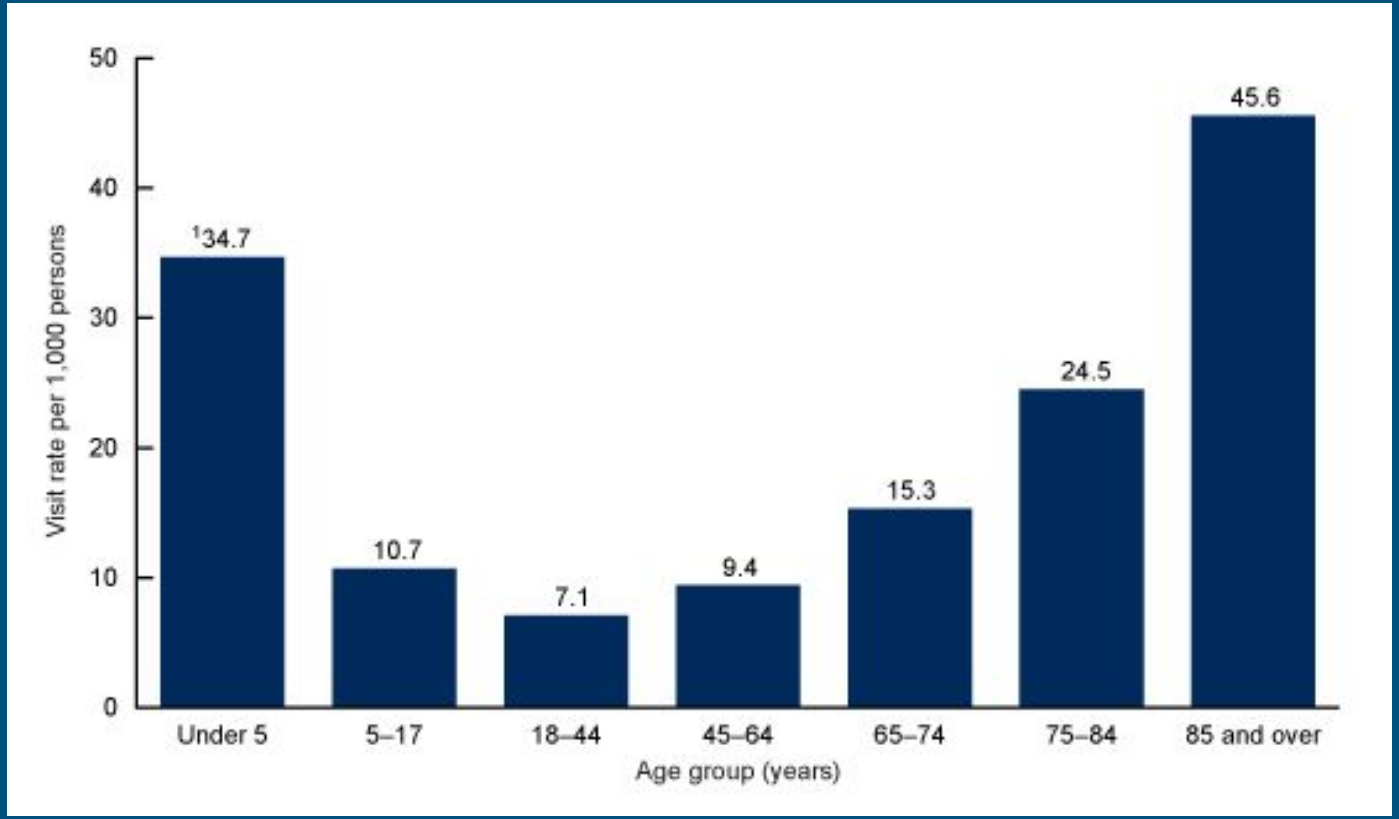
Predicting Pneumonia- Neural network model

Connecting data science to the clinic

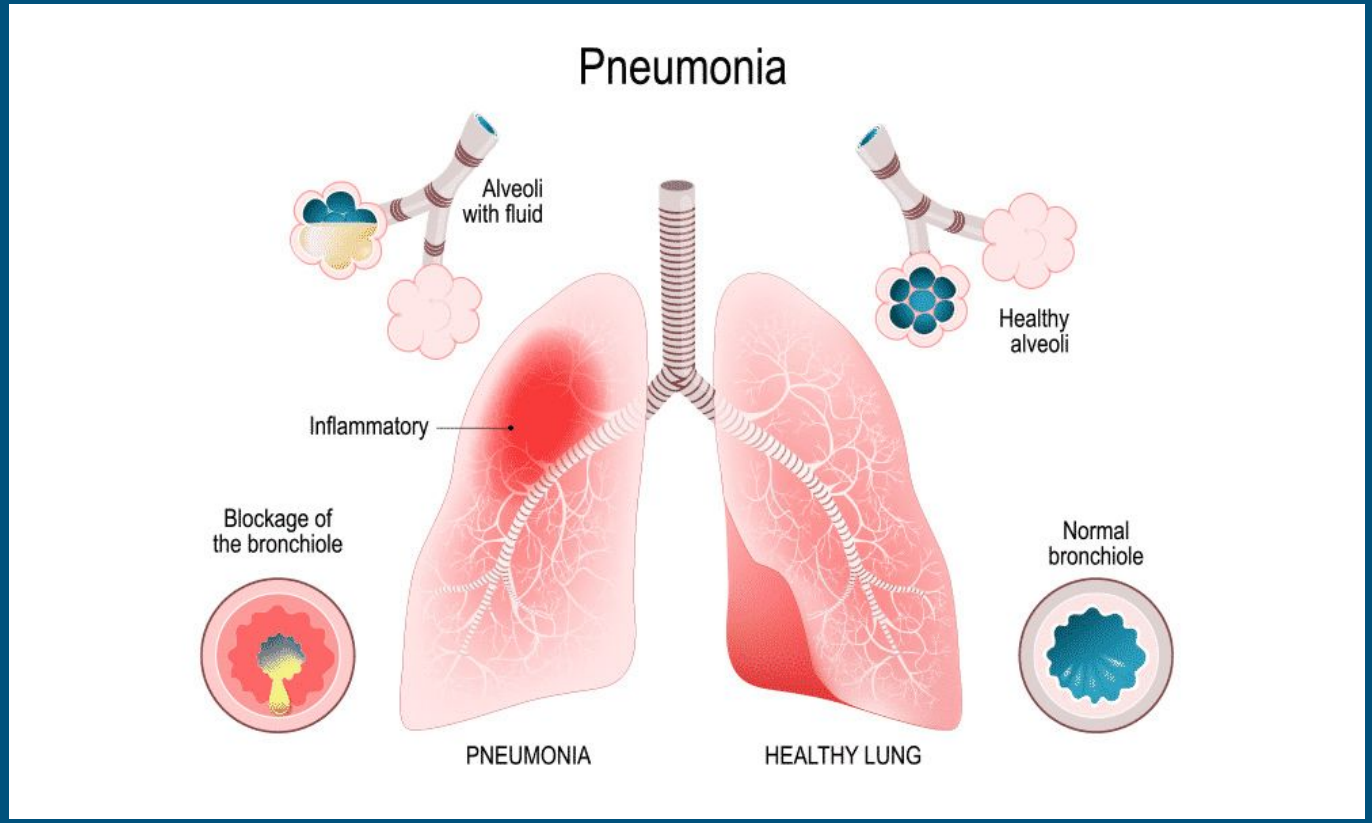
Intermountain HealthCare

- A Utah-based, not-for-profit system of 10 hospitals, 23 rural clinics.
- Network of more than 3,800 physicians and clinicians
- Leader in clinical quality improvement and efficient healthcare delivery

Hospital visits for Pneumonia - 2016-2018



Pneumonia - global health issue



Business Problem

Pneumonia is the fourth most common reason for a pediatric admission.

- 42% of delays, waiting for Radiology results
- 3 hours to generate report for CT study
- Medical imaging increases 5% per year
- Radiology positions increase 2% per year

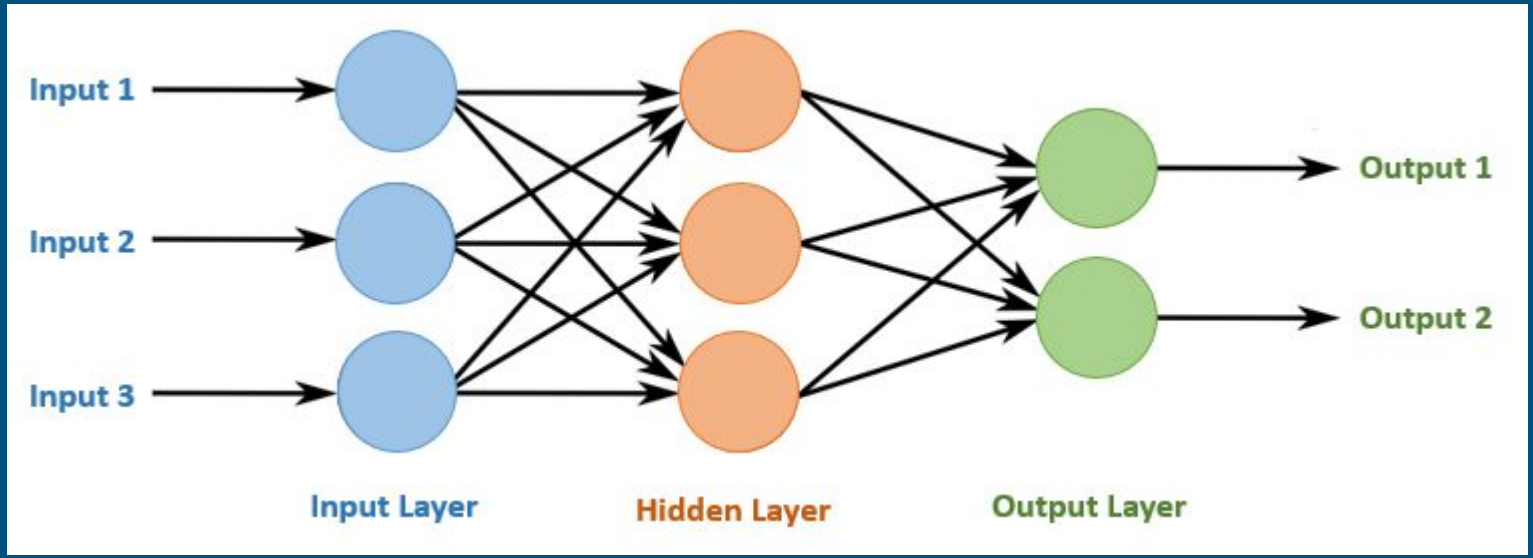
Three Needs in Radiology

- Increase number of radiology positions
- Increase awareness of radiology in medical school, more rotations
- Improve radiology efficiency: Decrease distraction, integrate Artificial Intelligence into the diagnostic pipeline

Data Science Goal

Decrease turnaround times in pneumonia diagnosis through the use of an imaging model that accurately identifies lungs with pneumonia in pediatric patients.

Neural Network Model



Data ~5800 Images

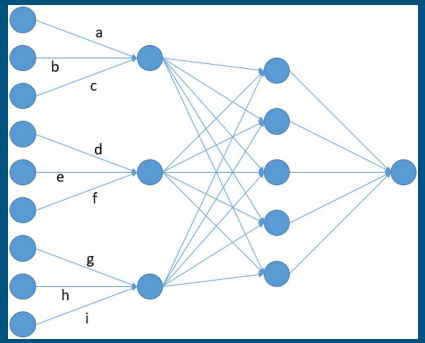
Normal

Bacterial

Viral

Image prep → Architecture → Tune → Evaluate

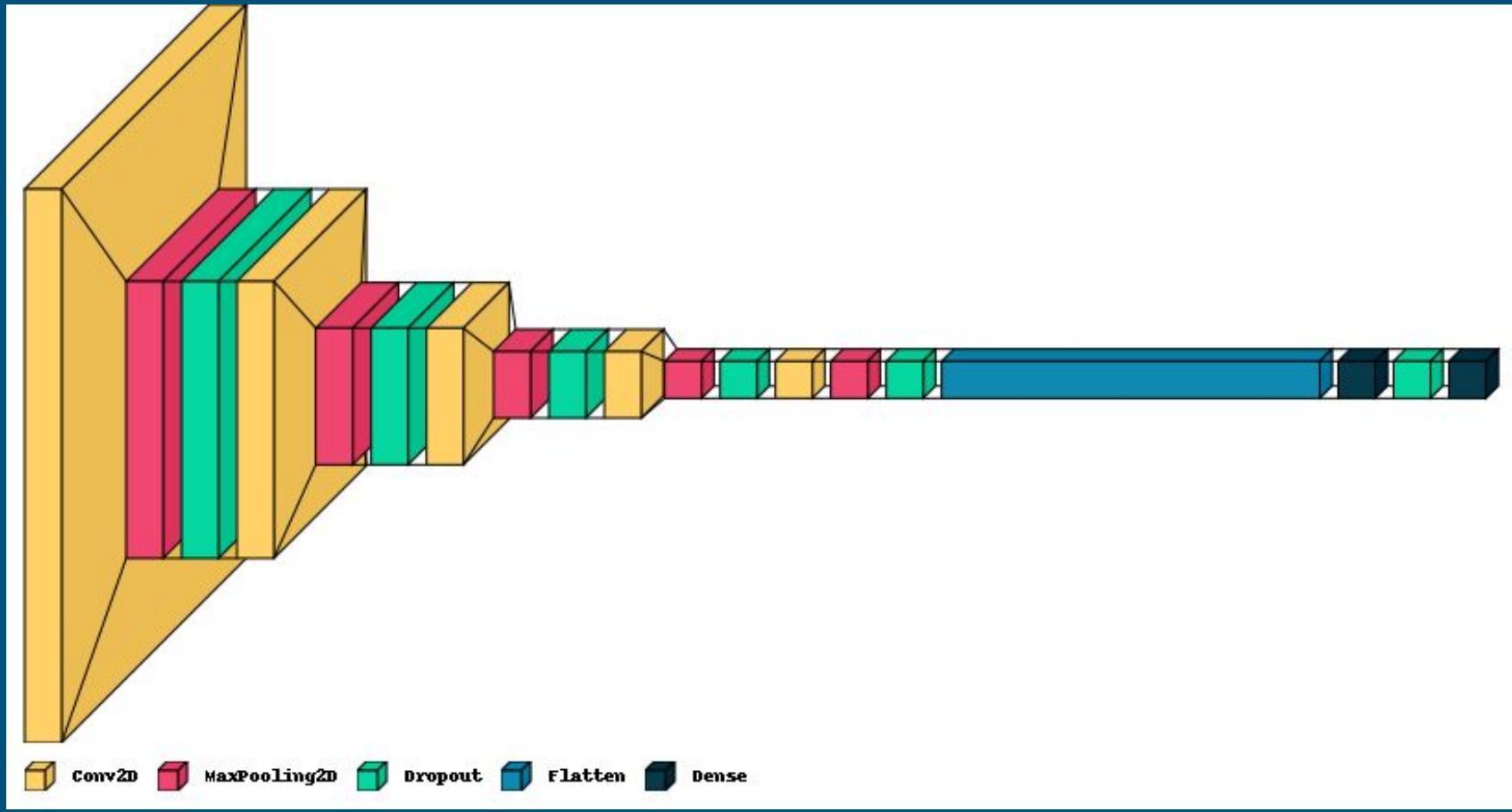
Training Data



Normal

Pneumonia

Test Data


Conv2D
MaxPooling2D
Dropout
Flatten
Dense

Model Boundaries

Pediatric Population < 5 years old

Does not identify origins or specify treatment

Accuracy is high, not perfect - False negatives and positives may occur

Recall Accuracy
97%

Recall

Rate of identifying true positives.

Avoid false negatives

Recommendation 1

Prototype the model in a controlled pediatric clinical setting to reduce turnaround time.

Model → Radiologist → Diagnosis

Radiologist → Model → Diagnosis

Recommendation 2

Neural Network models for one problem can be used for other related problems.

Elderly Population

- Gather quality controlled images labelled by experts, extend the model’s usefulness.

Thank you

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Data Science research,
Education

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