Ensemble Models: Stacking

Hunter Glanz

OUTLINE

Foundational Machine Learning

- You've learned about:
  - Traditional Regression
  - Logistic Regression
  - K-Nearest Neighbors
  - Discriminant Analysis
  - Support Vector Machines
  - Tree-Based Methods

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Remember *there's no free lunch*!

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    2. Stacking
    3. Boosting

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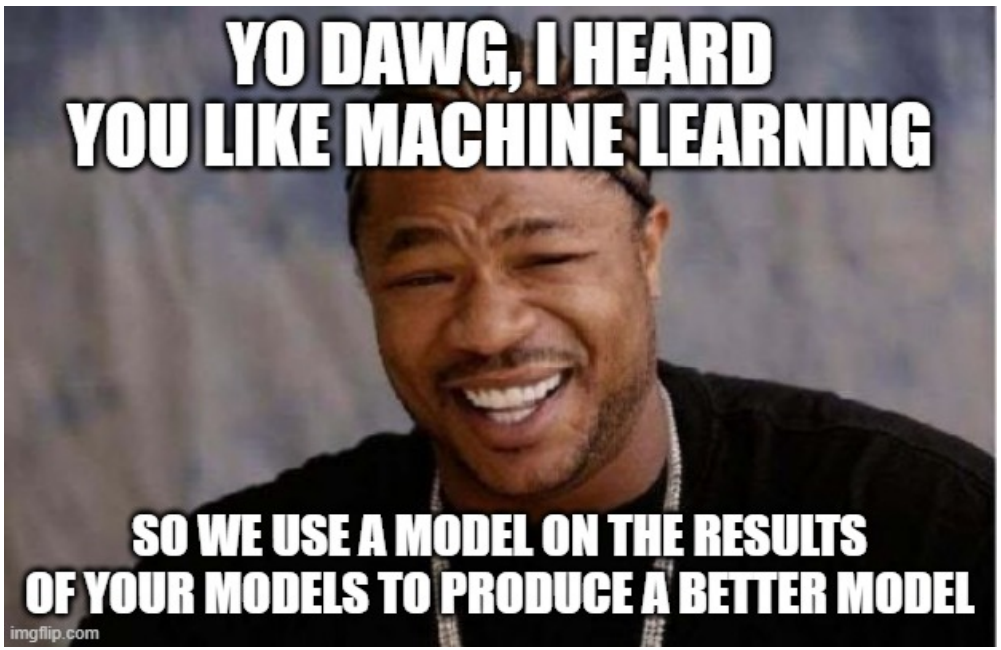
Today we will focus on **stacking**

Motivation

Given multiple machine learning models that are skillful on a problem, but in different ways, how do you choose which model to use (trust)?



The Stacking Approach

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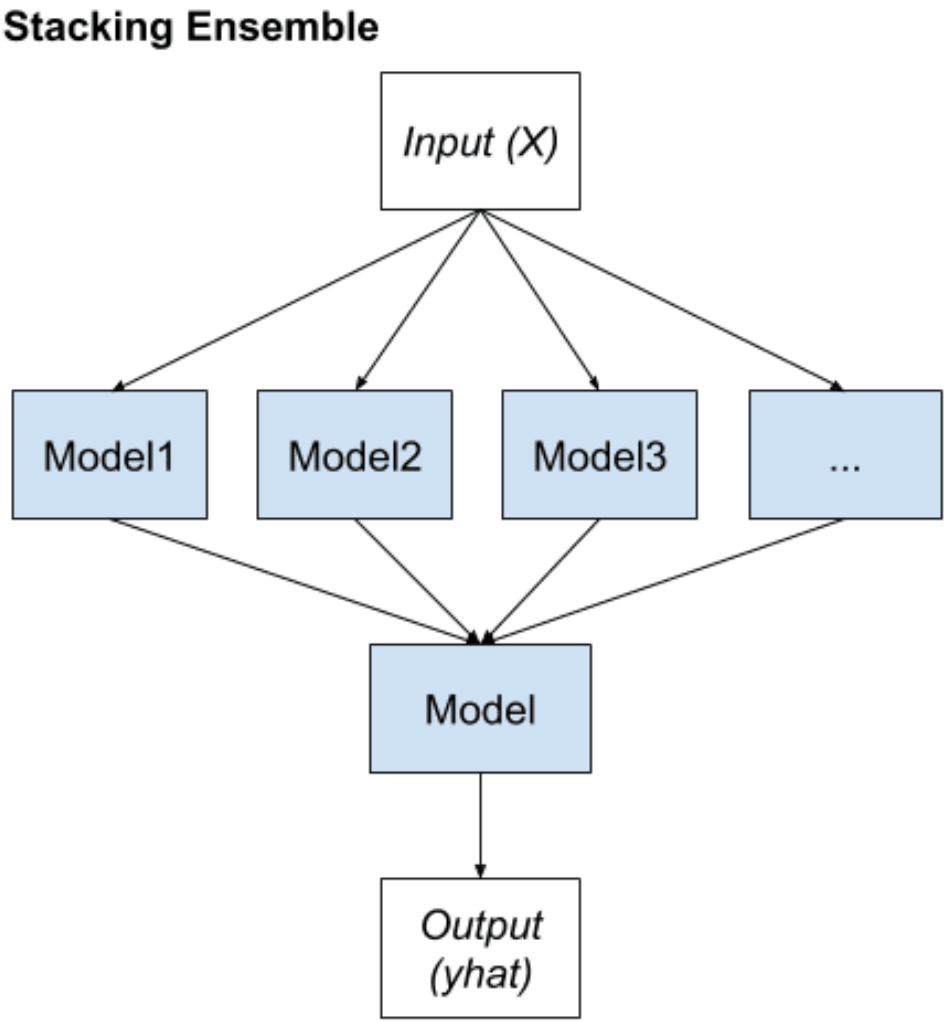
- The base models are typically different (e.g. not all decision trees)
- The base models are fit on the same dataset (e.g. instead of samples of the training dataset)

The Stacking Visual



The Stacking Implementation

- **Level-0 Models (Base-Models)**: Models fit on the training data and whose predictions are compiled.
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1. Base models are fit on training data. Predictions are made (and stored) on test data.
2. These test predictions are the inputs to the meta-model, where the outputs are the true response values in the test dataset.

One of the most common ways to set this up is via k-fold cross-validation

Stacking Notes

- Base-models are often complex and diverse (you can even use other ensemble methods as base-models).
- Meta-model is often simple, providing a smooth interpretation of the predictions made by the base models.
  - As such, linear models are often used as the meta-model, although this is not required.