Boosting: AdaBoost

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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
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Today we will focus on **AdaBoost**

Motivation

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Most people cite **Adaptive Boosting (AdaBoost)** by Freund and Schapire (1997) as the big emergence of boosting.

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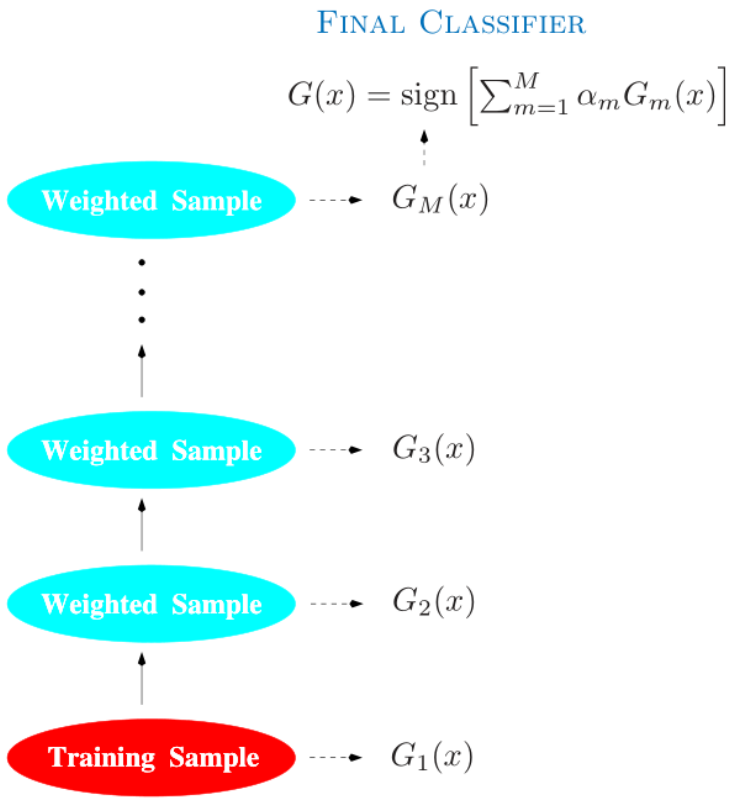
Sequentially apply the weak classification algorithm to repeatedly modified versions of the data.

The AdaBoost.M1 Visual



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  - **Giver higher influence to the more accurate classifiers in the sequence**
- The weighted samples/data (w_i):
  - Weights applied to each of the training observations
  - Initially all set to $w_i = 1/N$
  - **Observations that are misclassified have their weights increased, whereas weights are decreased for those correctly classified**

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  - Implementations have converged on some very popular and successful versions
- Elements of Statistical Learning example (pg. 339, not PDF page):
  - Each weak learner is a "stump": two-terminal node classification tree
  - Boosting reduces the prediction error rate by almost a factor of four
  - It outperforms a single large classification tree

Small trees are popular choices for the weak learners