COURSE OUTLINE: COMPLETED

DATA EXPLORATION

SUPERVISED LEARNING: REGRESSION

SUPERVISED LEARNING: CLASSIFICATION

UNSUPERVISED LEARNING

VARIOUS TOPICS

LOGISTIC REGRESSION

NAIVE BAYES

RANDOM FORESTS

SUPPORT VECTOR MACHINES

COMPETITION (TODAY)

Questions?

I. REVIEW

	continuous	*categorical*
supervised	*regression*	*classification*
unsupervised	*dimension reduction*	*clustering*

What supervised algorithm should I pick for which problem?

Try them all with varying regularization parameters and pick the one with the **best cross-validation results**

To avoid overfitting on the test set, you might want to use three different sets: training set, cross-validation set, test set

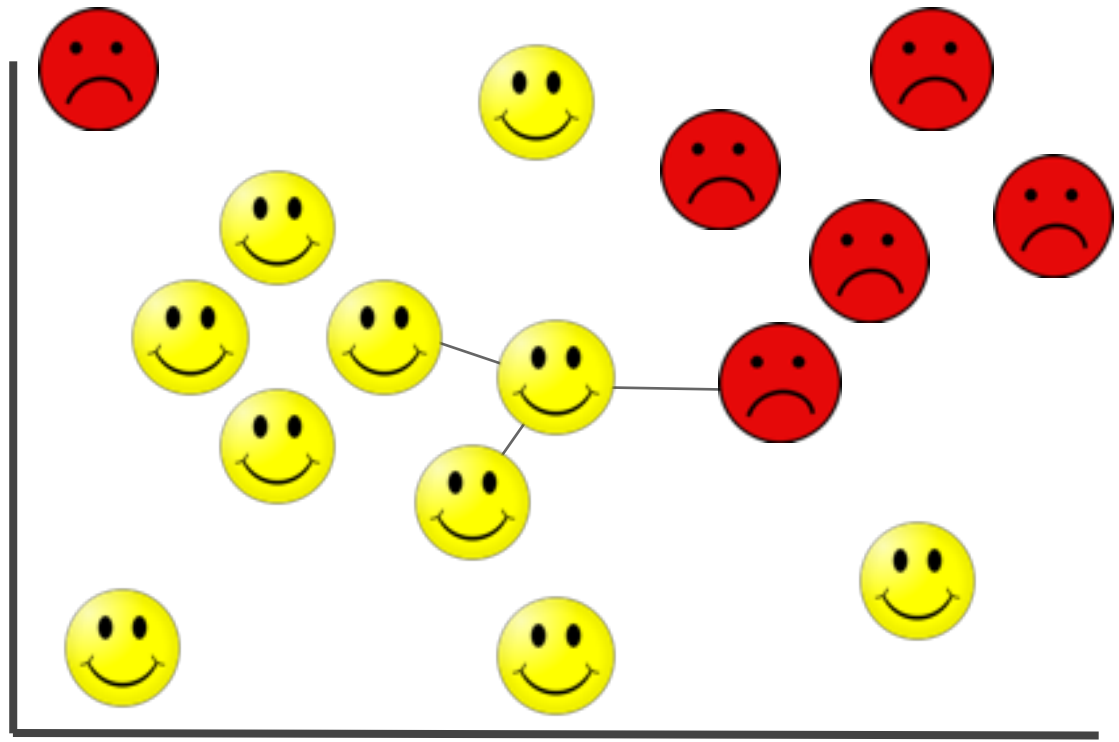
	kNN	*Logistic*	*NB*	*RF*
Linear	-	+	+	-
Interpretation	-	+	+	-
Feature impact	-	+	+	+
Configuration	+	+	+	+
Overfitting	*k*	*L1/L2*	Prior	*n* trees
Scalable	-	+	+	-

Choose k

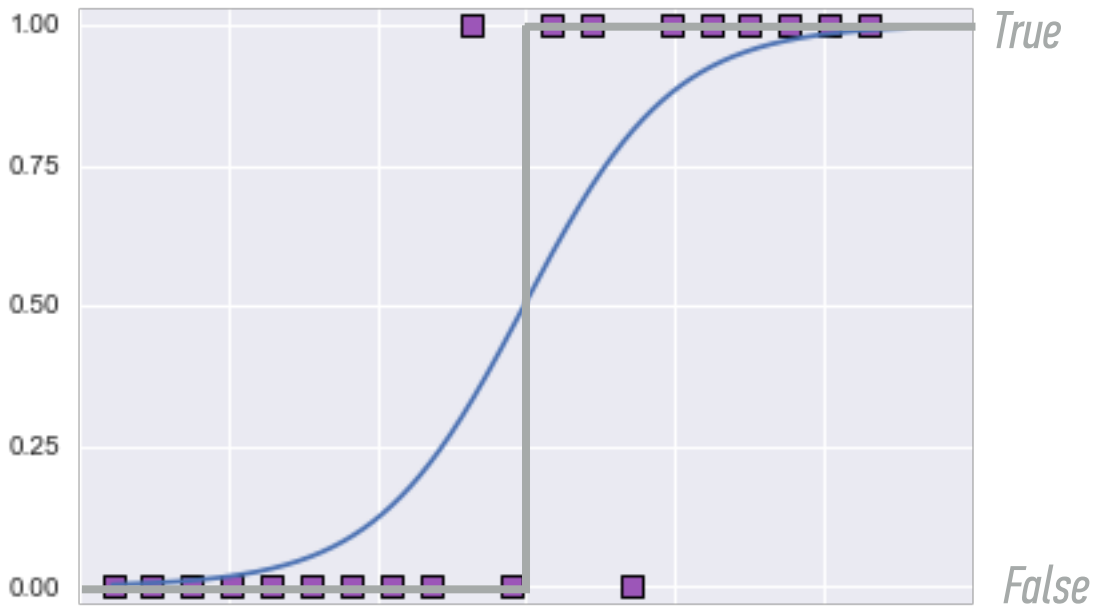
e.g., k = 3

Find k nearest neighbors

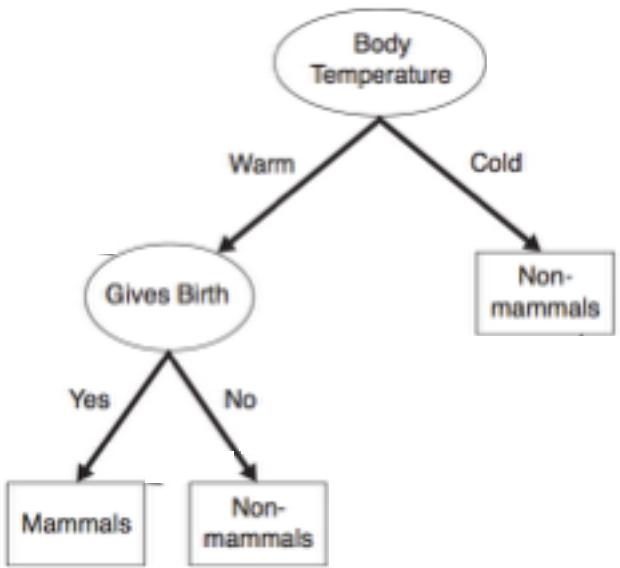
Take majority vote



Logistic regression gives us predicted probabilities, which then could be 'snapped' to class labels



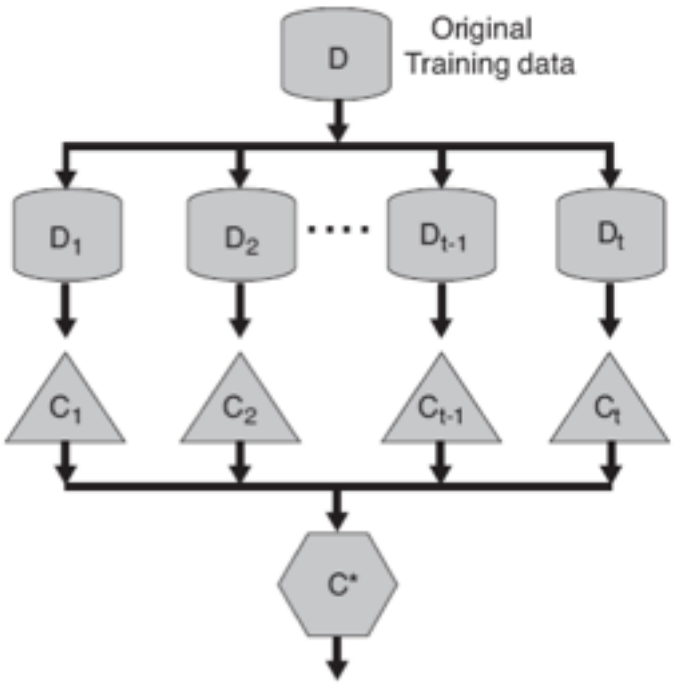
A decision tree for mammal classification...



...may be an accurate way of describing the dataset

Name	Body Temperature	Skin Cover	Gives Birth	Aquatic Creature	Aerial Creature	Has Legs	Hiber-nates	Class Label
human	warm-blooded	hair	yes	no	no	yes	no	mammal
python	cold-blooded	scales	no	no	no	no	yes	reptile
salmon	cold-blooded	scales	no	yes	no	no	no	fish
whale	warm-blooded	hair	yes	yes	no	no	no	mammal
frog	cold-blooded	none	no	semi	no	yes	yes	amphibian
komodo dragon	cold-blooded	scales	no	no	no	yes	no	reptile
bat	warm-blooded	hair	yes	no	yes	yes	yes	mammal
pigeon	warm-blooded	feathers	no	no	yes	yes	no	bird
cat	warm-blooded	fur	yes	no	no	yes	no	mammal
leopard shark	cold-blooded	scales	yes	yes	no	no	no	fish
turtle	cold-blooded	scales	no	semi	no	yes	no	reptile
penguin	warm-blooded	feathers	no	semi	no	yes	no	bird
porcupine	warm-blooded	quills	yes	no	no	yes	yes	mammal
eel	cold-blooded	scales	no	yes	no	no	no	fish
salamander	cold-blooded	none	no	semi	no	yes	yes	amphibian

source: http://www-users.cs.umn.edu/~kumar/dmbook/ch4.pdf

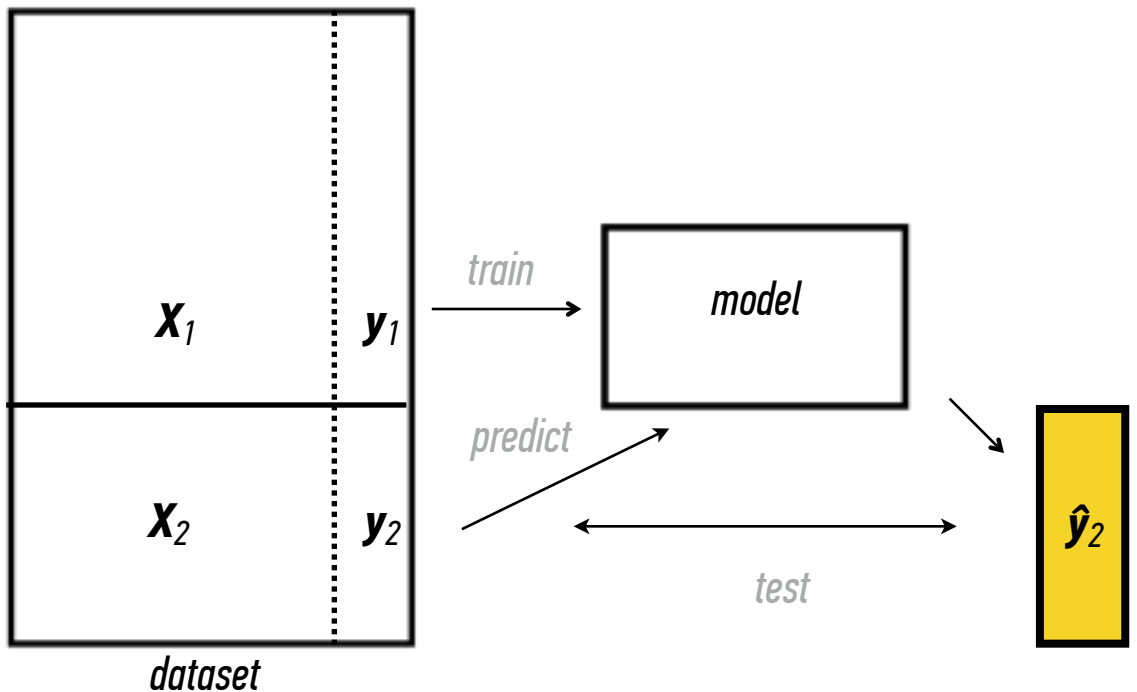


Train your base classifier on different bootstrap samples of your training set and take aggregate vote

Ensemble technique reduce the variance (overfitting), not the bias (underfitting)

How do we test the model's predictions?

*Train model on a part of **X**, and test the results on the rest of the data*



How do we test the model's predictions?

Accuracy = $(TP + TN) / all$

Precision = $TP / (TP + FP)$

% correct of all positive predictions

Recall = $TP / (TP + FN)$

% correct of all positive cases

F1 score = $2 \frac{P \times R}{P + R}$

AUC =

% probability a positive case is scored higher than a negative case

		predictions	
	truth	*Yes*	*No*
	Yes	TP	FN
	No	FP	TN

DISCUSSION