PATIENT DIAGNOSIS WITH MACHINE LEARNING

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How diagnosis is done

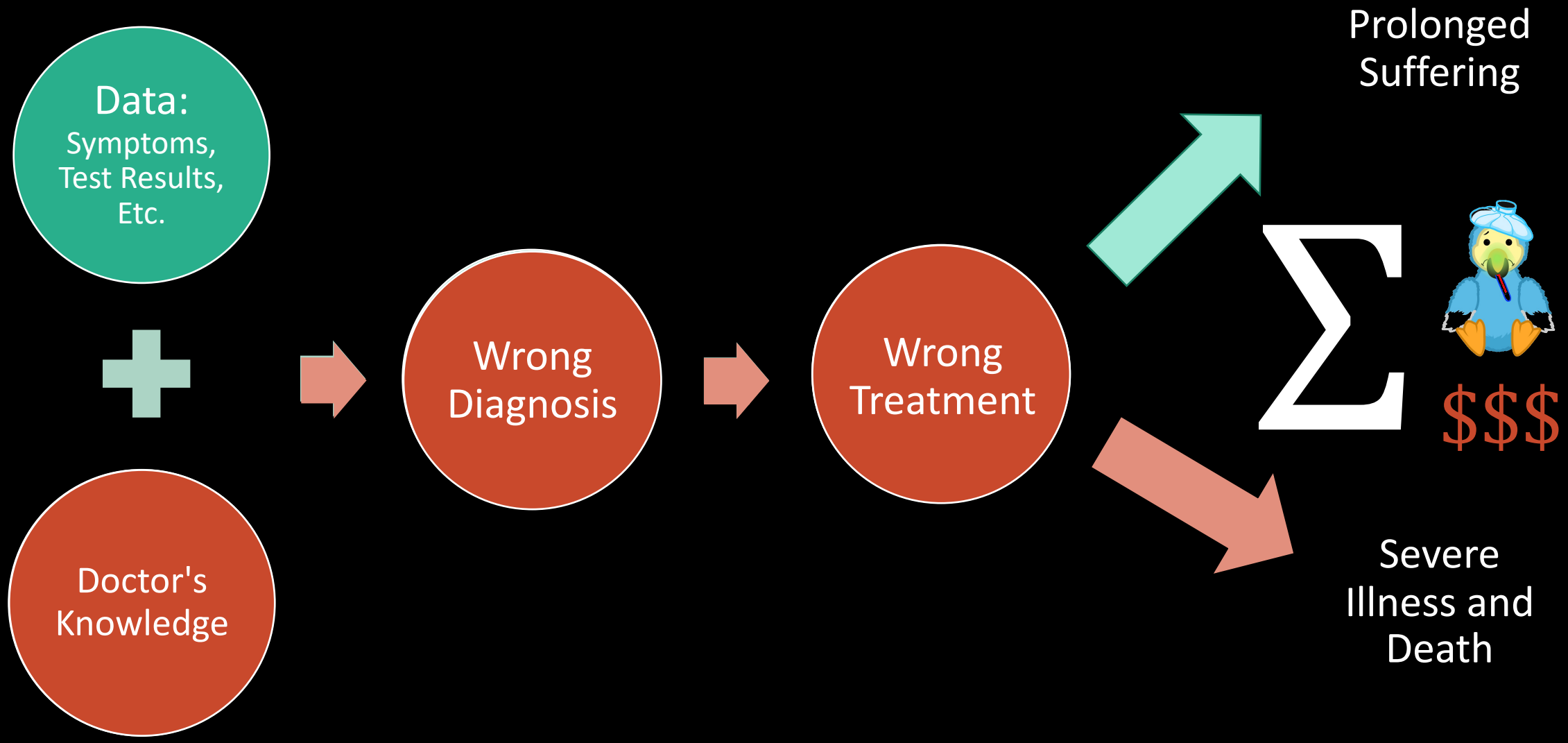
Data:
Symptoms,
Test Results,
Etc.

+

Doctor's
Knowledge

→ Diagnosis → Treatment

How can it go wrong?



What can we do?

Data:
Symptoms,
Test Results,
Etc.

+

Machine
Learning
Model

→ Right Diagnosis → Right Treatment → $$$

Goal:

build a multi-class classifier that can accurately classify a patient’s diagnosis from based on their presenting symptoms, with >95% accuracy.

The data: "Disease Prediction Using Machine Learning" from Kaggle

Data:

- 4962 patient observations
- 131 symptoms
- 41 diseases

Some light tidying to get the data ready for analysis and modeling

Data Handling

Duplicate Features

- One symptom had two associated columns with nearly identical names
- One column was empty
- Empty column dropped, other column renamed

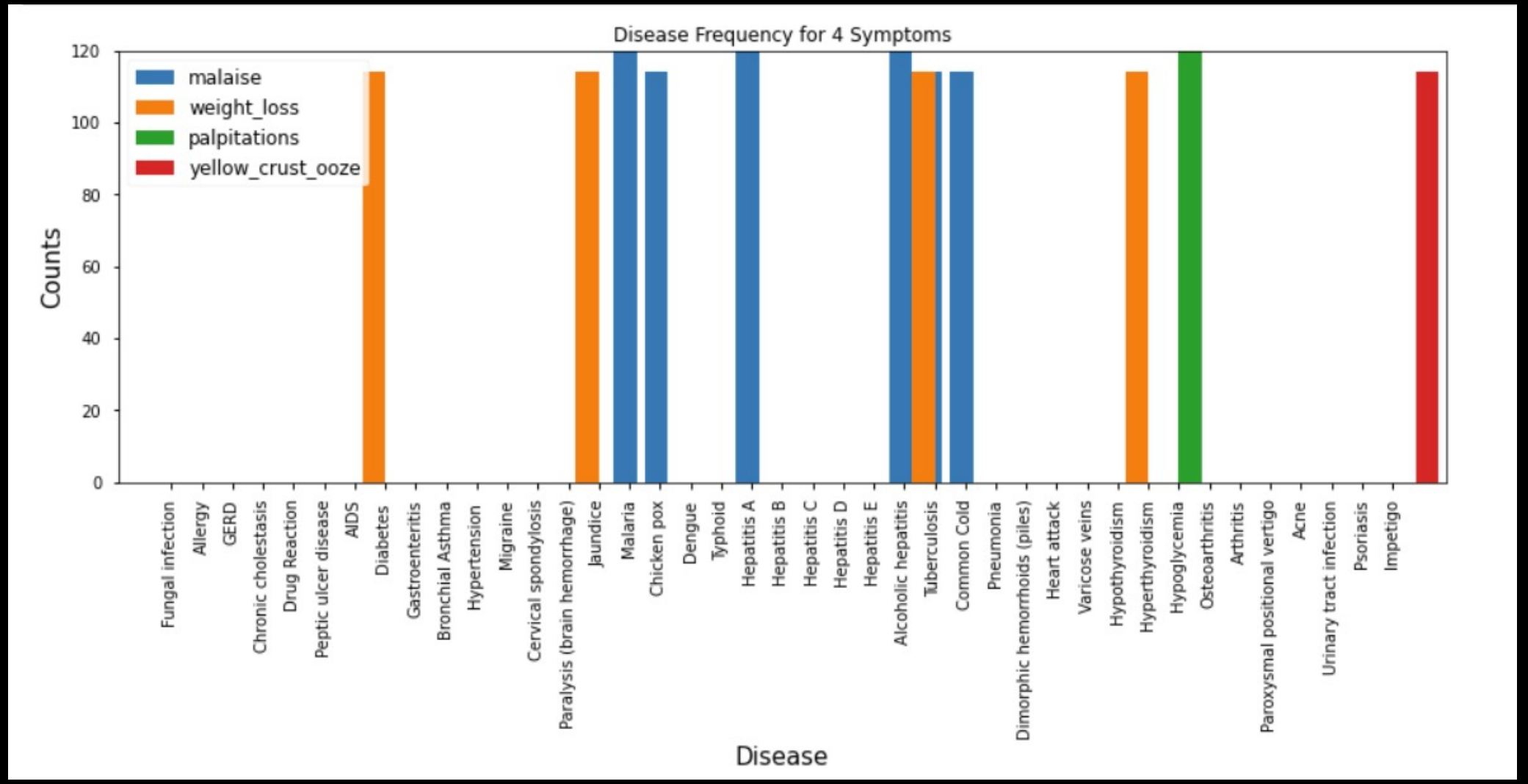
Formatting

- Several disease names had simple misspellings
  - Replaced with correct
- Some disease names had inconsistent formatting
  - Capitalized first letter

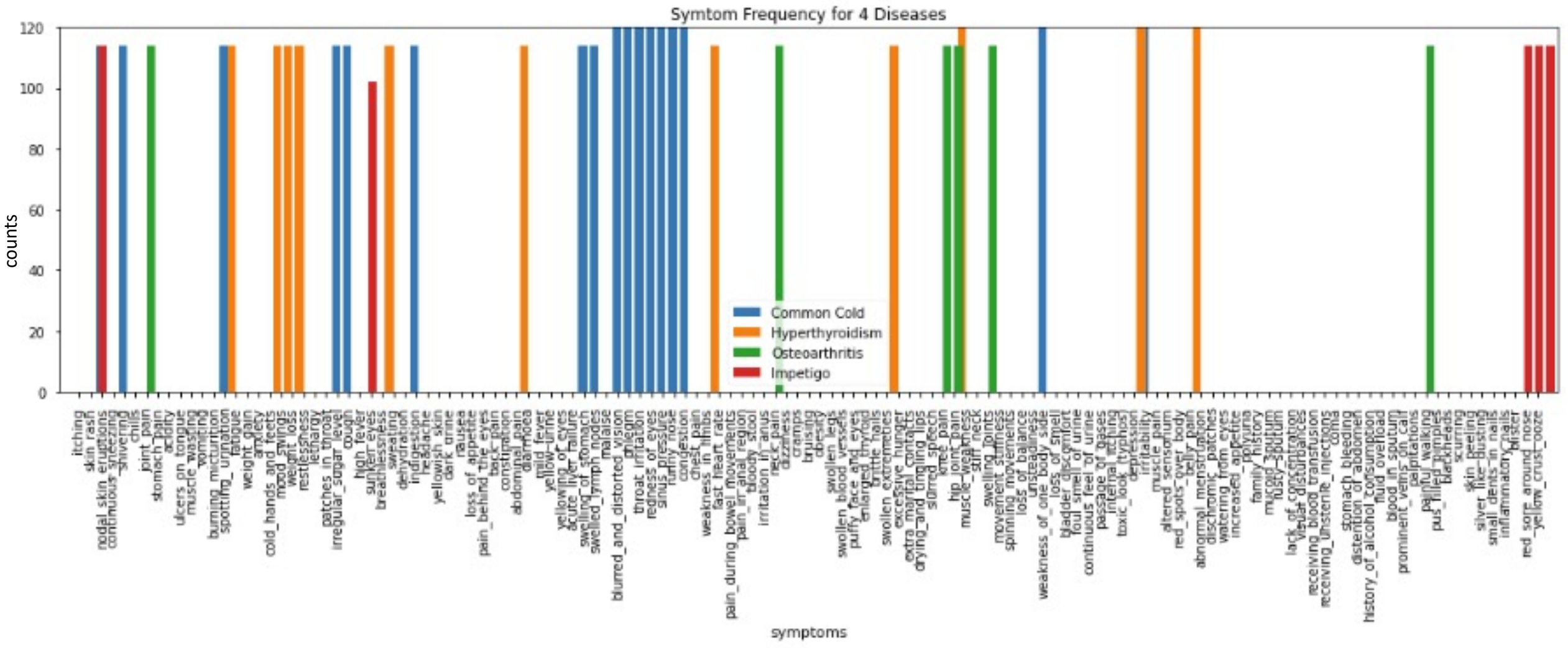
Label Encoding

- Disease names were label encoded prior to modeling

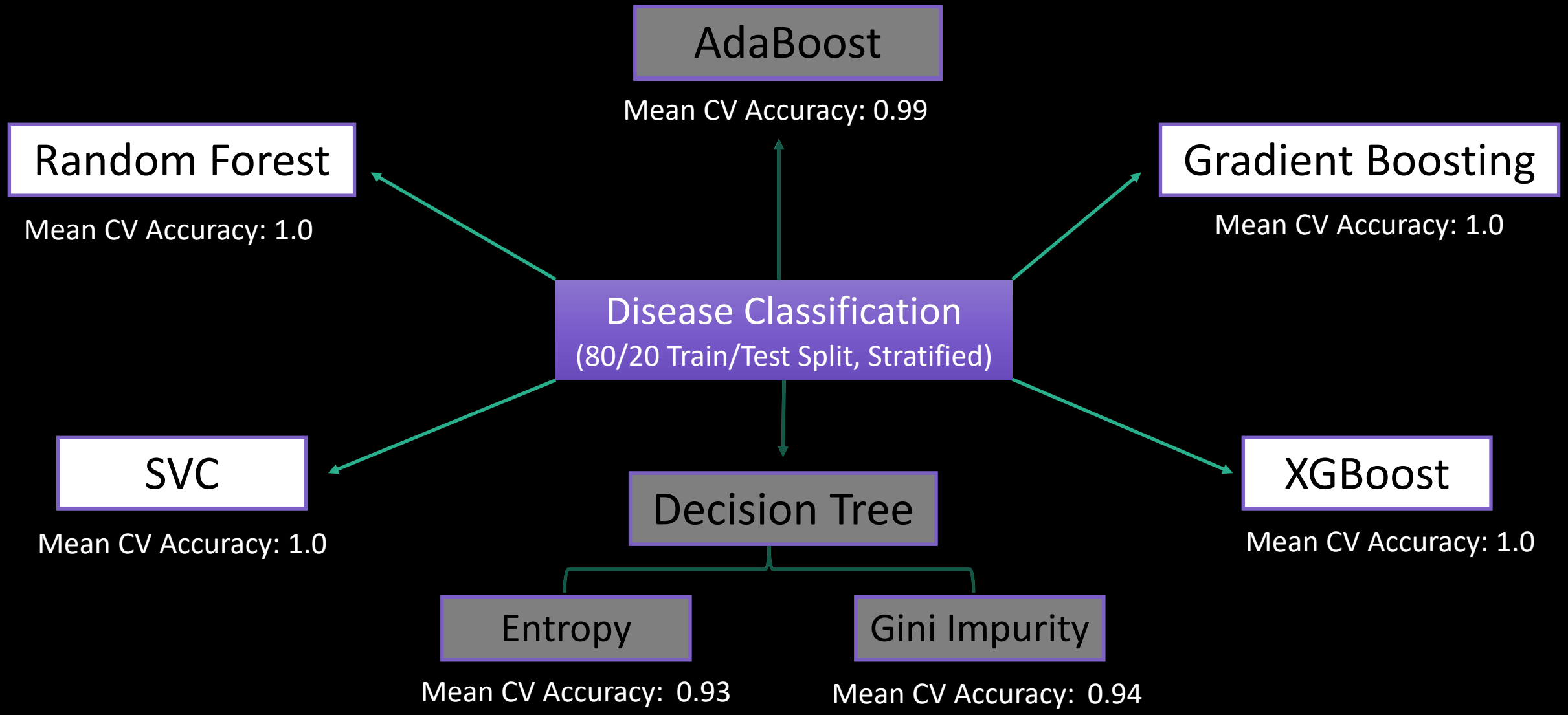
Symptoms can be indicated in one or more diseases



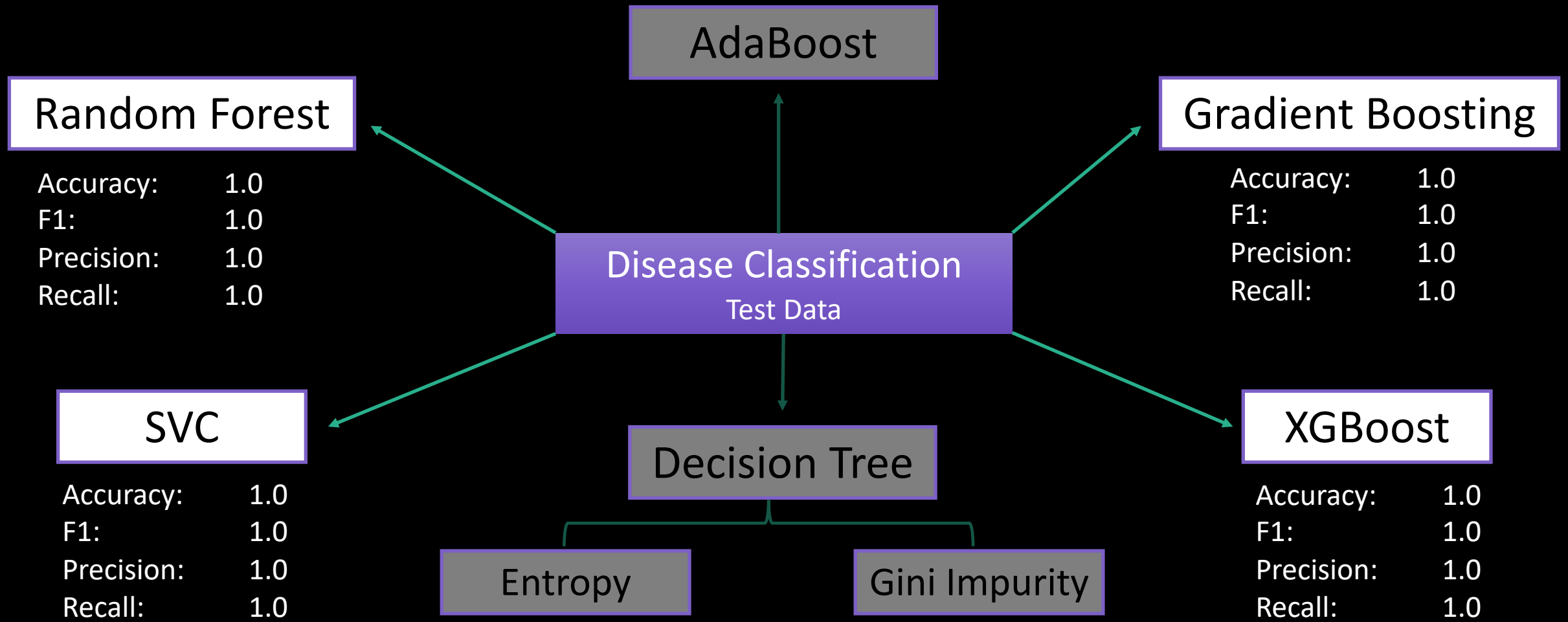
Each disease has a unique combination of symptoms



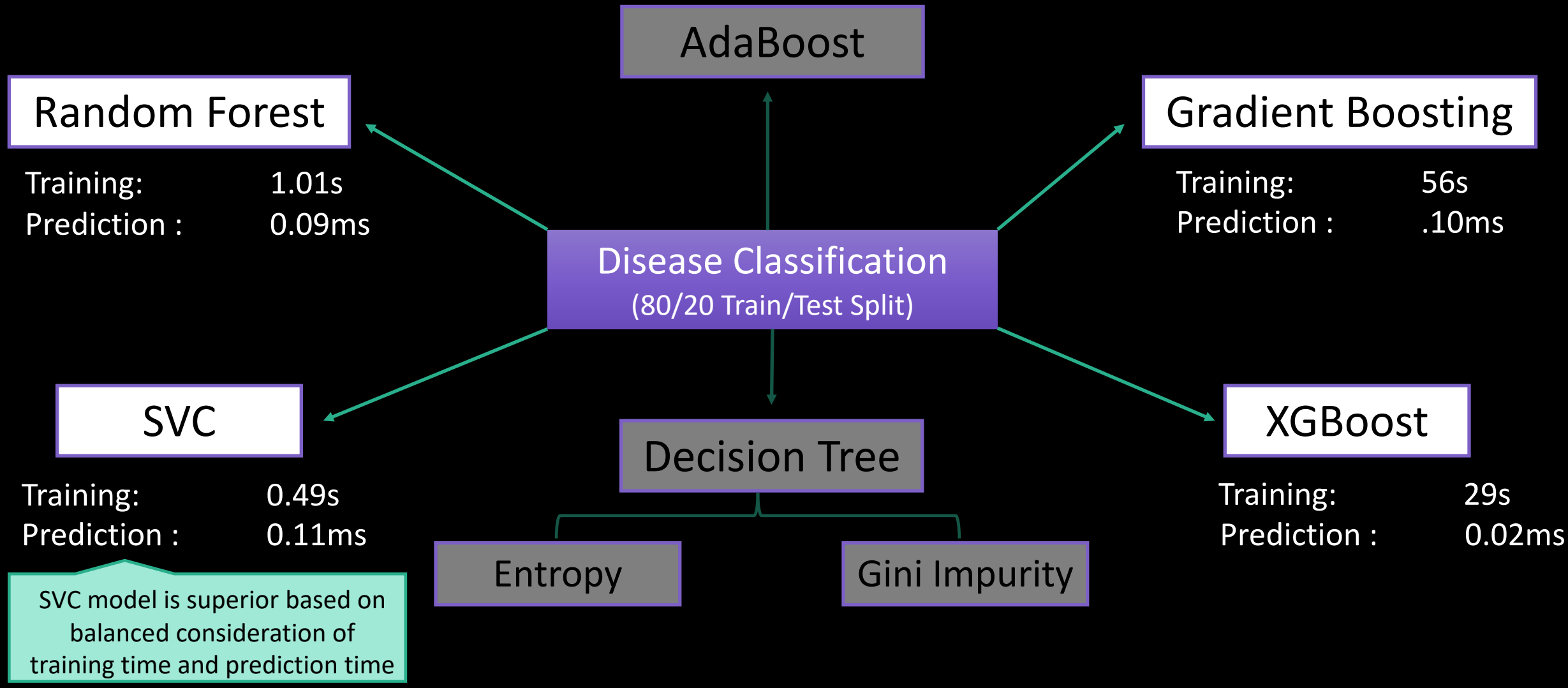
7 classification models were tuned and tested
4 had "perfect" CV accuracy scores



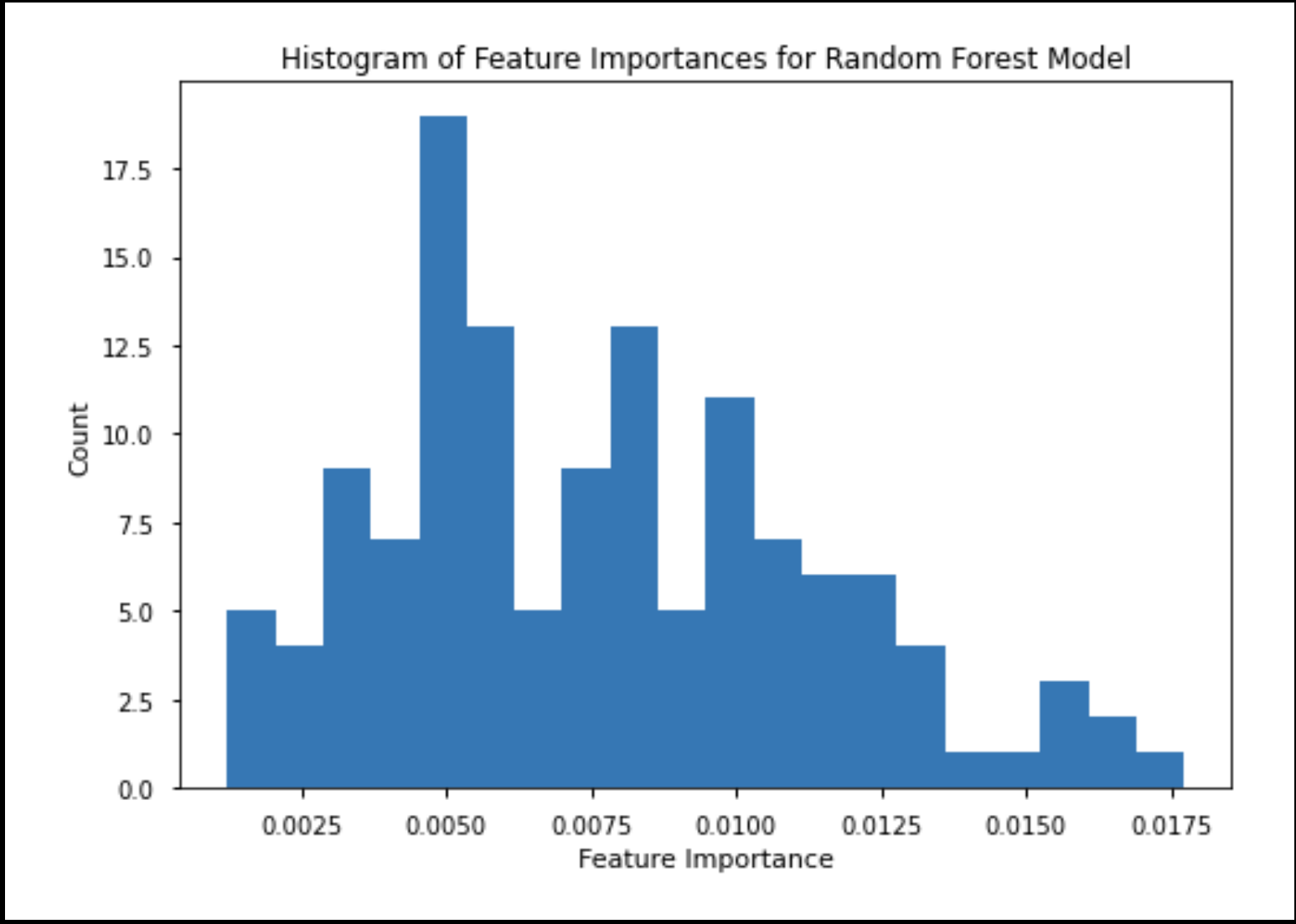
Performance on Unseen Test Data



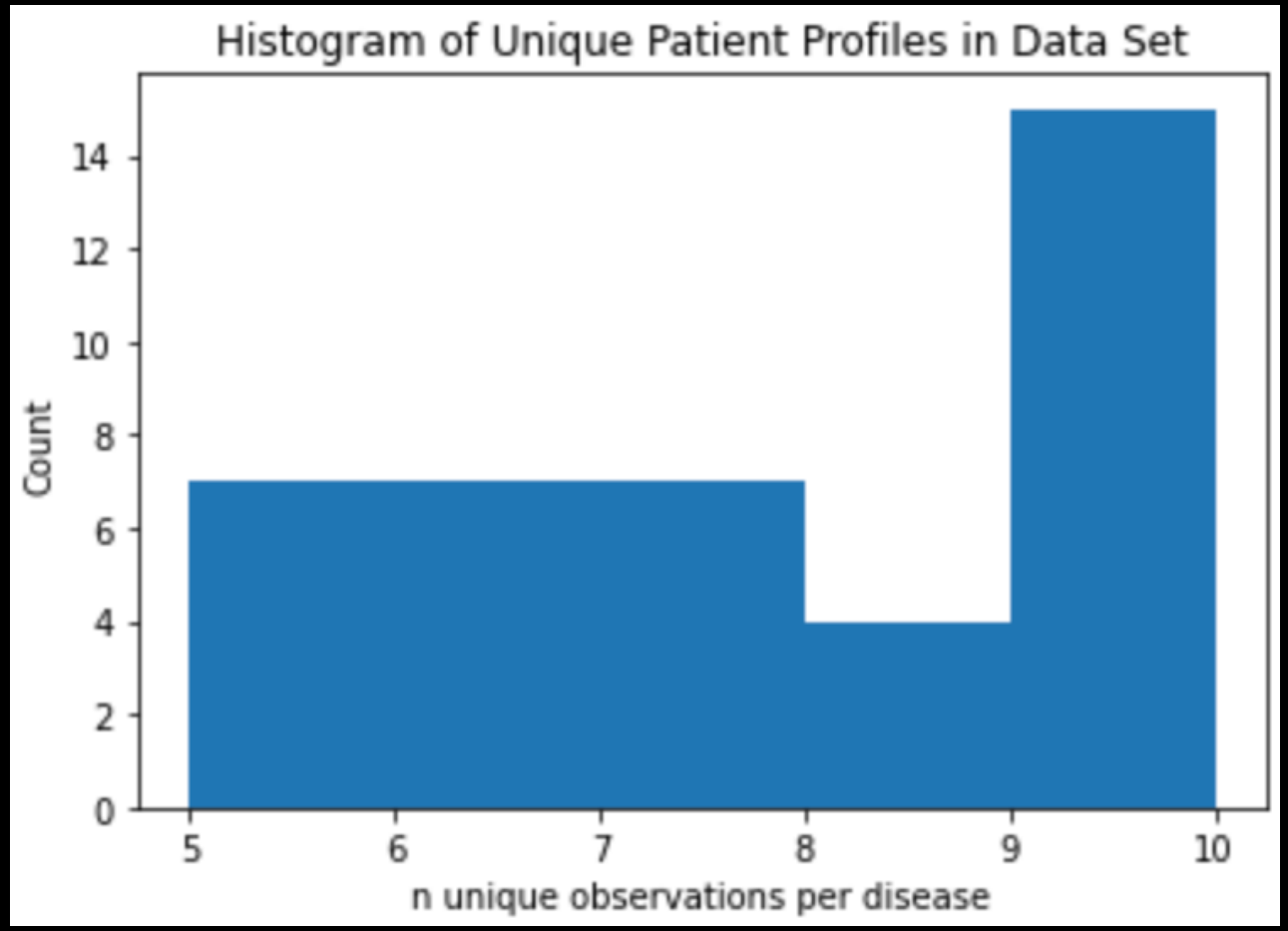
Training time and prediction time per patient to differentiate models



An analysis of feature importances reassures that the RF model is attributing similar weights to each symptom and that the model is valid



However, an investigation of duplicate values at this point told us the data set was almost entirely composed of duplicates…



- The data was most likely a poorly-generated synthetic dataset with no modeling value whatsoever!

- A difficult lesson was learned—you ***must*** ensure your data quality! "Garbage in, garbage out."

- The data must be replaced with a sufficient quantity of high-quality, real patient data before the true value of the models can be assessed. Fortunately, the code is ready to go for when the data comes in!

Where to go from here

- Proof of concept; needs further testing
- Need more volume, variety and quality of data:

- Recommendation System

Contact Info

For questions, suggestions, feedback and collaboration please email me at:

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