The Data Incubator: Finalist Interview

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PROBLEM

ICUs are expensive, and growing…

It costs just over **$2M** per ICU bed[3]

yet ICU care will most likely **double by 2030**[4]

Intensivist staffed ICUs can **decrease mortality**[2]

yet only

of hospitals employ full-time intensivists[5]

ICU care costs more than **$80B** per year[6]

yet results in **540,000 deaths** per year[7]

Critical care physicians are more likely to experience **burn out**

than their colleagues and are least happy outside of work[8]

https://www.usa.philips.com/healthcare/resources/landing/whatisteleicu

VALUE PROPOSITION

Can we predict which patients may need ICU care?

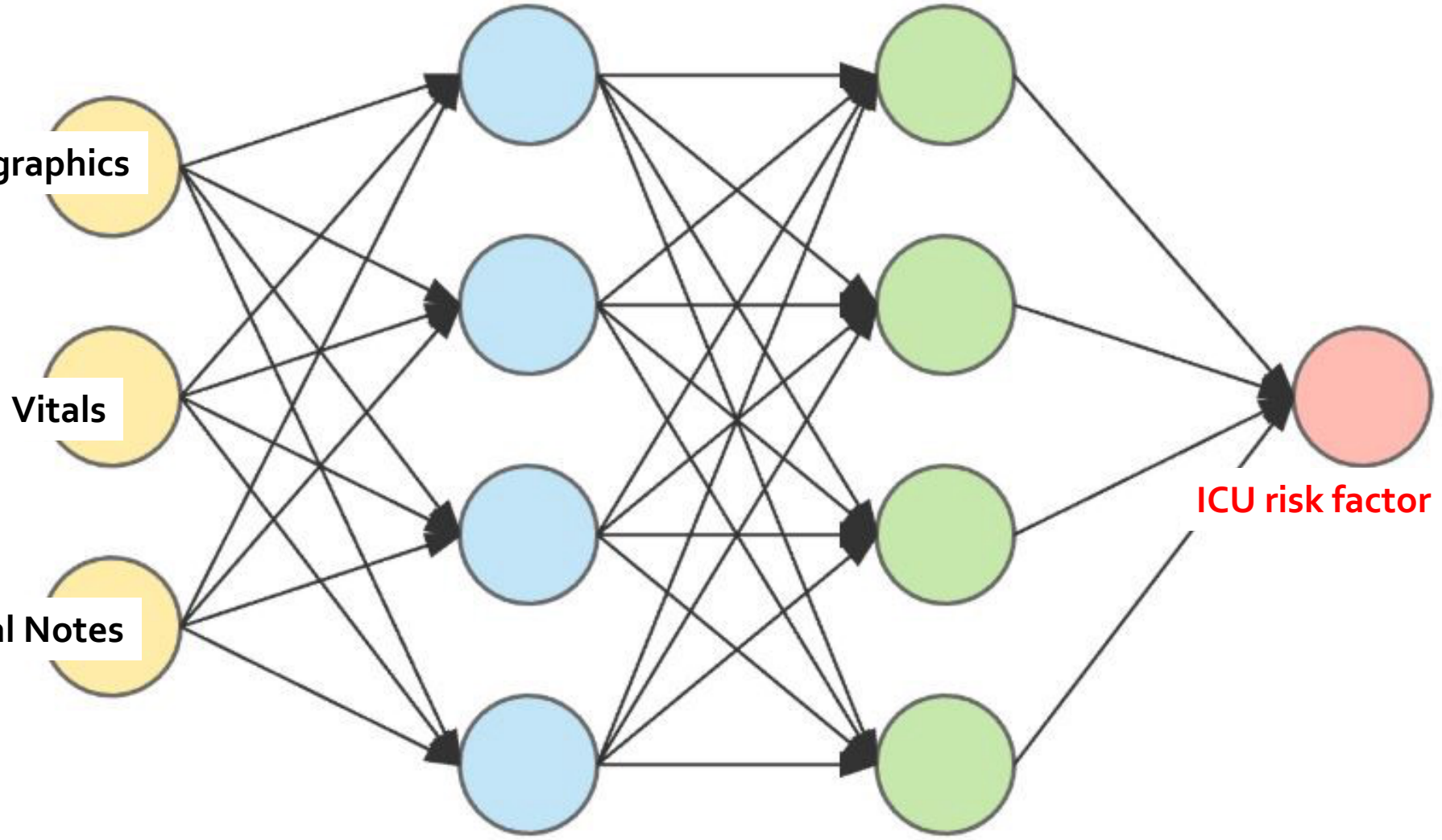


Image modified from: https://www.kdnuggets.com/2019/02/neural-networks-intuition.html

DATA SET

- Freely accessible
- 560GB data
- 60,000 ICU stays from 40,000 patients (2001-2012)

MIMIC-III Critical Care Database

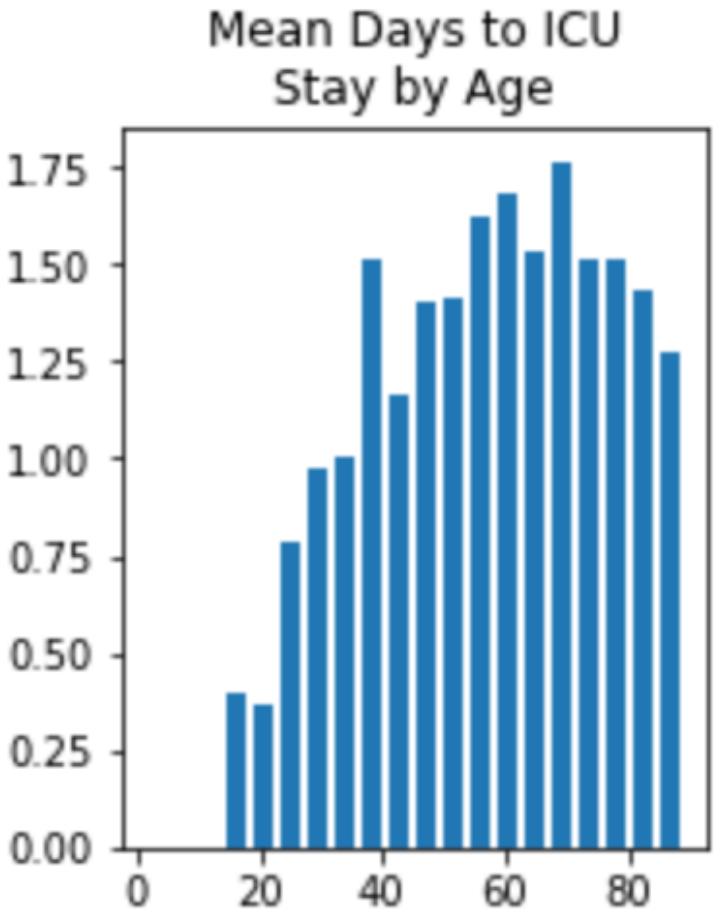
MIMIC-III (**M**edical **I**nformation **M**art for **I**ntensive **C**are III) is a large, freely-available database comprising deidentified health-related data associated with over forty thousand patients who stayed in critical care units of the Beth Israel Deaconess Medical Center between 2001 and 2012.

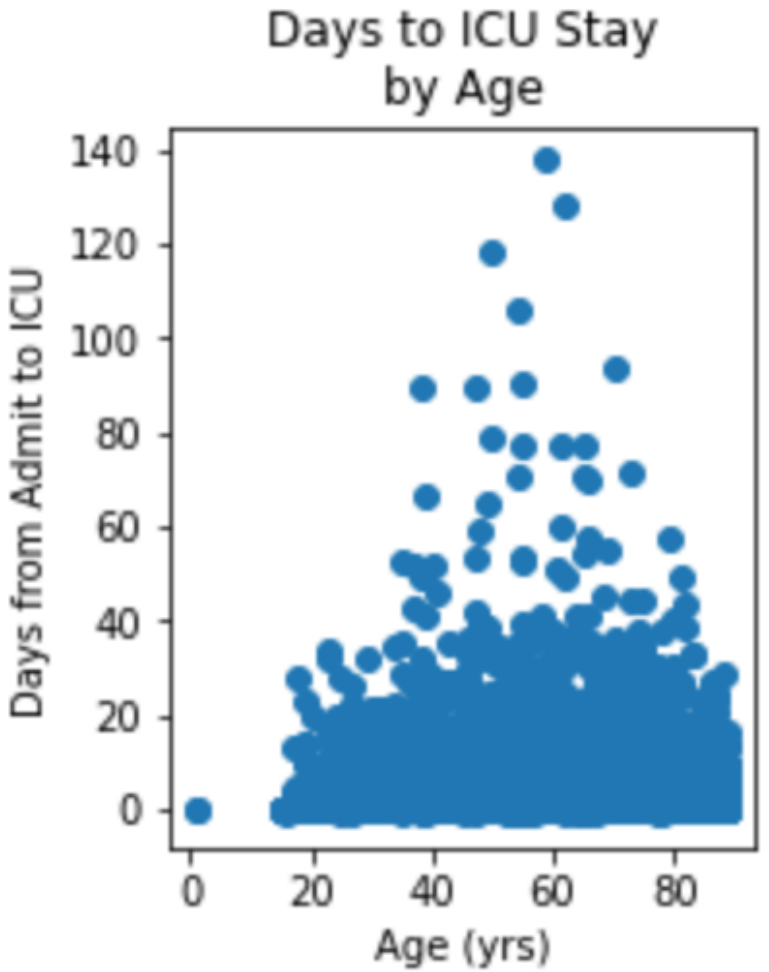
https://mimic.physionet.org/about/mimic/

https://github.com/MIT-LCP/mimic-code

DATA EXPLORATION

Age is a predictor of days to ICU stay

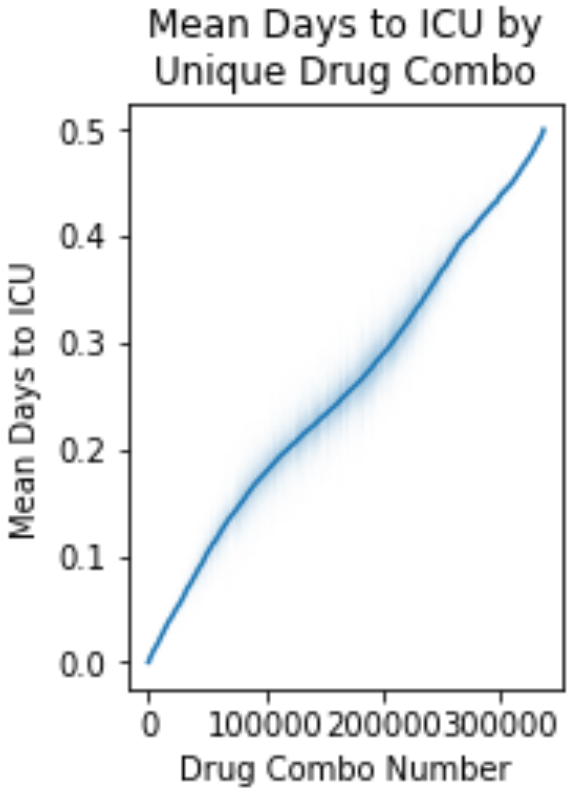




Pearson's r = 0.035 (p=1.77e-11)

DATA EXPLORATION

Certain drug types & drug combos co-occur with quick ICU transfers



Top drug pairs:

- Clobetasol Propionate Top & Dovonex 0.005% cream
- Insulin Glargine & Clobetasol Propionate Top
- Atorvastatin & Clobetasol Propionate Top
- Warfarin 5 MG Oral Tablet & Hydrocortisone 1 % Topical

Skin conditions, blood clots, diabetes, and high blood pressure

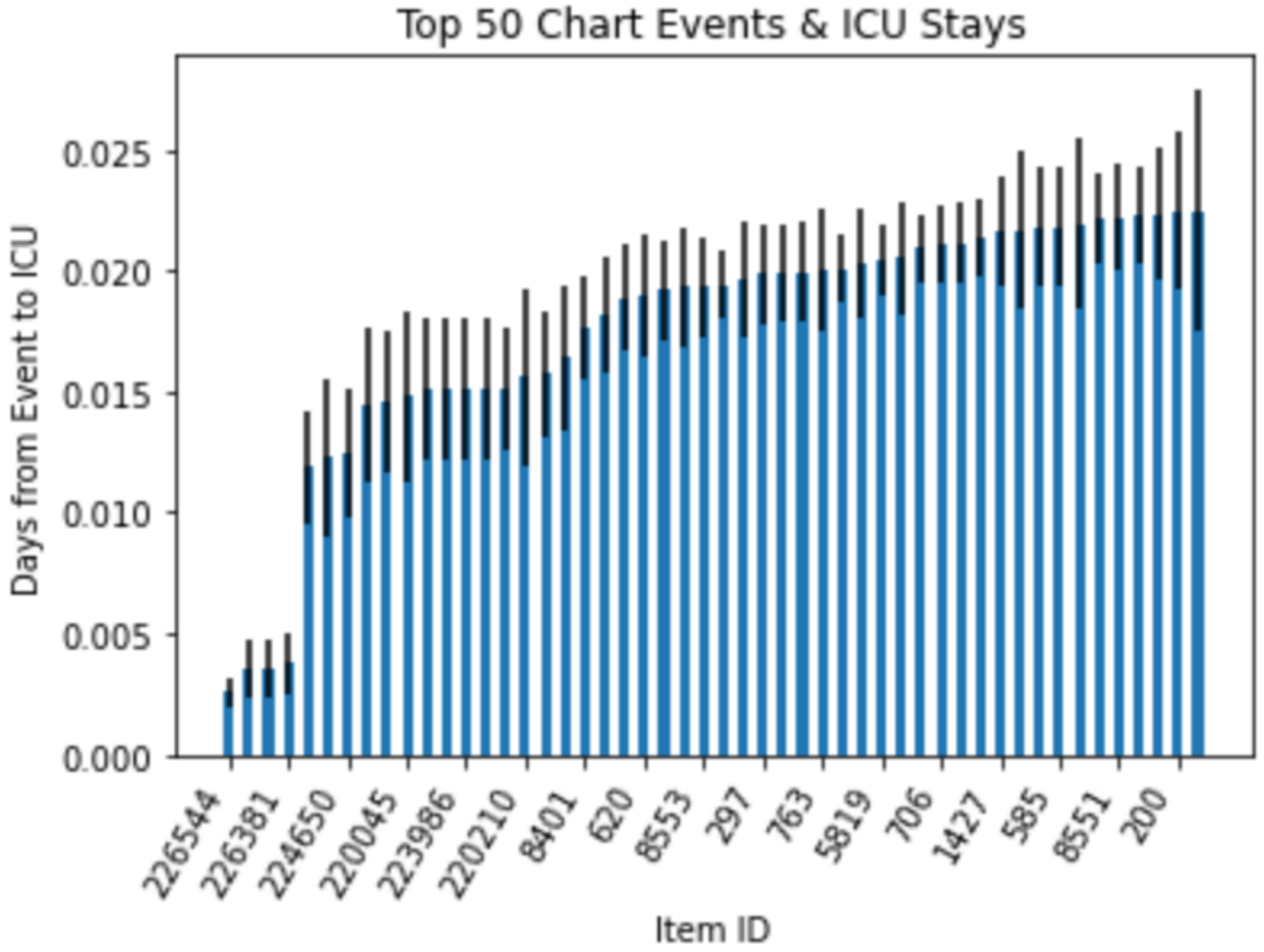
Top individual drugs:

- Famotidine
- Pantoprazole Sodium
- Heparin Sodium
- Ceftaroline Fosamil
- Sodium Chloride

Gastrointestinal distress, antibiotics, and minerals/electrolytes

DATA EXPLORATION

Chart events regarding vital signs most imminently precede ICU stays

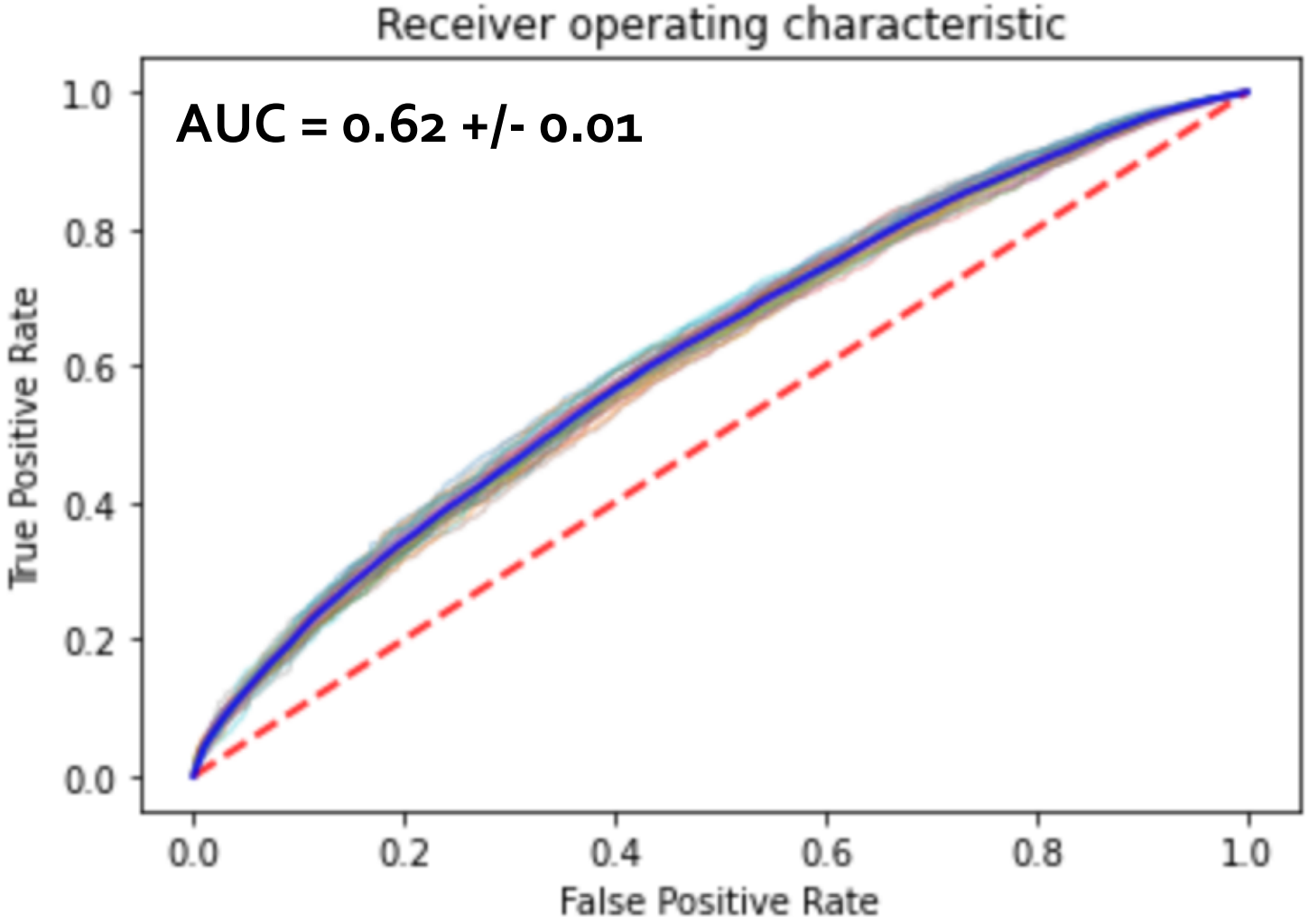


Top Chart Item ID Labels:

- Blood oxygenation
- Weight (lbs.)
- Sputum
- Blood pressure
- Lung vitals
- Heart vitals

LOGISTIC REGRESSION

Basic features alone yields AUC = 0.62 for predicting ICU admissions < 1 day.



Features: Gender, Admission Type, Admission Location, Insurance, Language, Religion, Marital Status, Ethnicity, Age

FUTURE GOALS

Design an application to compute ICU risk factor

1. Complete exploratory analyses (~1-1.5 weeks)
   - Validate/confirm
   - Analyze clinical notes (NLP)
   - Settle on model design
2. Build and test model (~4 weeks)
   - Neural network
3. Implement model in an application (~1-2 weeks)
   - Heroku

Thank You!

Questions?