Artificial Intelligence in Critical Care Medicine
Session Handbook
Pre-Conference Workshop at the 2025 CNH Annual Symposium

STOP

**PLEASE READ AND COMPLETE
BEFORE MARCH 1**

Please bring a fully charged laptop computer with all the workshop materials downloaded in advance.

This workshop includes interactive demonstrations using real code and sample data. Please install the needed software and download the materials BEFORE attending the workshop. Given the time constraints, we will be unable to delay the workshop to allow downloads and installation. Links to the materials and software are found below.

Intended audience

This workshop is designed primarily for critical care providers who are interested in clinical and research applications of Big Data, data analytics, and AI who are interested in learning more about handling data and getting an introduction to some analytic techniques using common EMR software and free open-source software tools. Prior programming or analytic experience is not required but participants should be comfortable with moderate to advanced computer skills.

Materials

The latest version of the materials (including slides, sample data, sample code, and documentation) can always be found at our GitHub site:

https://github.com/zvesoulis/keystoneworkshop2025

All materials can be downloaded in a single bundle by clicking the green button marked "< > Code" and selecting "Download ZIP" from the dropdown. This will download a file called "keystoneworkshop2025-main.zip". The live demonstrations will be conducted under the assumption that this file has been saved to a standard "Downloads" folder and has been extracted.
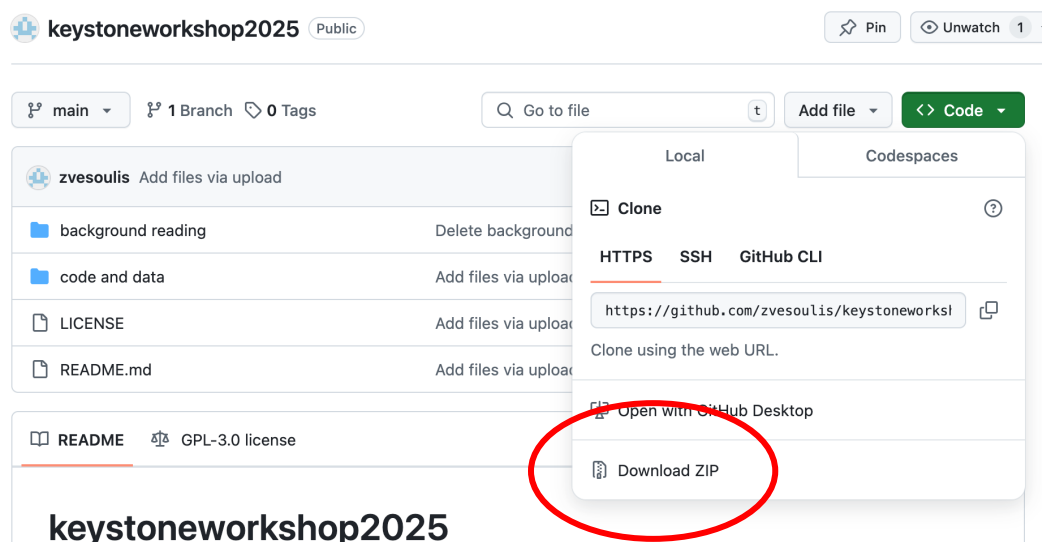
Software installation
The live demonstrations will utilize two free open-source software packages: Octave and R Studio. Octave can be downloaded from: https://octave.org/download and R Studio can be downloaded from: https://posit.co/download/rstudio-desktop/. Although it is not free, attendees who have institutional access to MATLAB are welcome to use it as an alternative to Octave. MATLAB can be installed directly on your computer, or the online version can be used instead (https://matlab.mathworks.com/) Detailed instructions for installing and configuring the software can be found on our GitHub page.

The live demonstration will also include interaction with large language model chatbots. We suggest the use of ChatGPT (https://chatgpt.com/) or Claude (https://claude.ai). Attendees should visit one or both of those websites in advance of the meeting and create a free account to streamline the activities.

Links
GitHub repository for the workshop: https://github.com/zvesoulis/keystoneworkshop2025
Epic Training: https://training.epic.com

Email addresses
James Barry: JAMES.BARRY@CUANSCHUTZ.EDU
Ameena Husain: ameena.husain@hsc.utah.edu
Alvaro Moreira: moreiraa@uthscsa.edu
Zach Vesoulis: vesoulis_z@wustl.edu

Interactive Breakout Session Instructions

Activity 1 - LLM Practice
Login into the ChatGPT or Claude website, cut and paste these prompts

1. Write a 250-word scientific abstract on an animal model of ischemic brain injury during extracorporeal support in a piglet model. Include references.
2. Help me understand the role of cerebral NIRS monitoring in the hemodynamic management of critically ill children
3. Go to this article: https://pmc.ncbi.nlm.nih.gov/articles/PMC5457314/pdf/nihms853990.pdf and copy the full text of the article. Next go back to ChatGPT and type in "summarize this article in 3 sentences" and then paste the text of the article
4. Write a recommendation letter of a current resident in Pediatrics for a fellowship in Neonatal-Perinatal medicine. He is a friendly guy who loves to learn but has a lot of issues with getting to work on time, prioritizing tasks. You are really hoping he goes somewhere else for fellowship, so make him sound good.
5. Write a specific aims page in the NIH R01 style. It should be about melatonin used for neuroprotection in a Vannucci rat model

Activity 2 - NeoMIND-AI Tools
1. Visit the Presentations website (https://neomindai.com/presentations-1) to see past webinars
2. Visit the Apps page (https://neomindai.com/apps) and go to the Exploratory Data Analysis Tool
3. We will perform analysis on two files. The first is purely numeric data, containing HR and SpO2 values. From the GitHub site (https://github.com/zvesoulis/keystoneworkshop2025) make sure you have downloaded the file "numeric_datasample.xlsx."

4. In the upload data file box, browse to the file on your computer and press "view summary." Basic statistical results appear in the <u>Data Summary</u> tab, the raw data elements can be viewed in table form under the <u>Data Table</u> tab, and a boxplot visualization can be seen under the <u>Numeric Visuals</u> tab.

5. In the second example, we will use a file of artificially generated clinical data which resembles something that would be collected in a typical NICU clinical research study.

6. First, press the refresh button on your browser to reload everything. Press browse to locate the file "categorical_datasample.xlsx" and upload it. Since this data file contains numerical and categorical variables, you will need to place a check in the box next to all of the categorical variables (sex, multiple birth, maternal conditions, delivery method, respiratory support, complications, survived). In addition to the analysis tools covered in the last file, there are additional categorical options including <u>Categorical Summary</u> tab which provides frequency counts and the <u>Categorical Visuals</u> tab which provides visualizations.

Activity 3 - Practice Big Data Analytics in in R Studio

1. Start R studio on your computer

2. Open the file "R_example.Rmd" (downloaded from the "code and data" folder in the GitHub repository)

3. Ensure that the two underlying data files are in the same folder (df_long.rds and newTable.rds)

4. Press the "Knit" button (ball of yarn with needles icon)

5. Once it completes running, a new window will open. The produced document contains a complete walkthrough of the code and output from an analysis looking at longitudinal heart rate and SpO2 data in preterm infants.

6. If you encounter problems running the code in R studio, a premade output file can be accessed in the same folder (R_example.html) and can be opened in any web browser

Activity 4 - More practice with Big Data Analytics in Octave/MATLAB

1. Ensure that you have downloaded the data and code for this exercise. This includes two scripts (data_intro.m and hrv_calc.m) and two datafiles (NICU_1007_vitals.mat and NICU_1095_vitals.mat). The two datafiles are provided as compressed ZIP files, please unzip them before you get started.

2. Start Octave/MATLAB or start MATLAB online

3. Open data_intro.m. This script can either be run all at once and you can review the output line by line. We suggest that you read through the script, cutting and pasting code blocks as you go. In this first script, you will learn how to load datasets, determine the statistical properties of a dataset, and generate visualization.

4. For the second part of the activity, open hrv_calc.m. This script provides a basic heart rate variability calculator. Again, we recommend cutting and pasting code blocks as you go through the script.

*** Please note that if you use MATLAB online, you will need to upload the datafiles before you can run the scripts. ***