

MODELS FOR MACHINE LEARNING

Models we've Constructed

Regression, Linear

$$w_0 x_0 + w_1 x_1 + w_2 x_2 = \hat{y}$$

2 features
3 Parameters

"Linear transformation scheme"

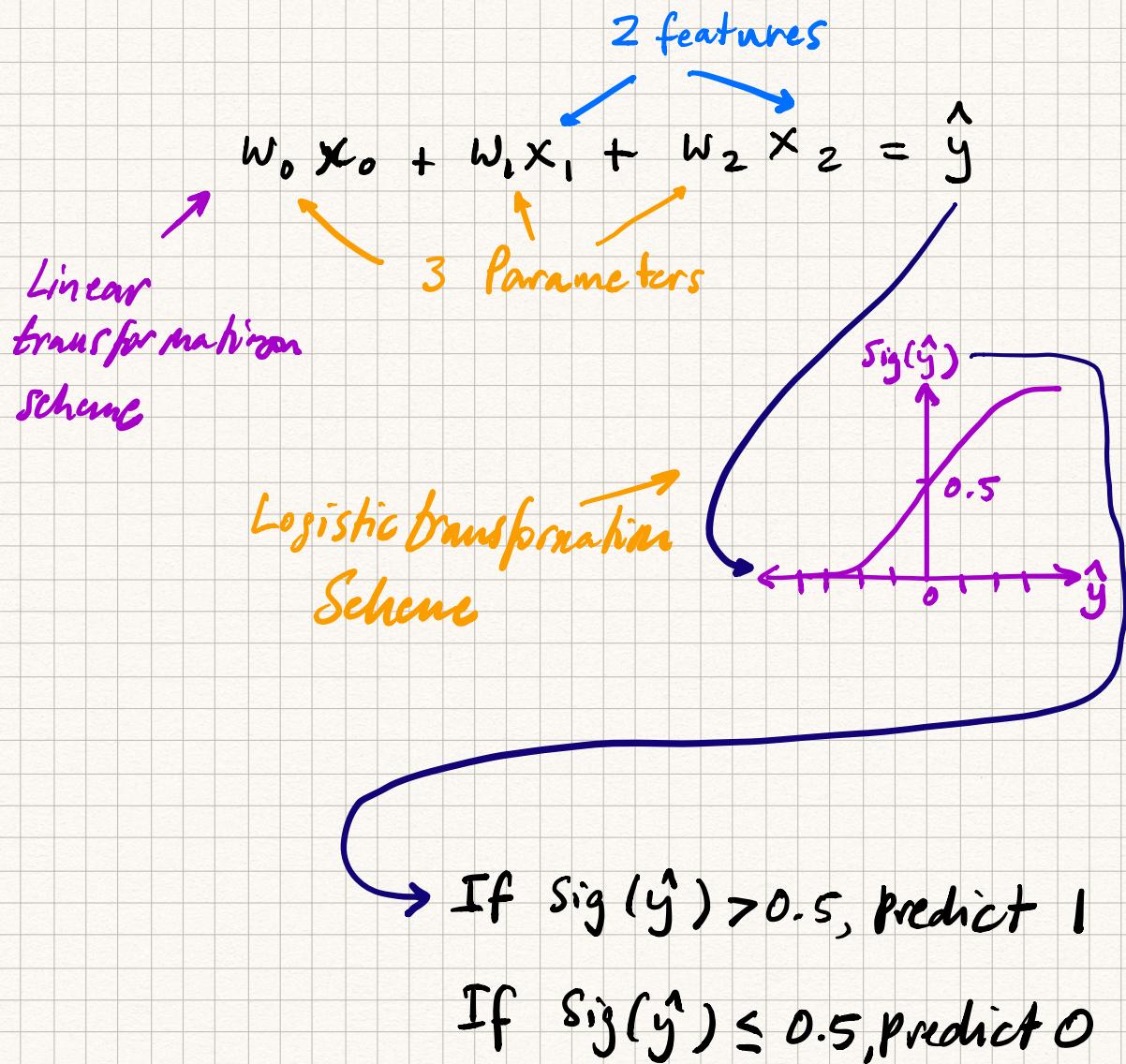
Regression, Non-Linear

$$w_0 x_0 + w_1 x_1^2 + w_2 x_1 x_2 + w_3 x_2^3 = \hat{y}$$

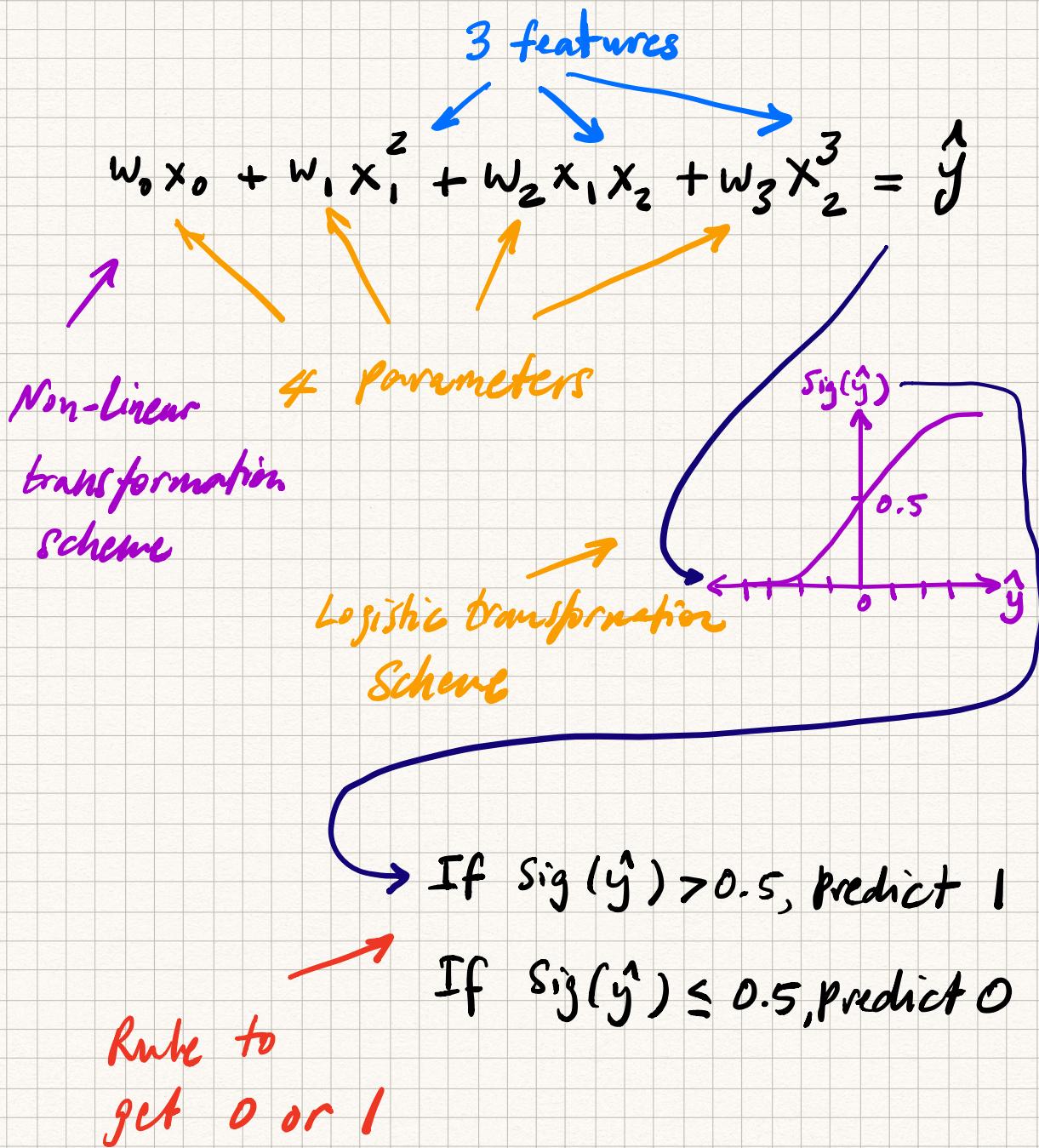
3 features
4 parameters

"Non-Linear transformation scheme"

Regression, Logistic, Linear



Regression, Logistic, Non-Linear

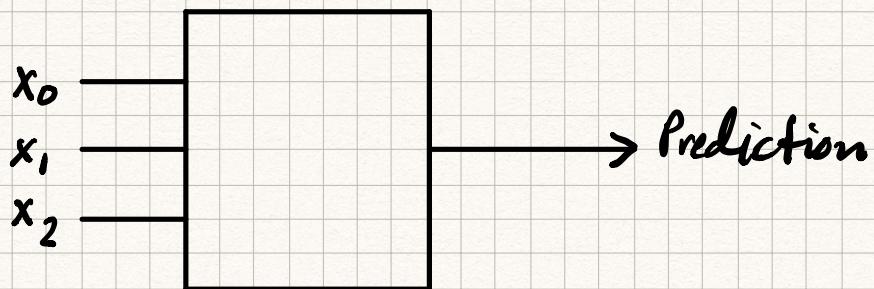


EXERCISE

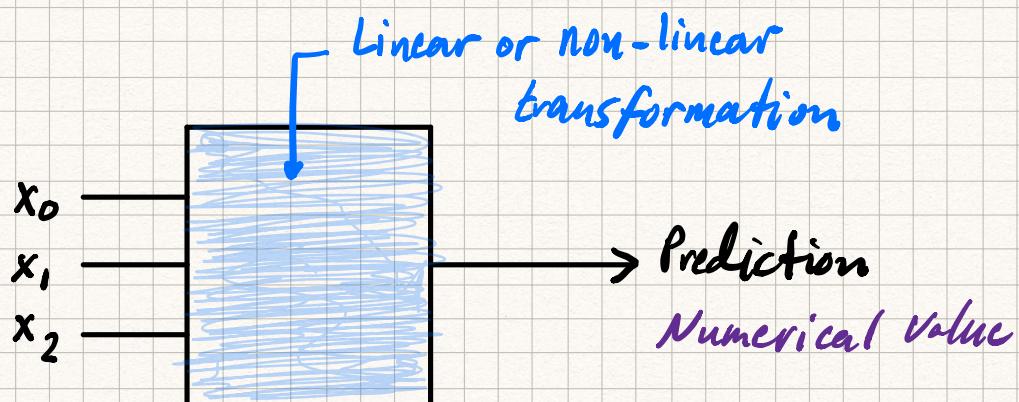
For the models above,
draw a schematic data table
for the original data and
show how this data table
is changed / transformed by
each of the models above.

There are many more
models available for
Machine learning.

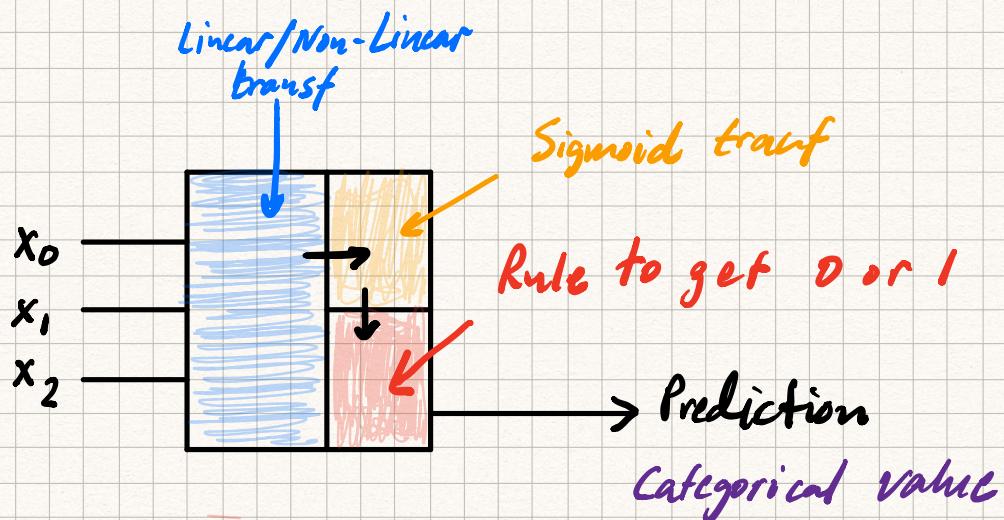
Let's use a simpler
representation of a model
and use this to introduce
models we've not seen before.



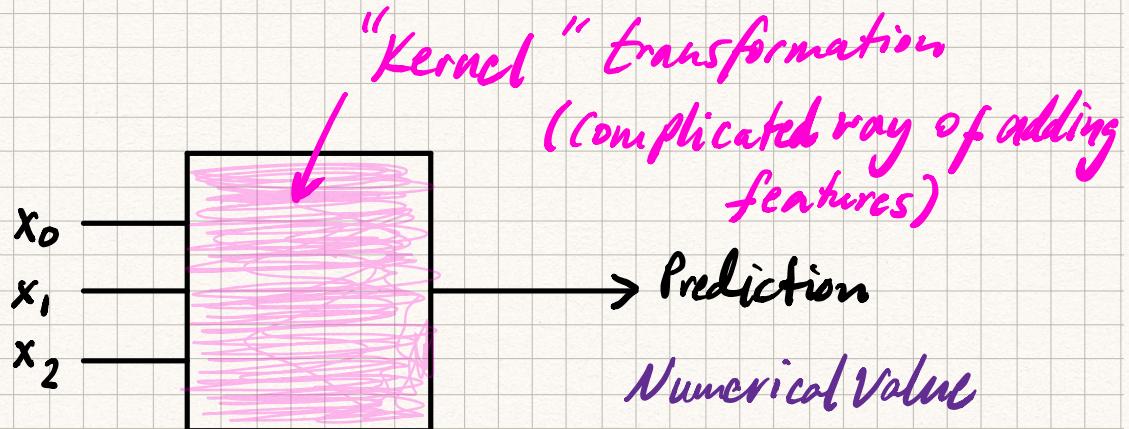
Regression, Linear/Non-Linear



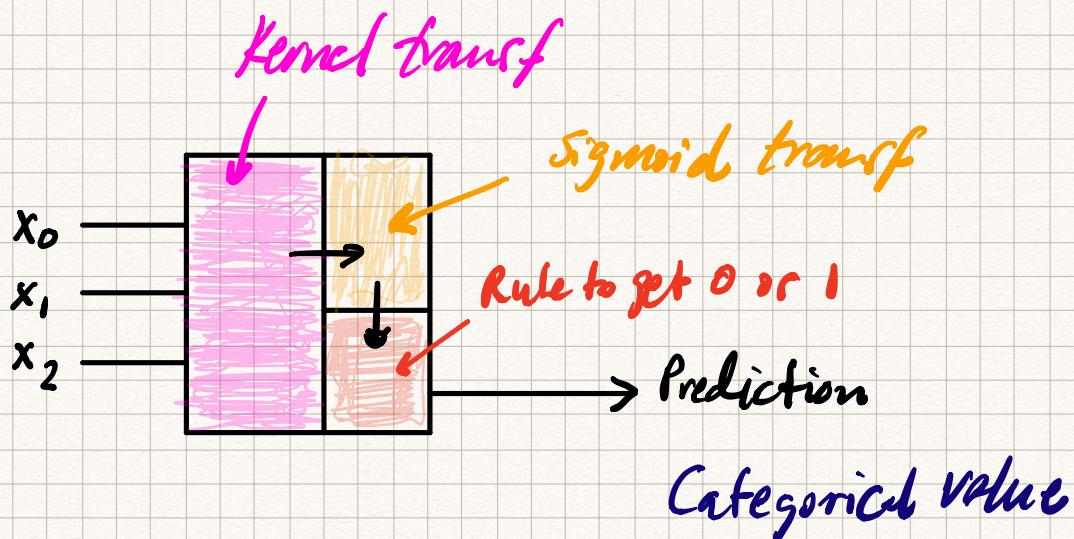
Regression, Logistic, Linear/Non-Linear



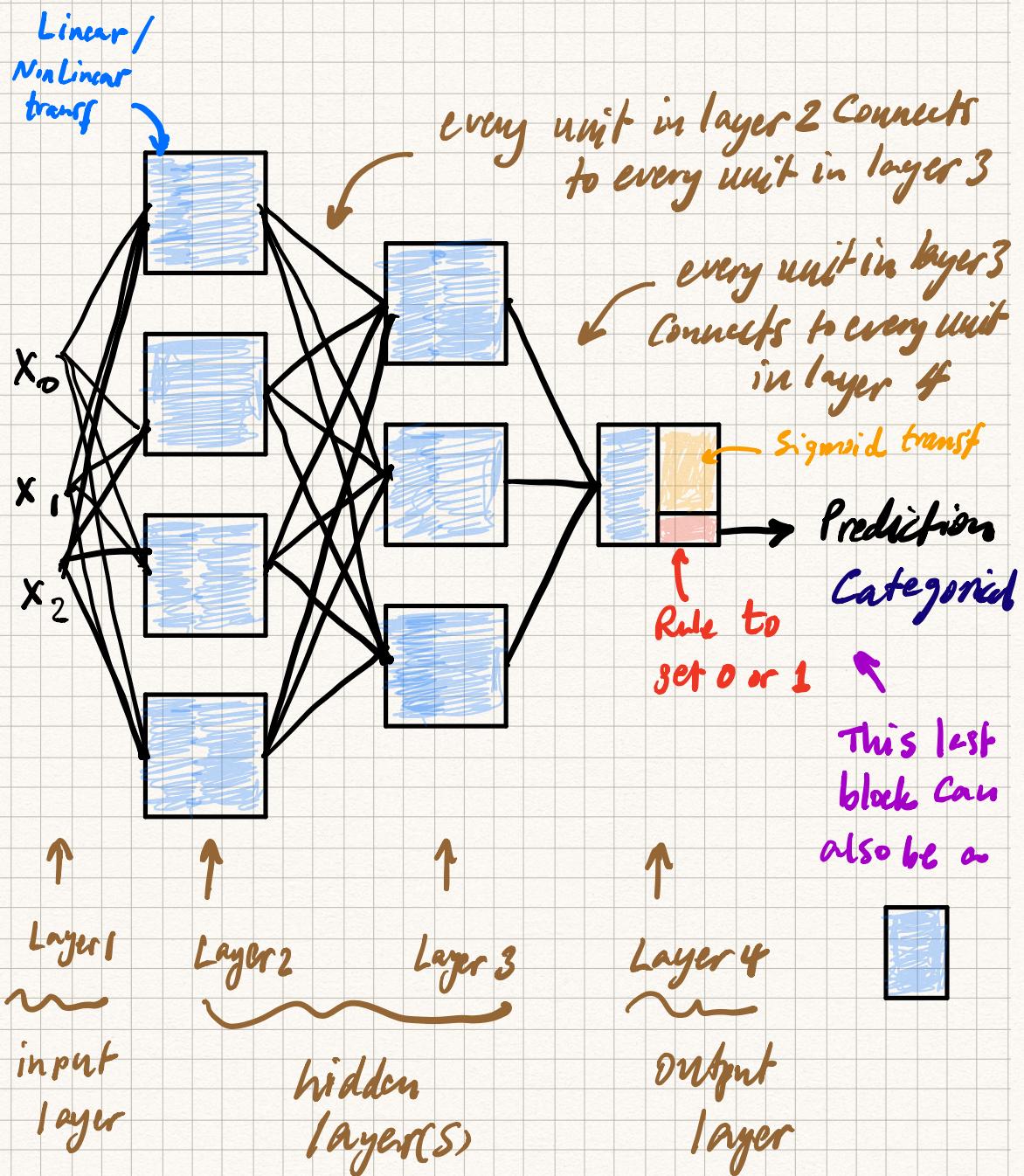
Regression, Support Vector Machine, Linear/ Non-Linear



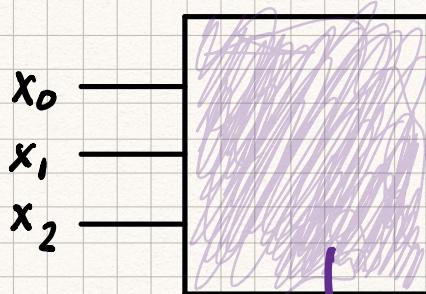
Regression, Logistic, SVM, Linear/Non-Linear



Regression, Logistic, Neural Network, Linear/ Non-Linear

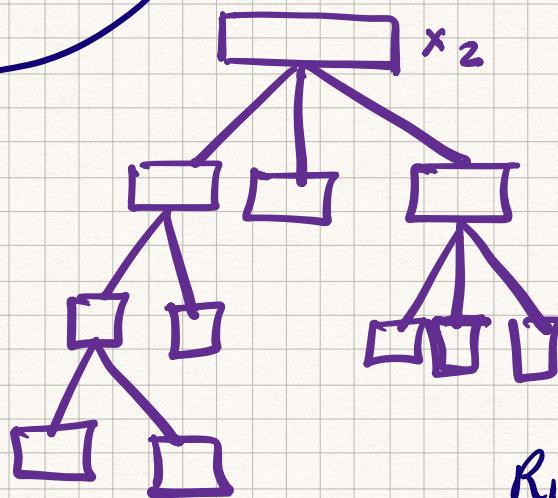


Regression/Logistic regression, Decision Tree, Linear



Prediction
Numerical or
Categorical

No w_0, w_1, w_2
parameters



Rules for:
• what to split on
• when to stop

Random Forest

Bunch of trees, each using
a random subset of the attributes

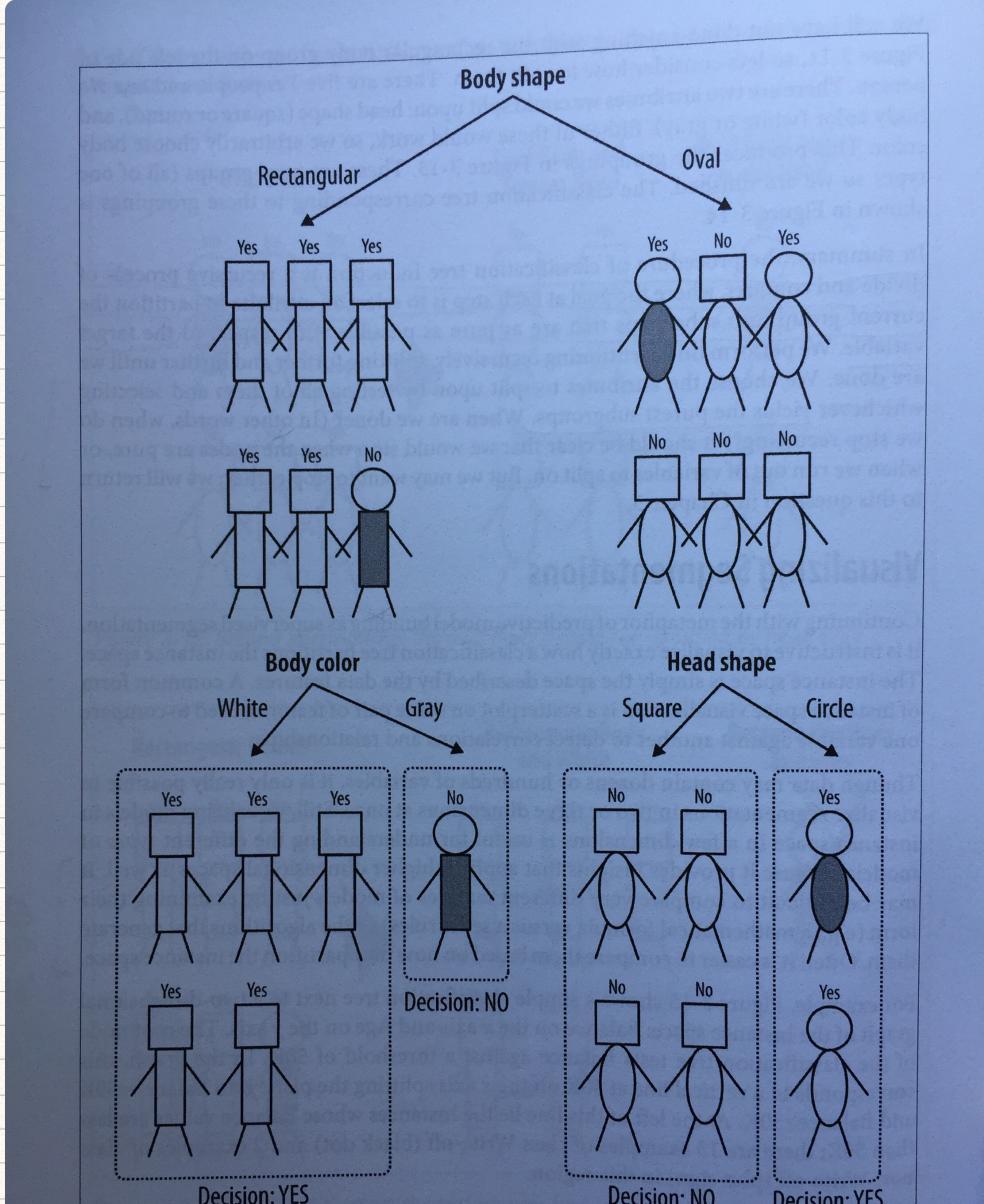
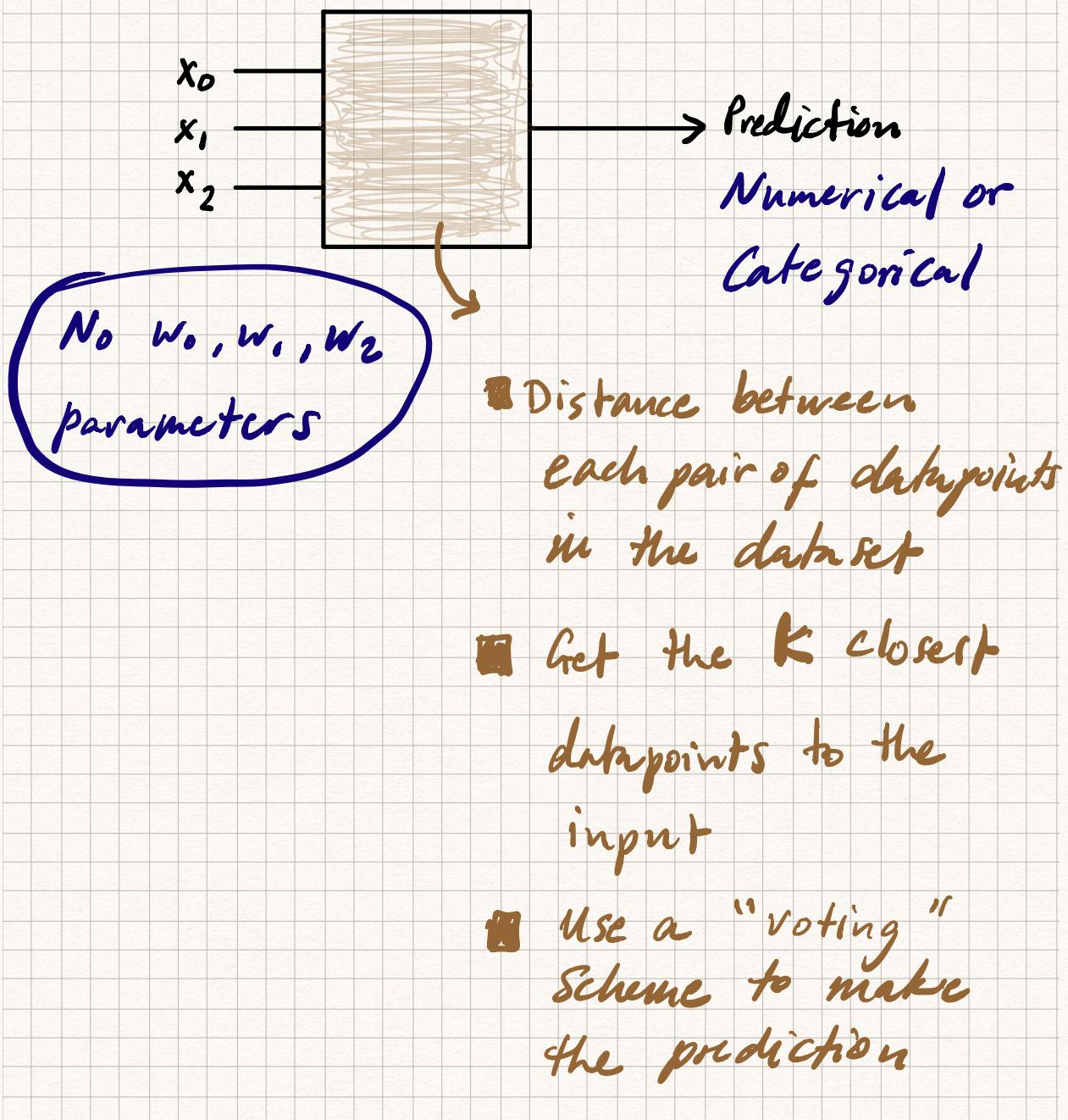
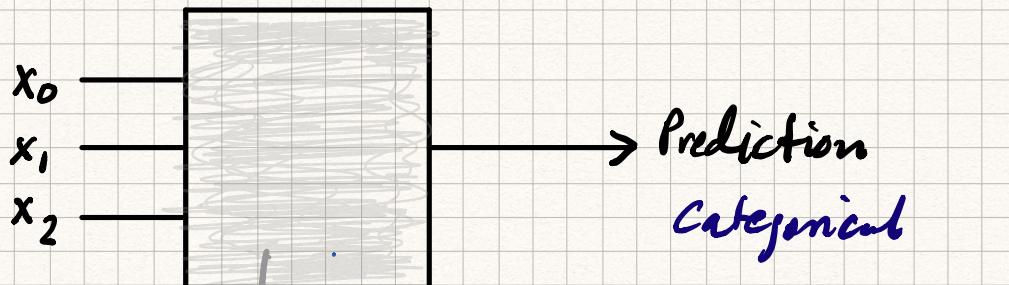


Figure 3-14. The classification tree resulting from the splits done in Figure 3-11 to Figure 3-13.

Regression / Logistic Regression, K-NN, Linear



Regression, Logistic, Naive Bayes, Linear



No parameters
 w_0, w_1, w_2

What is \hat{y} if $x_0 = 1$
 $x_1 = 2.2$
 $x_2 = -4.8$?

- Use Bayes' Rule to make the prediction

(we'll learn about Bayes' Rule later when we build an email spam filter)

SUMMARY

	Linear	Non-lin	Numerical	Categorical
Regression	✓	✓	✓	✗
Logistic Regression	✓	✓	✗	✓
SVM	✓	✓	✓	✓
Neural Network	✗	✓	✓	✓
Decision Tree	✓	✗	✓	✓
Random Forest	✓	✗	✓	✓
Ada Boost	✓	✗	✓	✓
K-NN	✓	✗	✓	✓
Naive Bayes	✓	✗	✗	✓

Q: How do you choose which model
to use ?

A: Try multiple models and
then choose the one that
performs the best.