# Support Vector Machine

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Bootstrapping

- the bootstrap method refers to random sampling with replacement
- it can test the stability of a solution
- Bootstrapping is used in both Bagging and Boosting
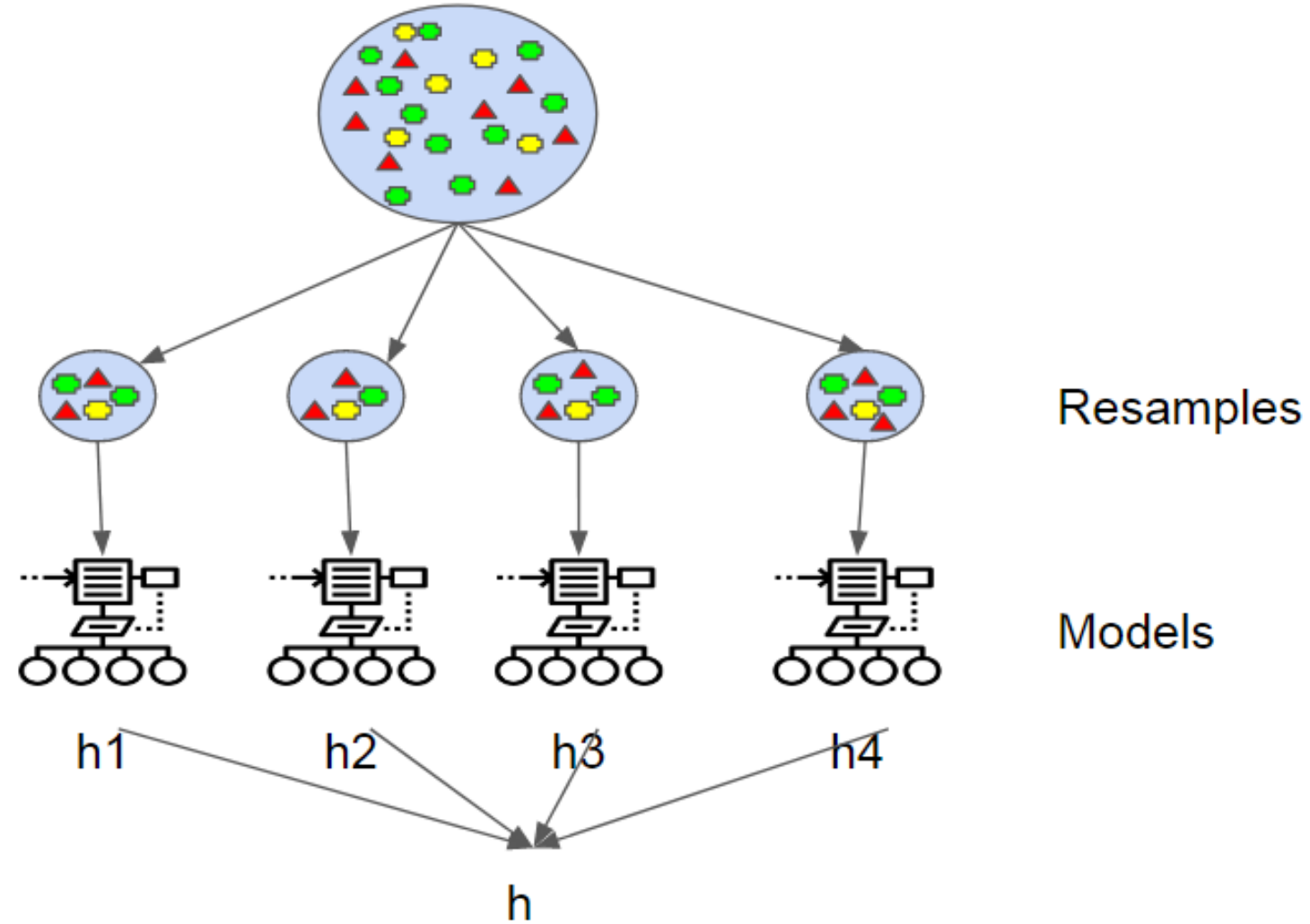- It helps to reduce overfitting

Bootstrapping
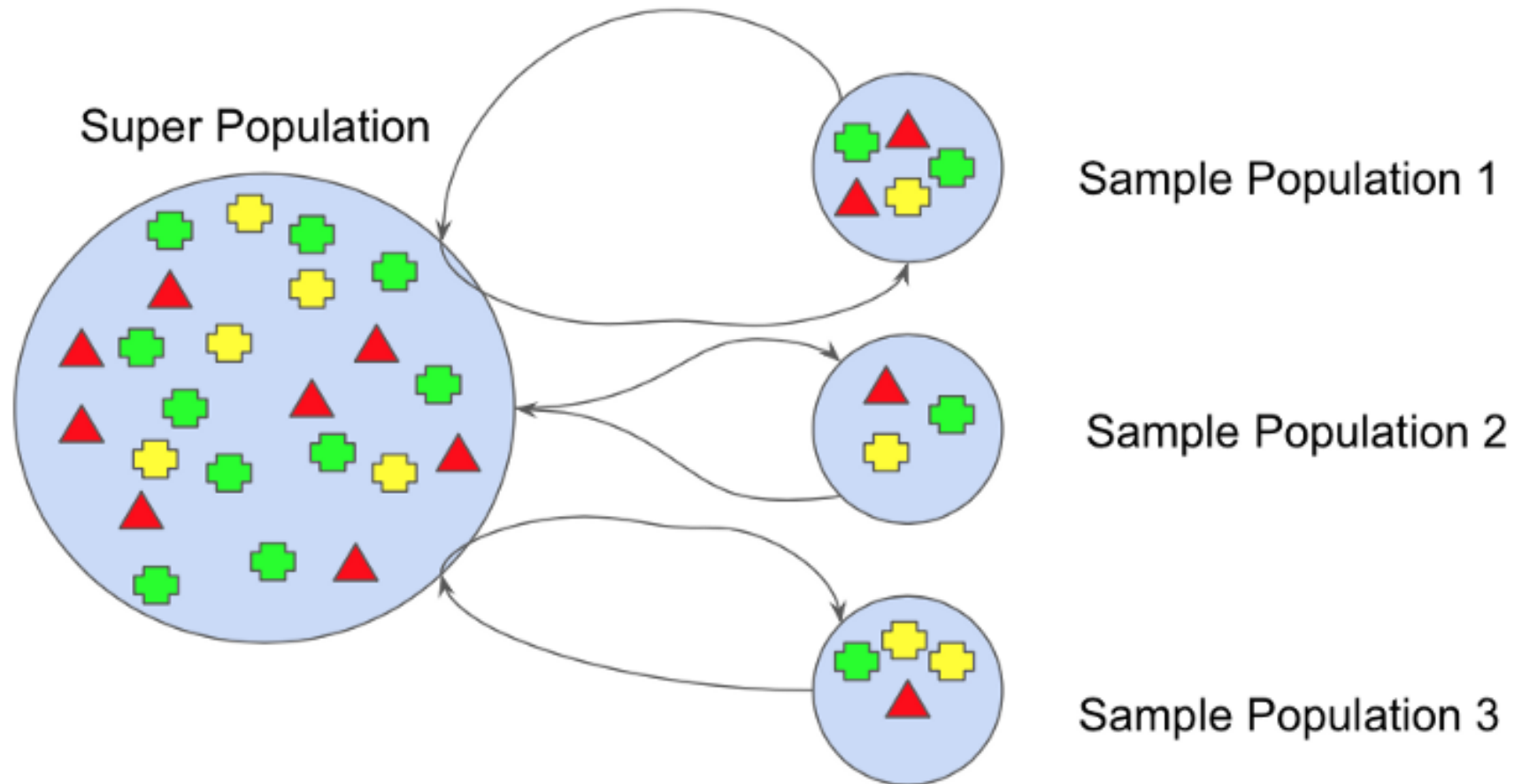
Bagging

- **Bagging actually refers to (Bootstrap Aggregators)**
- **It helps to reduce variance or overfitting**
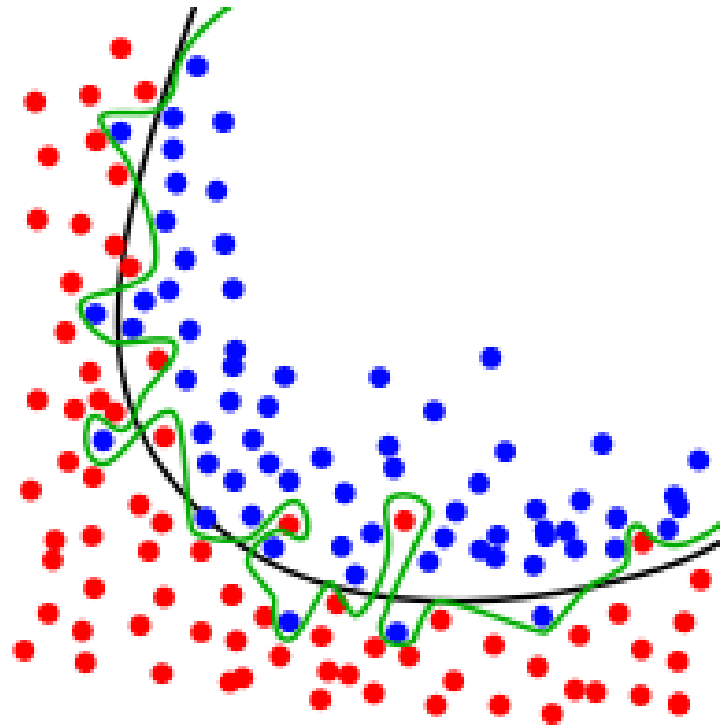
Bagging

Bagging

When Bagging works?
Under-fitting and over-fitting

- **Under-fitting:**
  - High bias (models are not accurate)
  - Small variance (smaller influence of examples in the training set)
- **Over-fitting:**
  - Small bias (models flexible enough to fit well to training data)
  - Large variance (models depend very much on the training set)
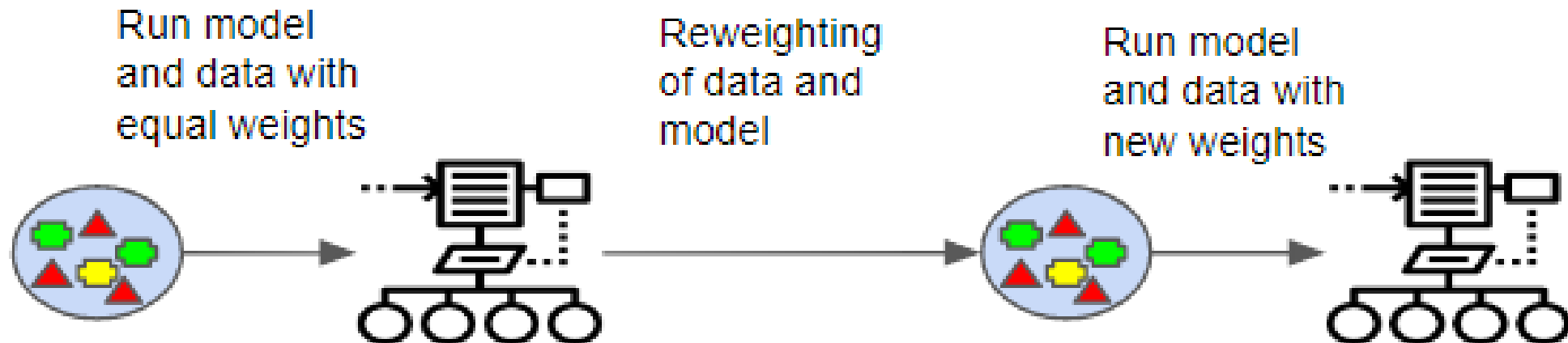
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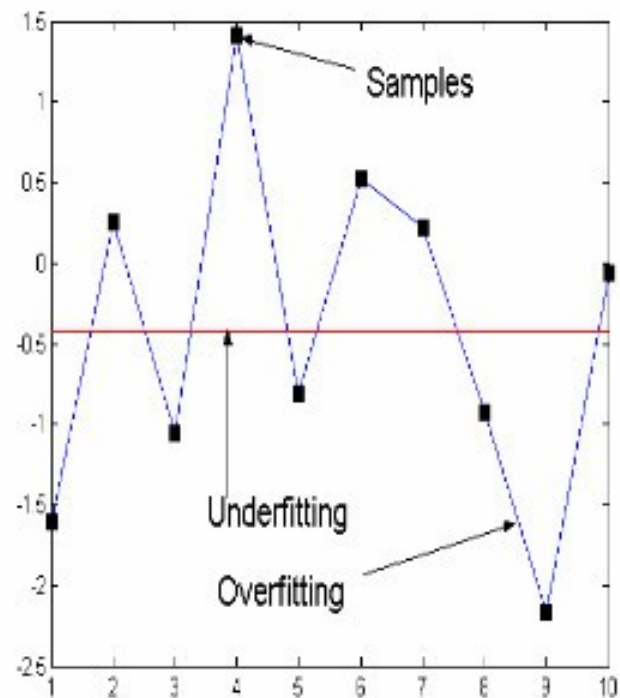
Boosting

- **Boosting refers to a group of algorithms that utilize weighted averages to make weak learners into stronger learners.**
- **Unlike bagging that had each model run independently and then aggregate the outputs at the end without preference to any model**
- **Boosting is all about "teamwork".**

Boosting

- **In boosting, the model's error rates are kept track of because better models are given better weights.**

Run model and data with equal weights → Reweighting of data and model → Run model and data with new weights

What is SVM?

- SVM is a supervised learning algorithm
- we plot each data item as a point in n-dimensional space
- Then, we perform classification by finding the hyper-plane that differentiate the two classes very well
- can be used for both classification and regression problems
- Support Vectors are simply the co-ordinates of individual observation

Any Question?