University of Glasgow | School of Computing Science

THE AWARDS 2020 | UNIVERSITY OF THE YEAR

Benchmark Deep Learning Models with EHR – Part 1

Dr. Fani Deligianni,

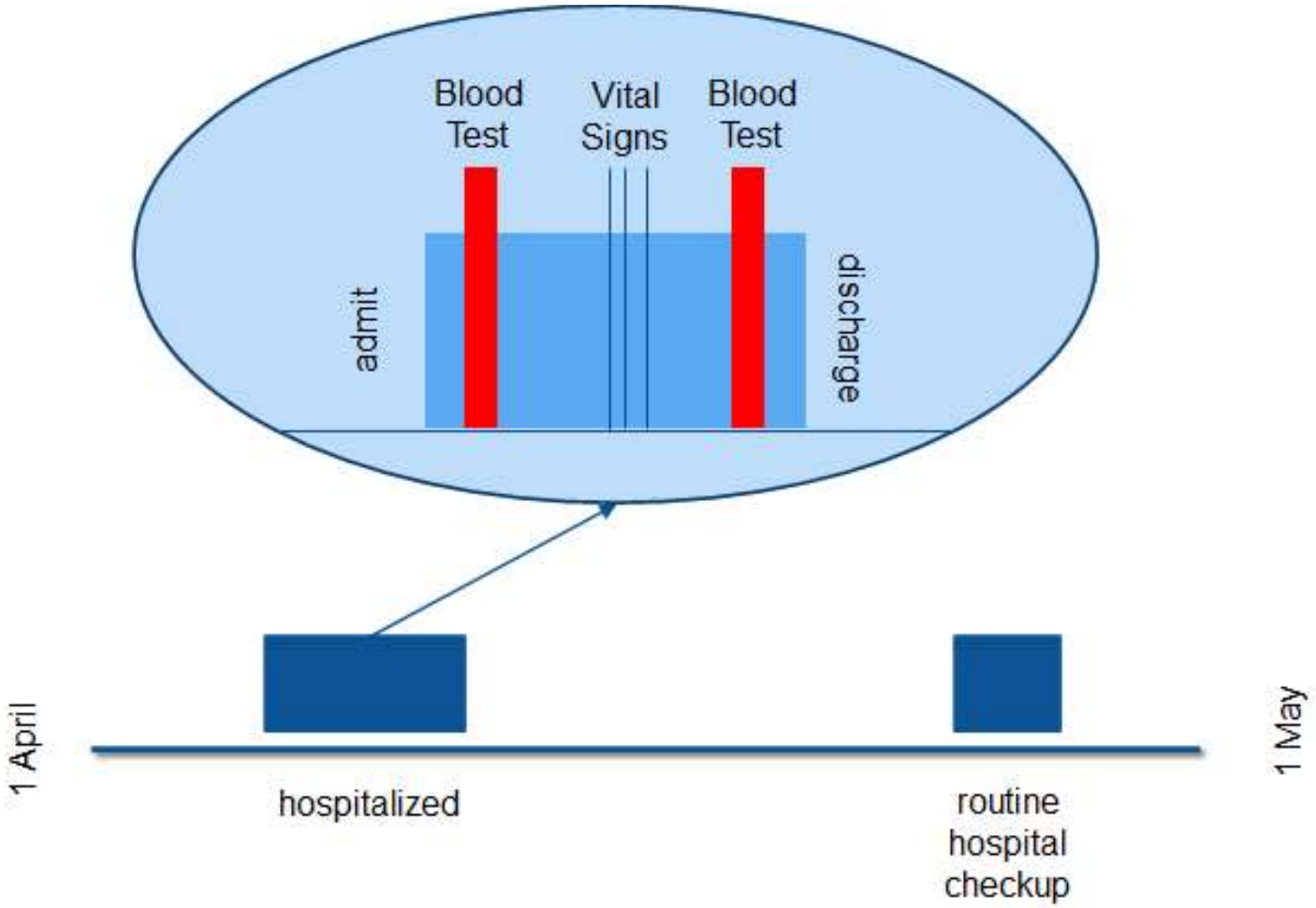
fani.deligianni@glasgow.ac.uk

Lecturer (Assistant Professor)

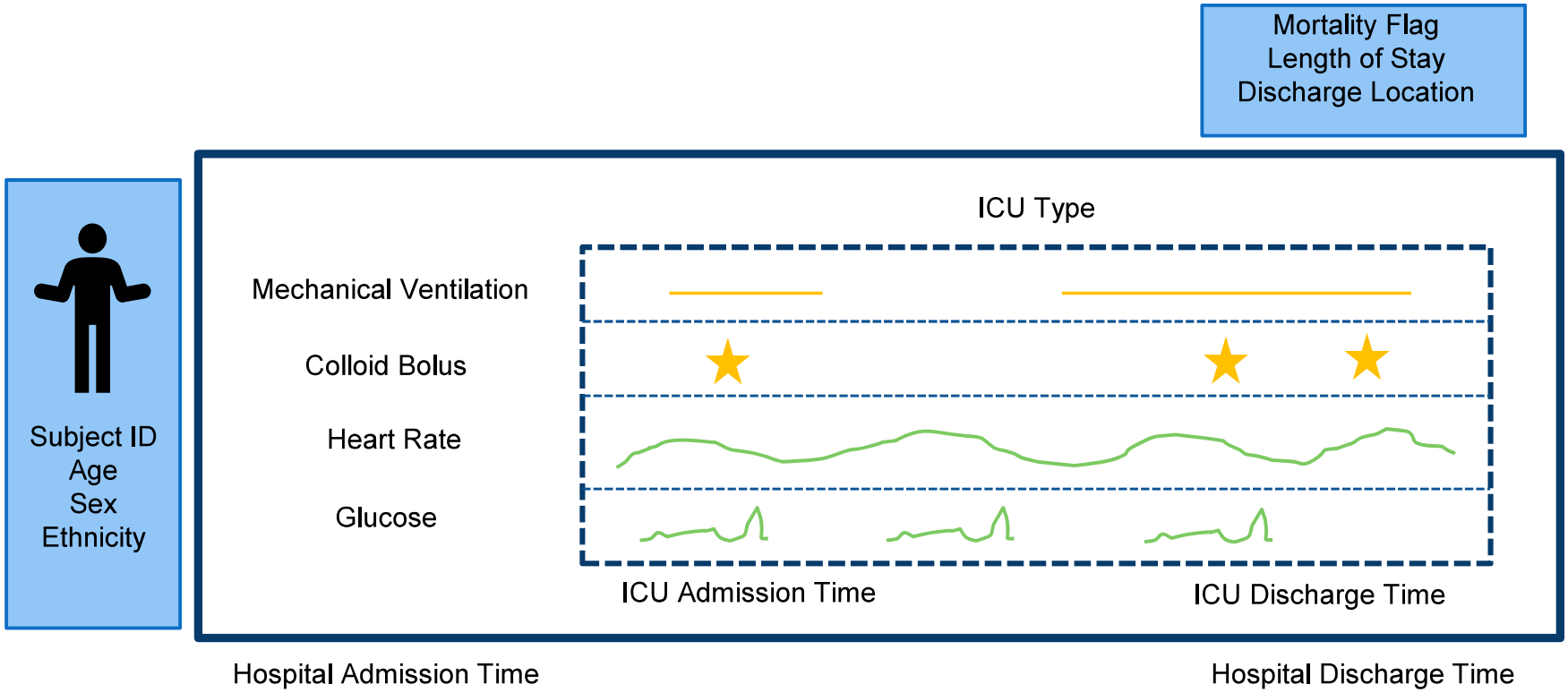
Lead of the Computing Technologies for Healthcare Theme

https://www.gla.ac.uk/schools/computing/staff/fanideligianni

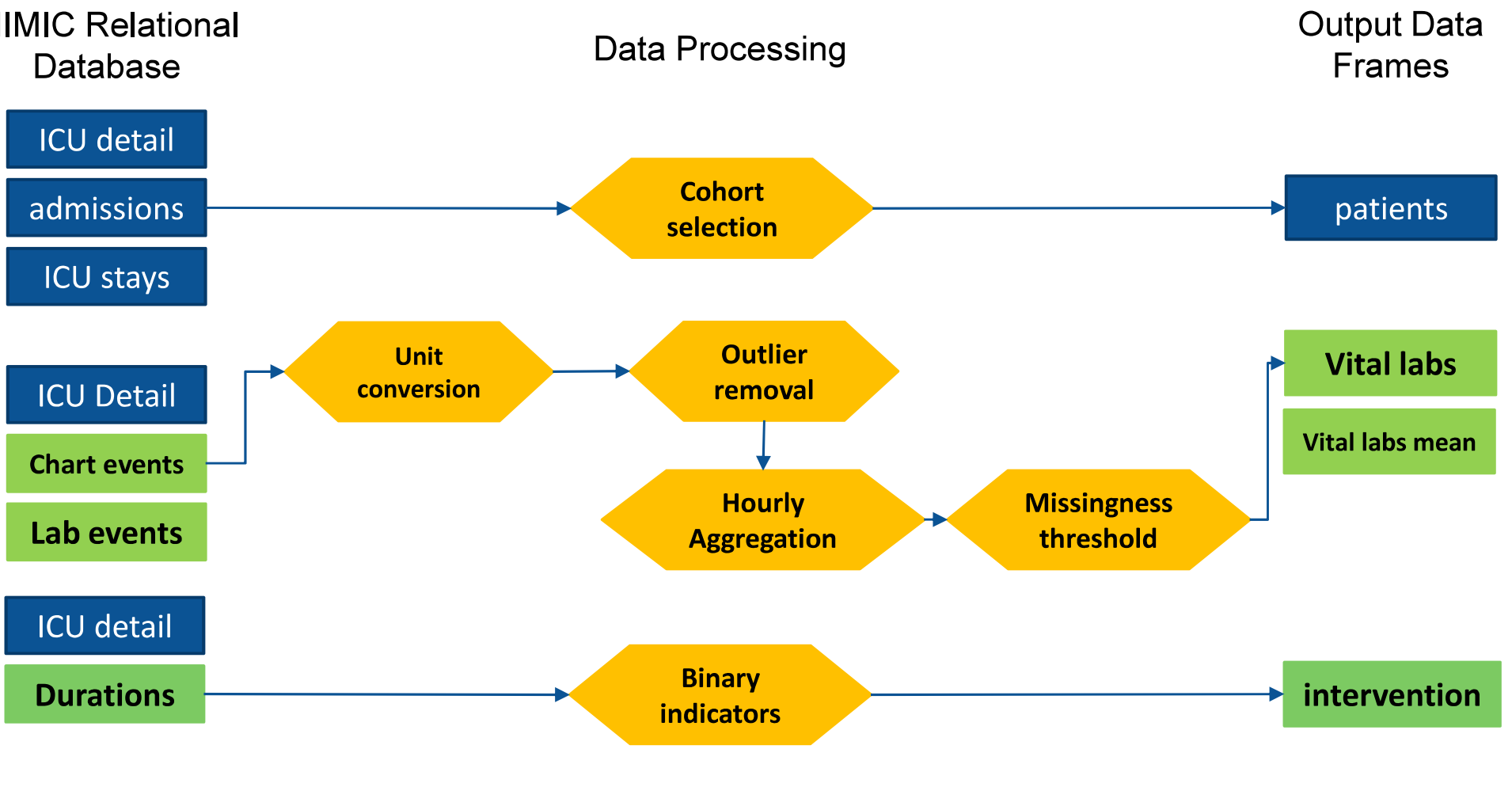
Patient Data in MIMIC-III



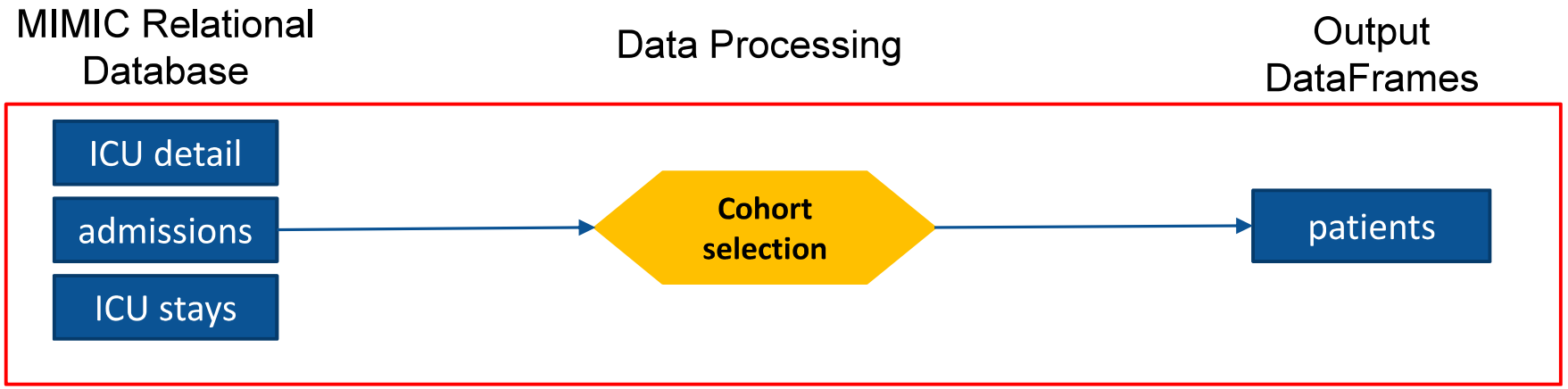
Extract clinical variables over regular intervals



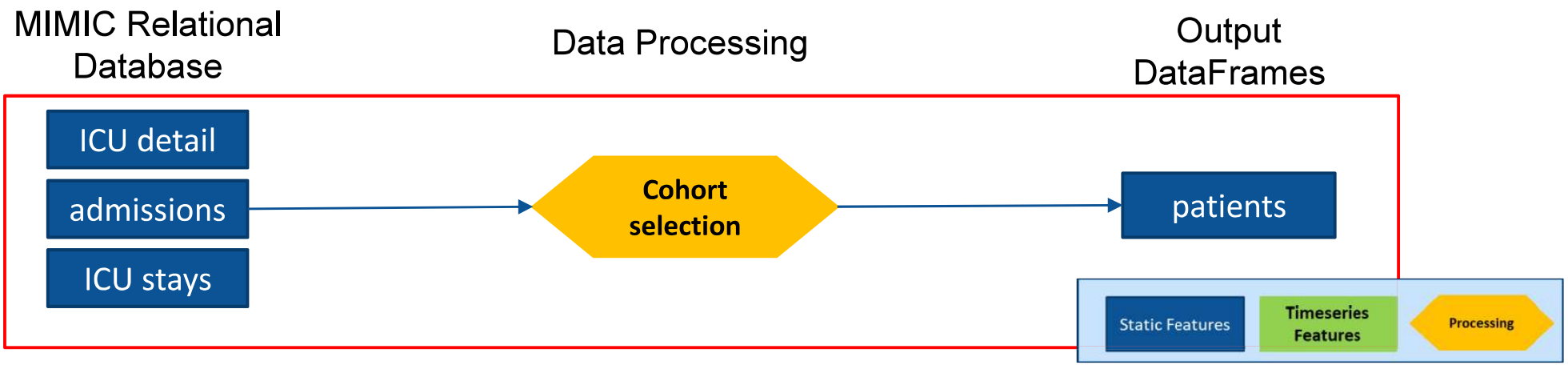
Preprocessing Pipeline



Cohort Selection

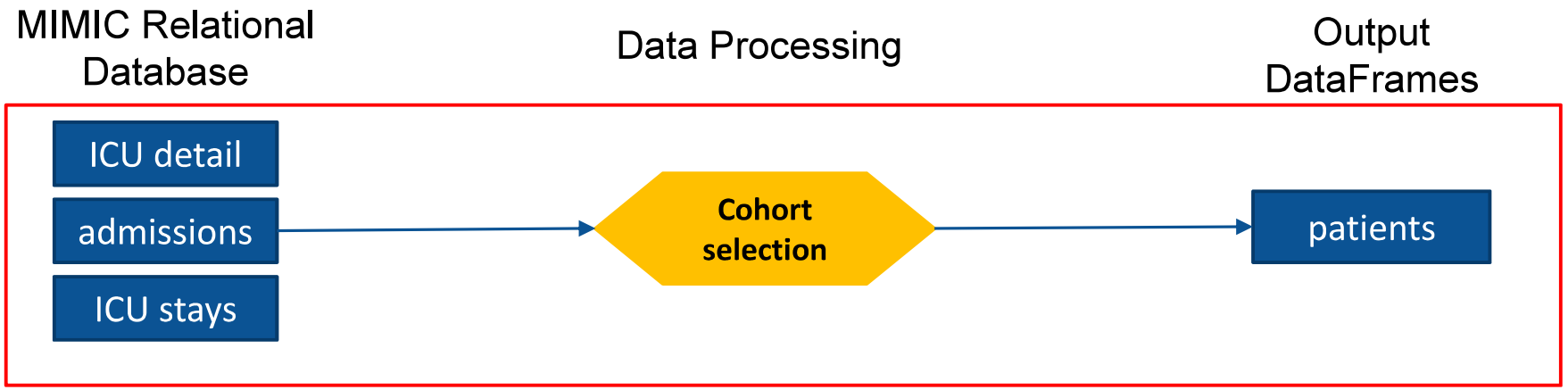


Cohort Selection



- **In-hospital mortality prediction:** a binary classification task to predict in-hospital mortality based on the first 48 hours of an ICU stay.
- **Decompensation prediction:** predict whether a patient's health will rapidly deteriorate in the next 24 hours.
- **Length-of-stay prediction:** predict the remaining time spent in ICU at each hour of stay.
- **Phenotype classification:** (multilabel) classifying a given patient ICU stay record into one of 25 acute care conditions

Cohort Selection



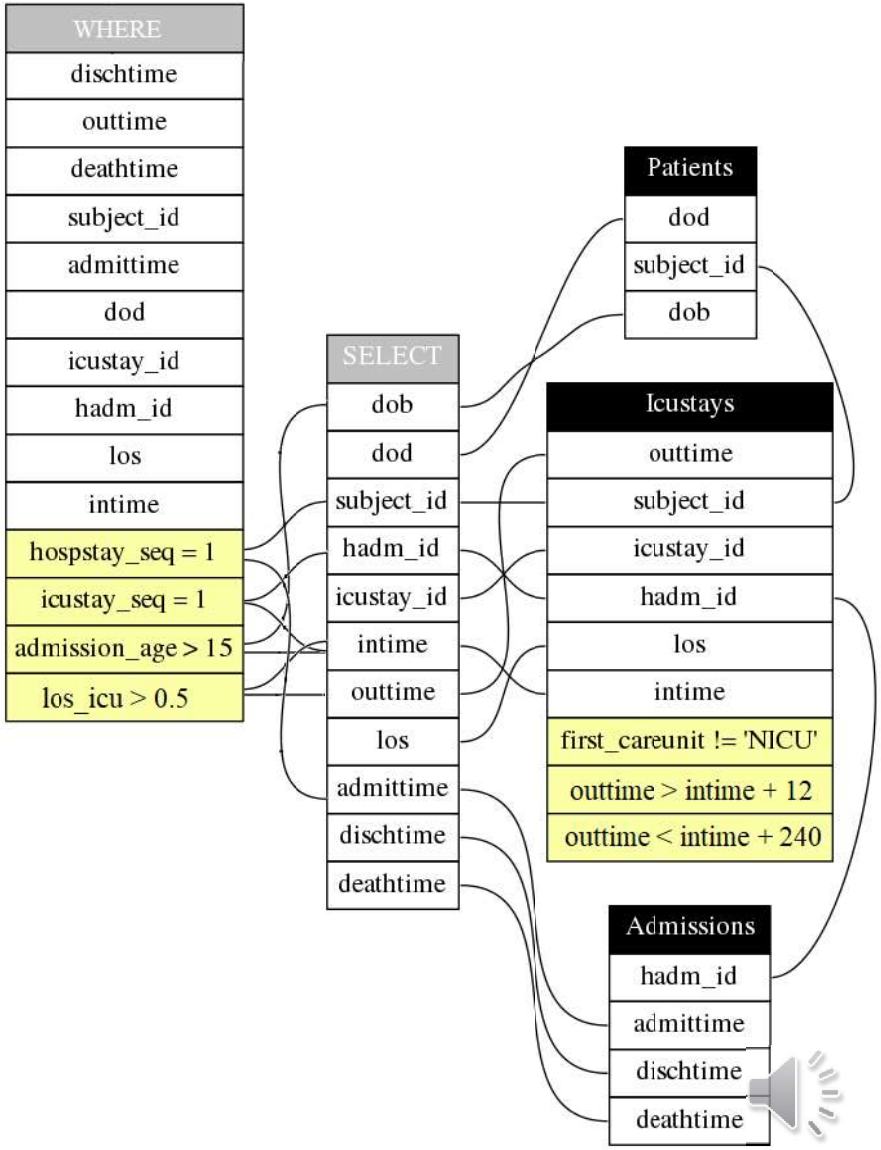
All Patients in MIMIC-III
-With all administration records available
-Only first ICU admission that took at least a day and less than 10 days

→ **Select** Adult patients only (age>=15)

→ Final Cohort (n=34,472)

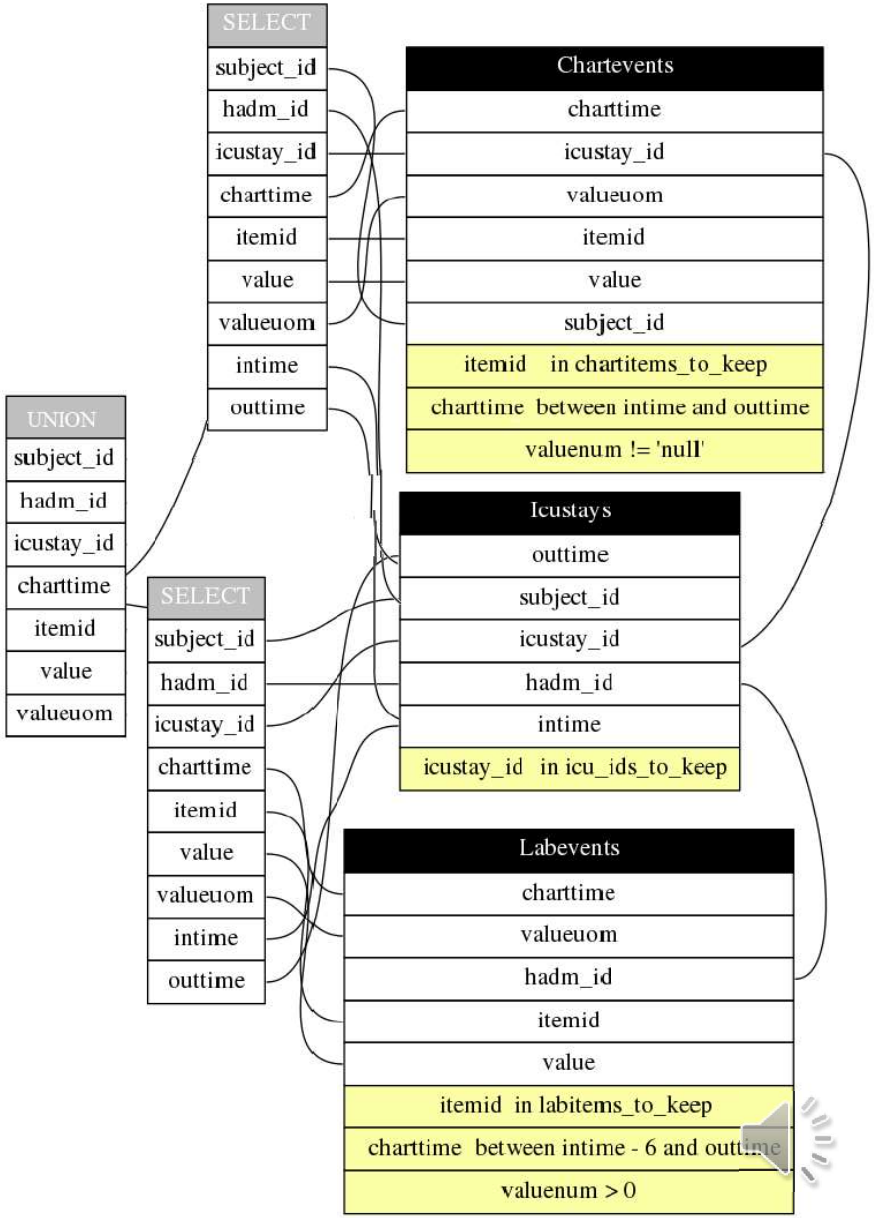
In-Hospital Mortality Prediction

- Unique ICU stay identifier
- Patient's hospital admission identifier
- Subject identifier
- Time of admission to the hospital/ICU
- Time of discharge of the hospital and ICU
- Death time, date of death
- Length of stay



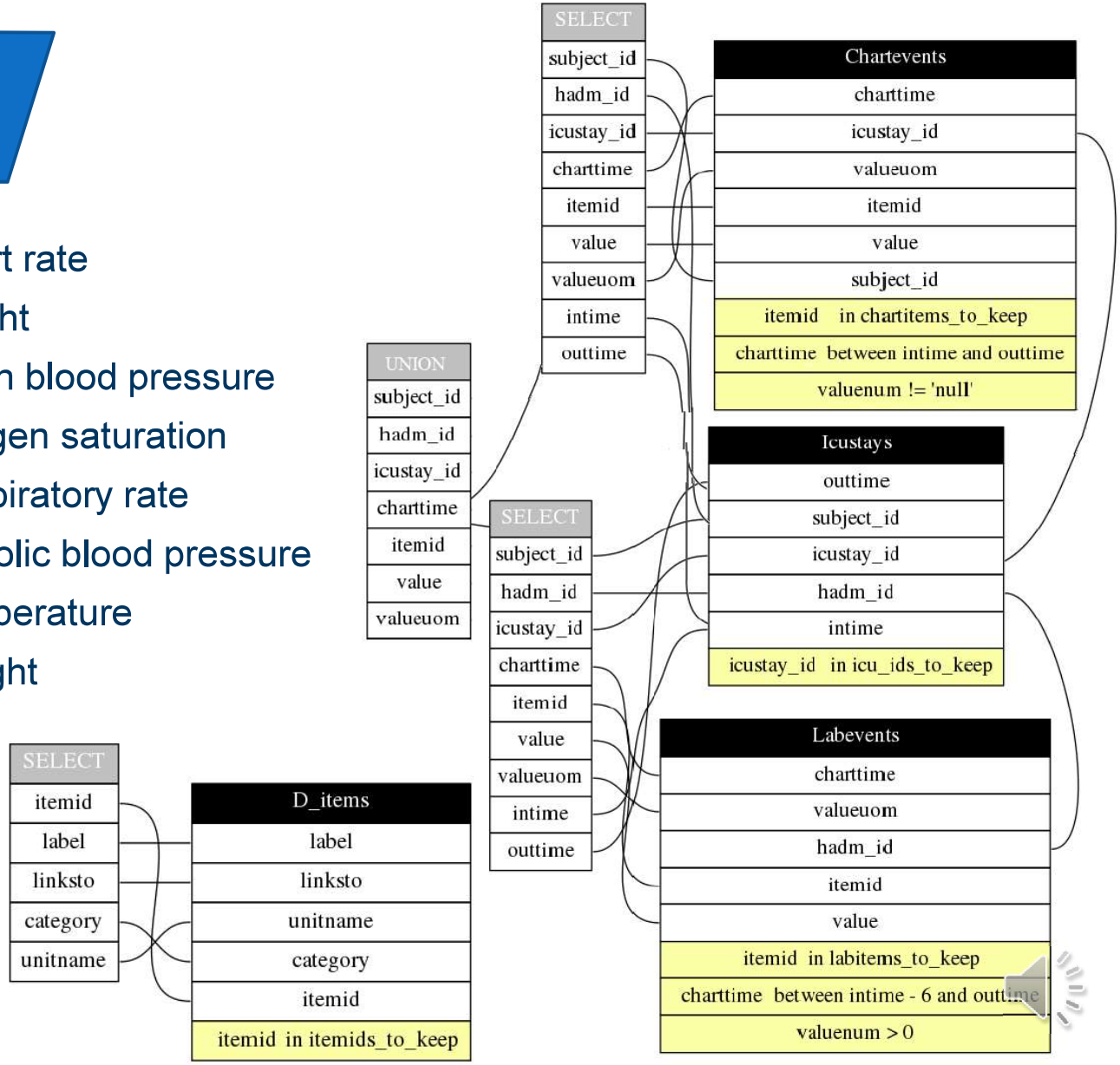
Extract Clinical Variables

- Capillary refill rate
- Diastolic blood pressure
- Fraction inspired oxygen
- Glasgow coma scale eye opening
- Glasgow coma scale motor response
- Glasgow coma scale total
- Glasgow coma scale verbal response
- Glucose
- Heart rate
- Height
- Mean blood pressure
- Oxygen saturation
- Respiratory rate
- Systolic blood pressure
- Temperature
- Weight
- pH



Extract Vital Data

- Capillary refill rate
- Diastolic blood pressure
- Fraction inspired oxygen
- Glasgow coma scale eye opening
- Glasgow coma scale motor response
- Glasgow coma scale total
- Glasgow coma scale verbal response
- Glucose
- Heart rate
- Height
- Mean blood pressure
- Oxygen saturation
- Respiratory rate
- Systolic blood pressure
- Temperature
- Weight
- pH



Summary

- Robust Representations of Labs and Vitals Time Series
- Clinically Meaningful Interventions and Outcomes
- Reproducibility and Extensibility

References

- Johnson et al. ‘MIMIC-III, a freely accessible critical care database’, Scientific Data, 2016.
- Wang et al. ‘MIMIC-Extract: A Data Extraction, Preprocessing, and Representation Pipeline for MIMIC-III’. https://arxiv.org/abs/1907.08322, 2019.
- Harutyunyan et al. ‘Multitask learning and benchmarking with clinical time series data’, Scientific Data, 2019.