Oren from Google in

# Get hands-on coding experience

```
---  
title: "Predicting outcome of patients in the ICU"  
output: pdf_document  
date: "1/1/2023"  
---  
  
```${r load_data, include=FALSE}  
sql_query <- "SELECT i.subject_id, i.hadm_id, i.los  
              FROM `physionet-data.mimiciii_demo.icustays` i;"  
data <- run_query(sql_query)  
head(data)  
```  
  
This document shows how RMarkdown can be used to create a reproducible analysis using  
MIMIC-III (version 1.4). Let's calculate the median length of stay in the ICU and  
then include this value in our document.  
  
```${r calculate_mean_los, include=FALSE}  
avg_los <- median(data$los, na.rm=TRUE)  
rounded_avg_los <- round(avg_los, digits = 2)  
```  
  
So the median length of stay in the ICU is `r avg_los` days. Rounded to two decimal  
places, this is `r rounded_avg_los` days. We can plot the distribution of length of
```



# Build collaborations



Photo: 49th Annual Conference of the Society of Critical Care Medicine (SCCM 2020)

# Schedule

# Overview

- First two weeks, focus on methods for learning from data
  - Responsible machine learning
  - Data wrangling
  - Building and evaluating models
  - Communication of results
- Final week of the course:
  - Explore bias in oxygen saturation measurements.
  - Plan and present a team project.

# Week 1

|            | Workshop (2 - 3pm)  | Talk (3 - 3.30pm)            |
|------------|---------------------|------------------------------|
| Mon 31 Jul | Course introduction | Leo Celi (MIT)               |
| Tue 1 Aug  | Responsible ML      | Vinith Suriyakumar (MIT)     |
| Wed 2 Aug  | Responsible ML      | Ahmed Abdelfattah (Harvard)  |
| Thu 3 Aug  | Introduction to ML  | Tristan Naumann (Microsoft)  |
| Fri 4 Aug  | Introduction to ML  | Danielle Bitterman (Harvard) |

## Week 2

|            | Workshop (2 - 3pm) | Talk (3 - 3.30pm)          |
|------------|--------------------|----------------------------|
| Mon 7 Aug  | Introduction to ML | Fábio Duarte (MIT)         |
| Tue 8 Aug  | Tree models        | Vesela Kovacheva (Harvard) |
| Wed 9 Aug  | Tree models        | Weiwei Pan (Harvard)       |
| Thu 10 Aug | Process mining     | Suzy McKinney (Harvard)    |
| Fri 11 Aug | Generative AI      | Eugenio Zuccarelli (CVS)   |



## Week 3

|            | <b>Workshop (2 - 3.30pm)</b> |
|------------|------------------------------|
| Mon 14 Aug | Project (pulse oximetry)     |
| Tue 15 Aug | Project (pulse oximetry)     |
| Wed 16 Aug | Project (pulse oximetry)     |
| Thu 17 Aug | Prepare group presentations  |
| Fri 18 Aug | Group presentations          |

# Presentation (Fri 18 Aug)

- Propose a project
- 6 minute talk (group, slides)
  - Introduction
  - Goals
  - Data
  - Methods

# Groups

### **Group 1**

João Matos

Yusuke Takeda

Naira Link

Hui Miao

### **Group 2**

Renata Proa

Chrystinne Fernandes

David Gritsch

Crystal McLellan

### **Group 3**

Niklas Adams

Fredrik Willumsen Haug

Pui Ning Pauline Yeung

Asimina Lazaridou

#### **Group 4**

Lasse Hansen

Zara Sheikh

Hiten Naik

Kieun Seok

#### **Group 5**

Nikolaj Munch

Sarah Loh

Anvesh Narimiti

Heena Manglani

Sung Hae Chang

#### **Group 6**

Tristan Struja

Khushboo Teotia

Rachel Rosen

Ana Cecilia Farfan Ruiz

Hiroki Mizuno

Lisa Gudenkauf



### **Group 7**

David Restrepo

Ohad Oren

Ardel Romero Pabon

Kevin An

### **Group 8**

Eptehal Nashnoush

Krishnaveni Parvataneni

Christopher Callahan

Margaret Ong

Kimberly Mills

### **Group 9**

Kevin Ma

Hugh Kim

Yung Lee

Christopher Dall

### **Group 10**

Po-Chih Kuo

Chao-Ju (Luna) Chen

James Stone

Tina Shiang

Rodrigo Rosa Gameiro

Sotonye Imadojemu

### **Group 11**

Jack Gallifant

Adrien Carrel

Zihan Quian

Hong Xiong

Heng Cai

# Evaluation

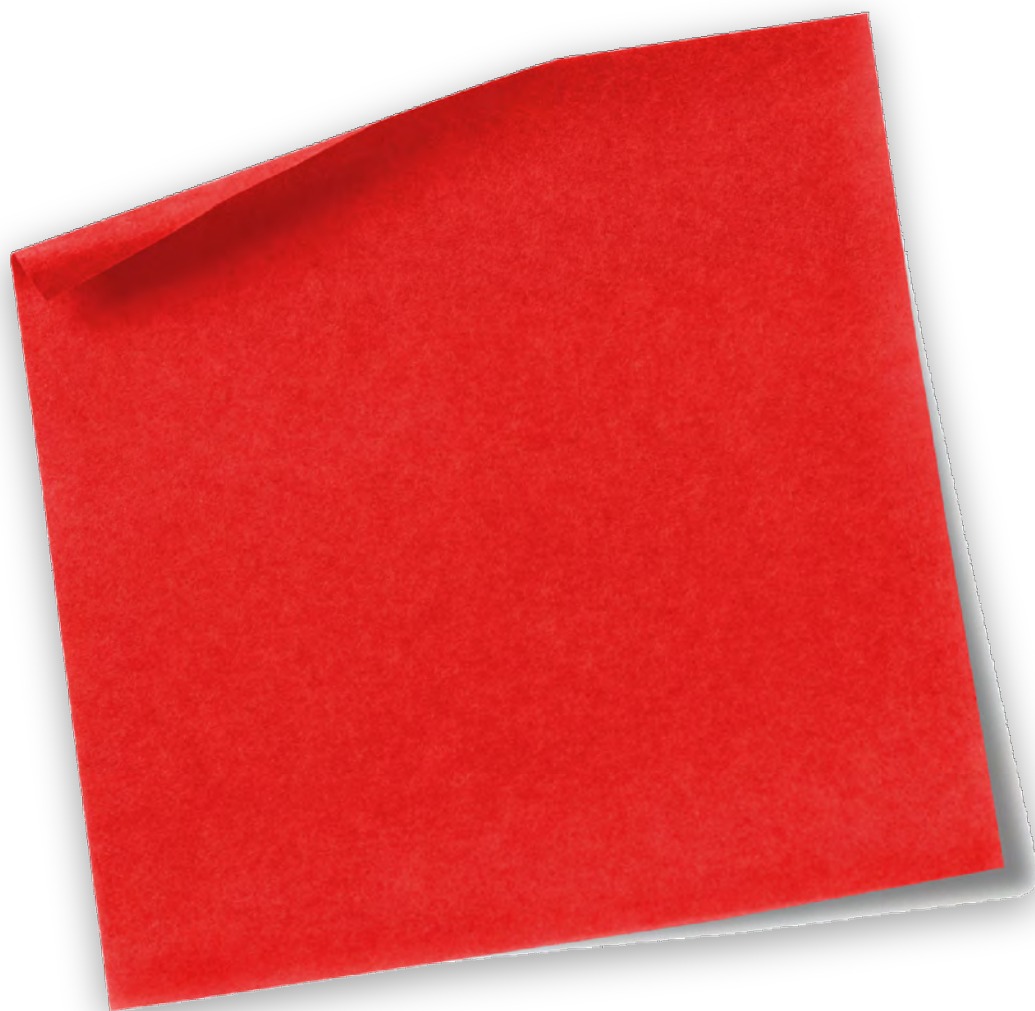
## Final grades based on:

- Attendance and participation: 60%
- Group presentation 40%

**Any questions?**



# Getting set up



# RStudio

DOWNLOAD

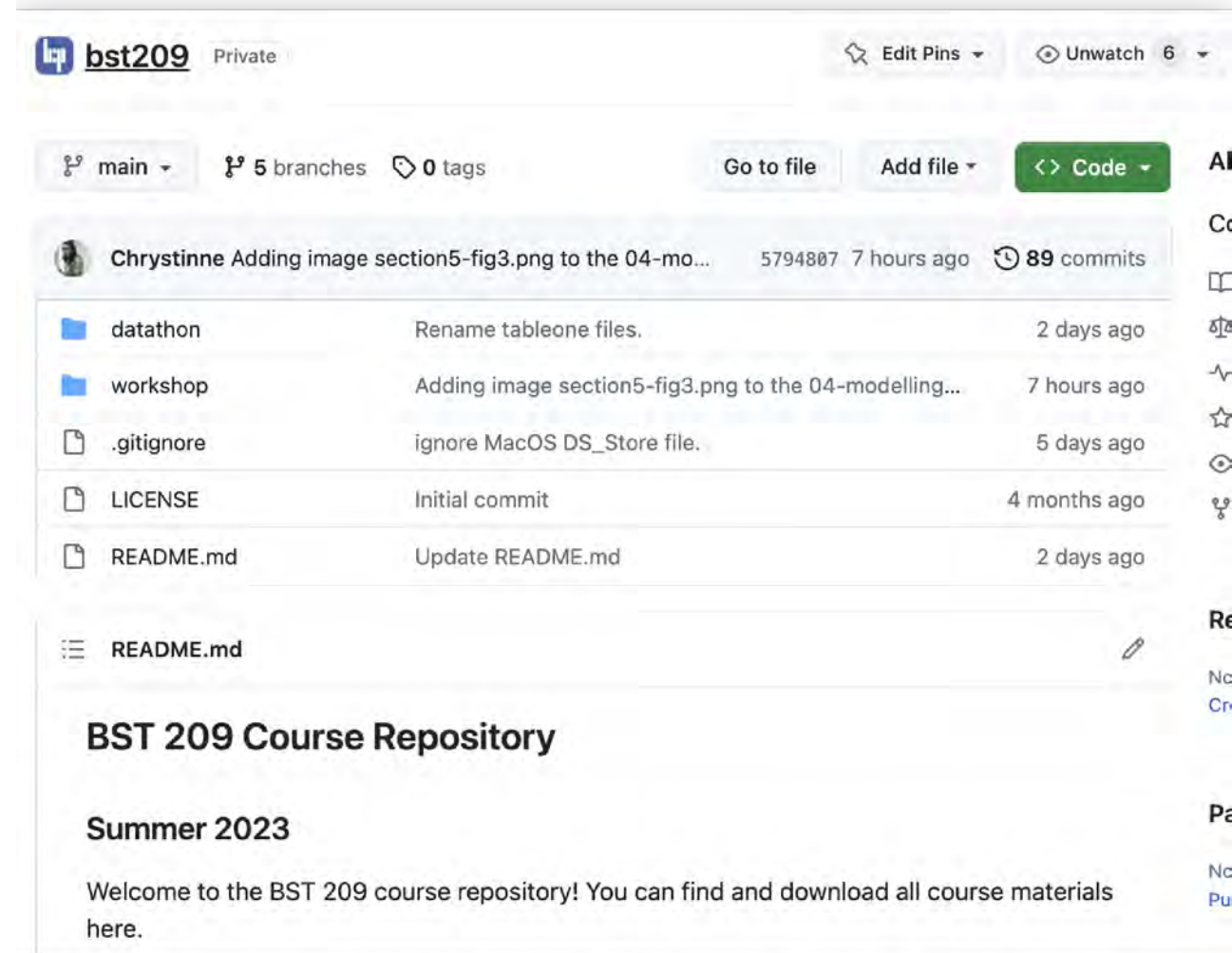
## RStudio Desktop

Used by millions of people weekly, the RStudio integrated development environment (IDE) is a set of tools built to help you be more productive with R and Python.

<https://posit.co/download/rstudio-desktop/>

# Course materials

<https://github.com/mit-lcp/bst209>



The screenshot shows the GitHub interface for the repository `bst209`, which is marked as `Private`. At the top, there are buttons for `Edit Pins` and `Unwatch` (with a count of 6). Below this, the repository's branch structure is shown: `main` (selected), `5 branches`, and `0 tags`. Action buttons include `Go to file`, `Add file`, and a green `<> Code` button. A recent commit by `Chrystinne` is displayed, titled `Adding image section5-fig3.png to the 04-mo...`, with a commit hash of `5794887` and a timestamp of `7 hours ago`. It also shows `89 commits` in total. Below the commit list, a table of files is shown:

| File                    | Commit Message  | Time         |
|-------------------------|---|--------------|
| <code>datathon</code>   | Rename tableone files.                                | 2 days ago   |
| <code>workshop</code>   | Adding image section5-fig3.png to the 04-modelling... | 7 hours ago  |
| <code>.gitignore</code> | ignore MacOS DS_Store file.                           | 5 days ago   |
| <code>LICENSE</code>    | Initial commit  | 4 months ago |
| <code>README.md</code>  | Update README.md                                      | 2 days ago   |

Below the file list, the `README.md` file is selected, showing the repository title **BST 209 Course Repository** and the semester **Summer 2023**. The README text reads: "Welcome to the BST 209 course repository! You can find and download all course materials here."