Modeling ICU Patient Trajectories

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Critical events after ICU patient discharge

Aim of the project

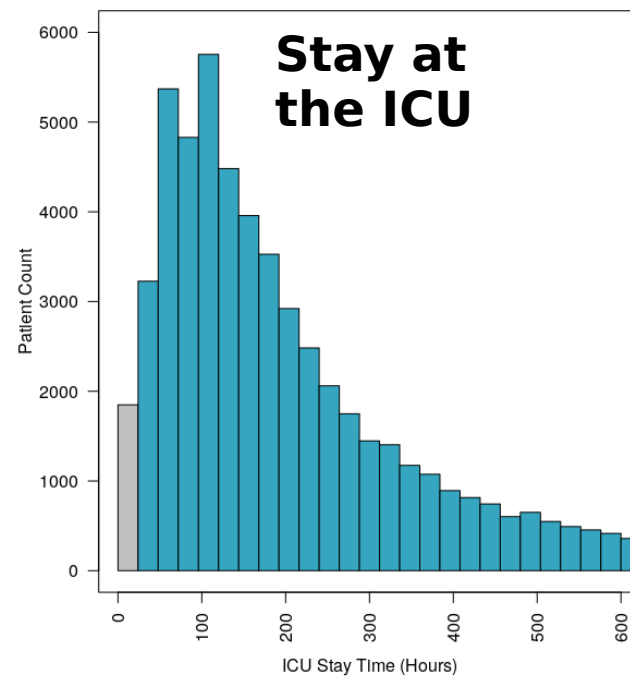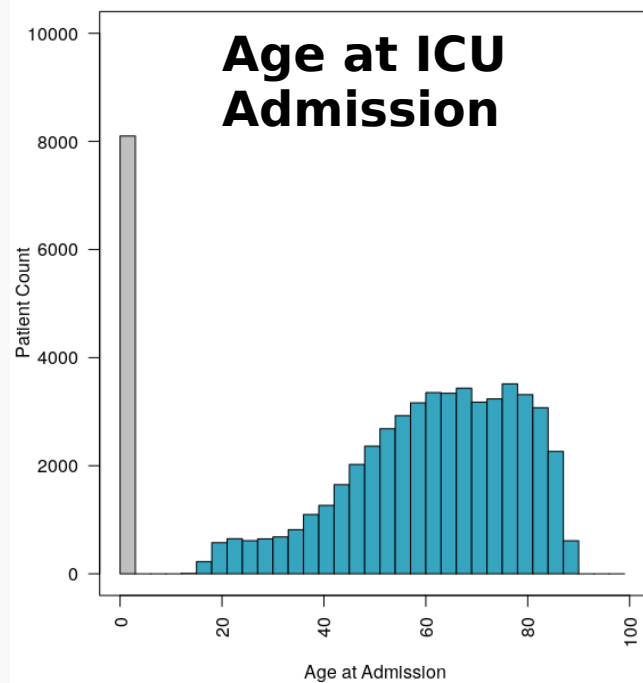- Identify patients likely to experience a critial event (death or readmission) soon after discharge

  - Leverage demographics as well as data collected during the ICU stay

  - Identify patients that were not stabilized at the time of discharge (prevent readmission)

  - Recommend at-home monitoring systems (reduce post-discharge death rates)

Mimic–iii dataset

Gap between ICU discharge and patient critical event

Events tend to occur early

Age at ICU Admission

Stay at the ICU
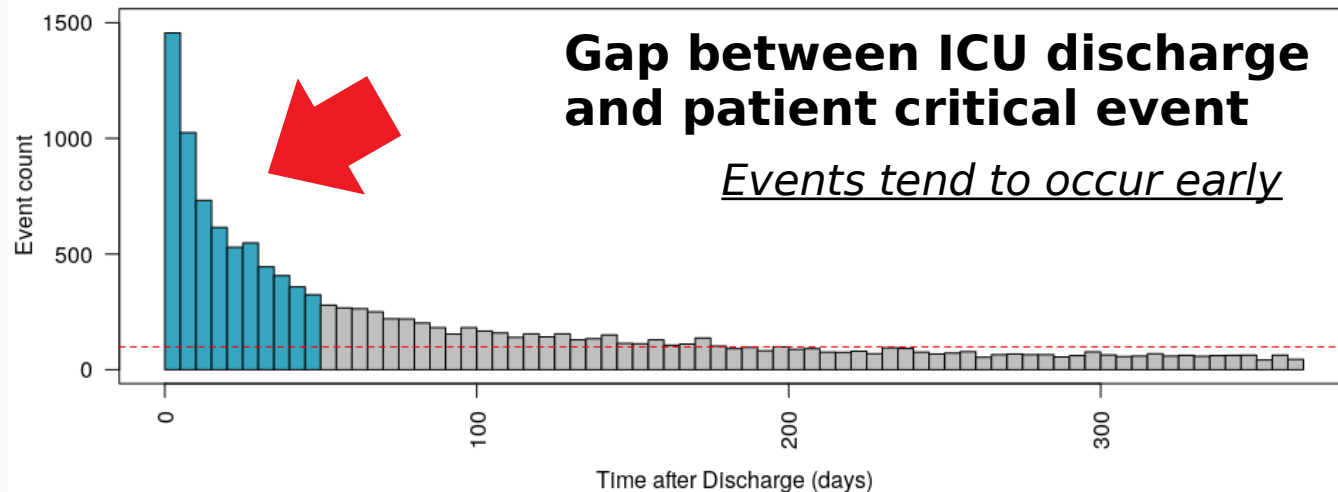
TARGET

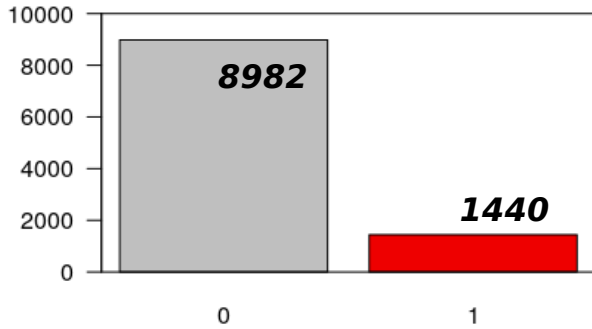Classification problem: "event within 50-day"

CHALLENGES

- Complex patient population
- Speciality IC units (newborns, surgical patients...)

Mimic–iii data: predictors

-- MICU --

Demographics
Age, Gender, ICU
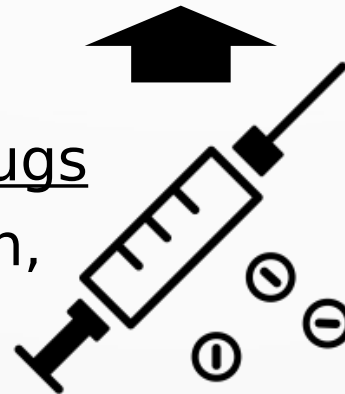stay length...

postgresql

Diagnostic
ICD-9 codes

Prescribed drugs

Acetaminophen, aspirin,
albuterol, lorazepam...

Blood work, and
charted events

HR, hematocrit,
coagulation time...

Principal Component Analysis

Chi-square: p=0.00011

% class 1 in cloud: 14.2%

% class 1 in cluster: 9.6%

~1000 patients
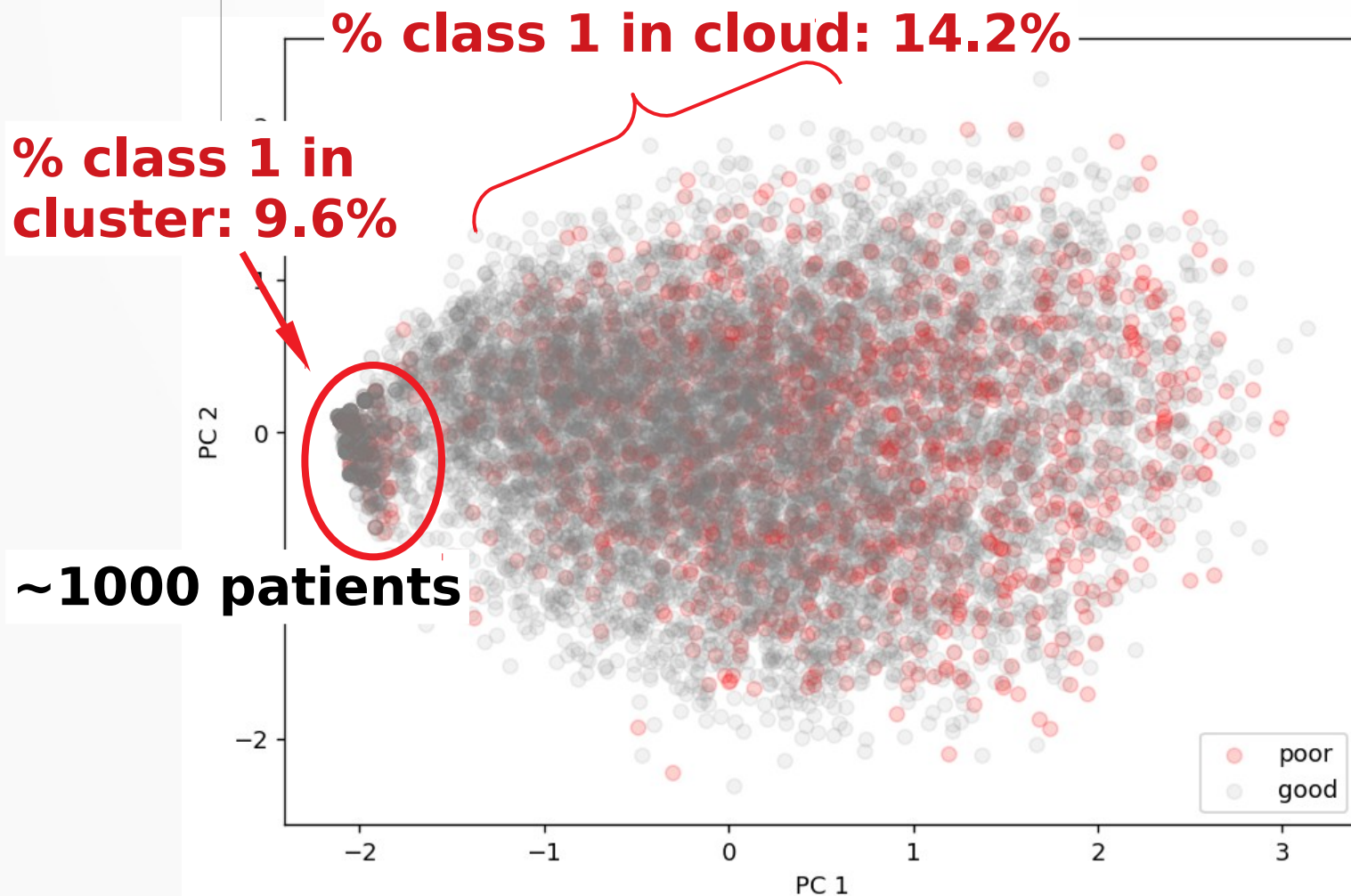
Respiratory
Albuterol
Ipratropium

Bowel
Docusate

Energy
Dextrose

Vascular
Furosemide
Heparin
Metoprolol

Antibiotics
Floxacin
Vancomycin

Diabetes
Insulin

poor
good

Classification

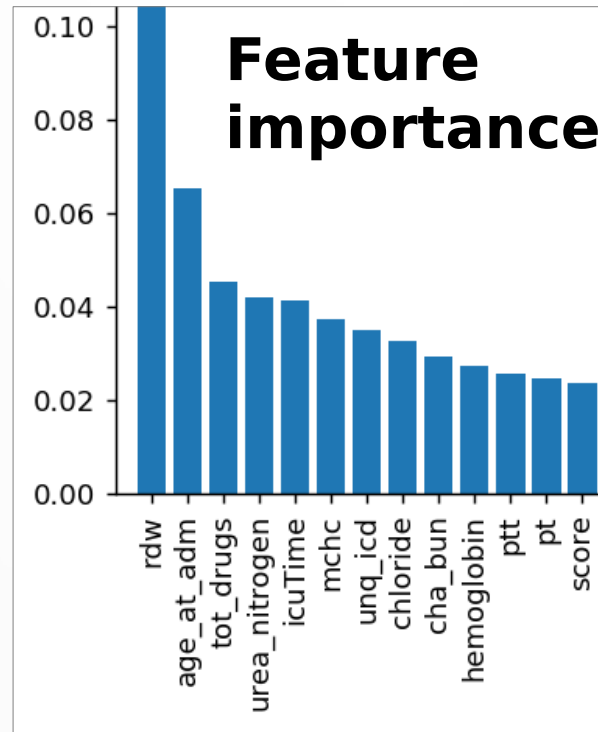Pull data (SQL)

Pre-processing

70:30 split

Modeling

Log.regr vs. RF

Sensitivity & Precision

Use class weights

Evaluate

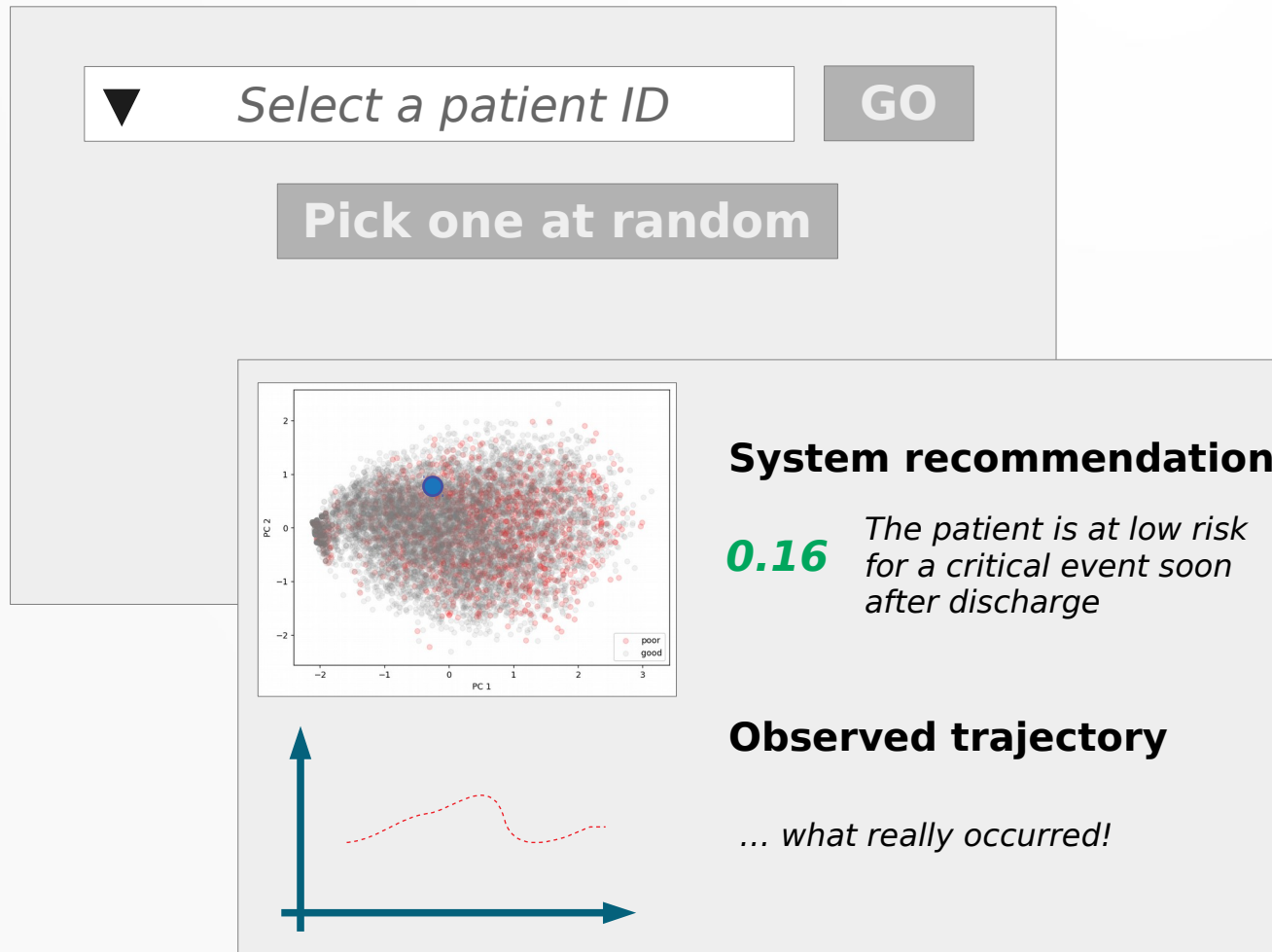**Feature importance**

Sensitivity: 0.521
Specificity: 0.781

on the test set

		Observed (critical events)	
		yes	no
Predicted (patient at risk?)	yes	211	535
	no	194	1906

Demo and conclusions

Select a patient ID | GO

Pick one at random

System recommendation

0.16 *The patient is at low risk for a critical event soon after discharge*

Observed trajectory

... what really occurred!

- **Identify high-risk patients before discharge**

- **Focus on sensitivity/precision**

- **Clinical complexity plays a role**

- *Test the same model on other ICU units?*