

CS 260: Foundations of Data Science

Prof. Sara Mathieson

Spring 2025



Haverford
COLLEGE

In-lab review session
(pg 1&2 of practice exam)



i, j entry

$n \times m$

analytic solution

$$\vec{b} = \underbrace{\left(\overset{\substack{\uparrow \\ (p+1) \times n}}{X^T} \overset{\substack{\uparrow \\ n \times (p+1)}}{X} \right)^{-1} X^T \vec{y}}$$

$X^T X :$

$$\boxed{O(np^2)}$$

$$\begin{aligned} & (\dots)^{-1} \Rightarrow \text{cubic} \\ & \hookrightarrow O(p^3) \end{aligned}$$

**STUDENTS
NEEDED!**

Haveford College CS Department is interested in technology to help manage emotions. We are looking for undergraduate, high school, and middle school students to participate in our study.

If you are interested in participating, fill out our form



Prof. John
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time varying α

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$$t = 1$$

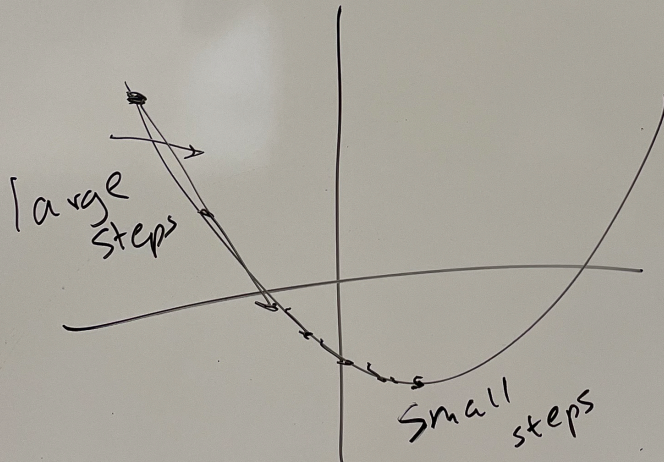
while not converged

$$\alpha = \frac{1}{t}$$

for $i = 1 \dots n$

$$\vec{w} \leftarrow \vec{w} - \alpha(\dots)$$

$$t += 1$$



multiple
features

$p > 1$

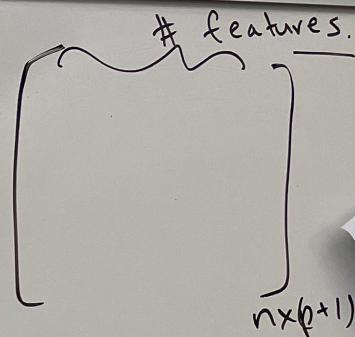
polynomial
regression

$p = 1$

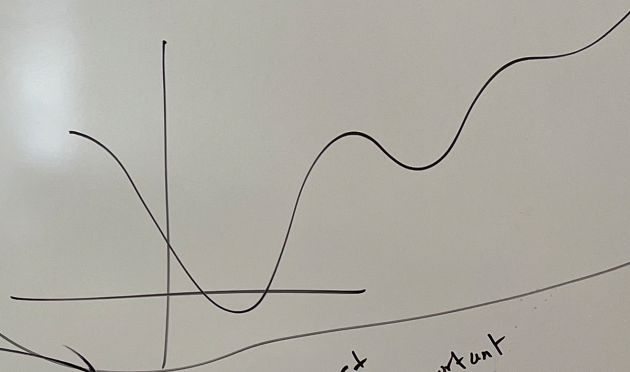
degree d

$$h_{\vec{w}}(\vec{x}) = w_0 + w_1 x_1 + w_2 x_2 \dots w_p x_p$$

$x_0 = 1$



$$h_{\vec{w}}(\vec{x}) = w_0 + w_1 x + w_2 x^2 + w_3 x^3 + \dots w_d x^d$$



Lab 3

$$\vec{w} = [w_0, w_1, w_2, w_3, w_4, w_5]$$

$w_0 = 2 \times 10^{-14}$

$w_1 = 0.65$ (circled)

$w_2 = 0.46$

$w_3 = 0.34$

$w_4 = 0.00587$

$w_5 = 0.427$

most important feature ①

avg area income

least important feature

① multi-class classification (discrete)
label

② regression (continuous)

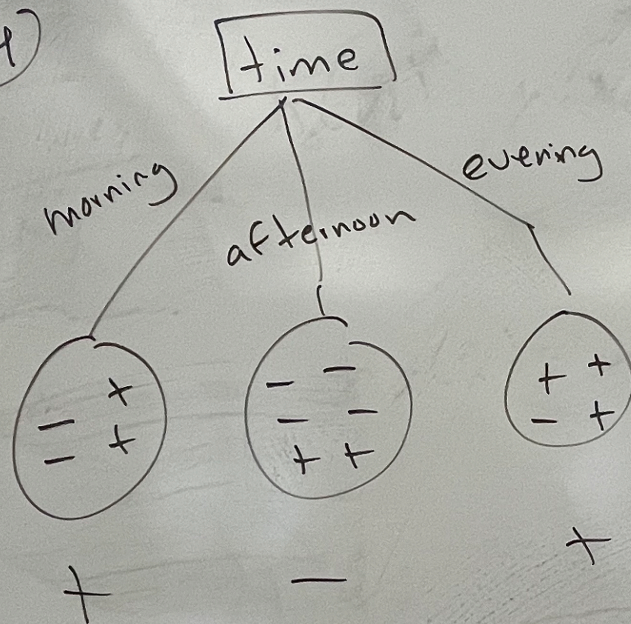
③ internal nodes — class labels
branches — feature names
leaves — feature values

1
2
3
4
:
:
:
14

(discrete)

label

(4)



$$\text{error} = \frac{2 + 2 + 1}{14}$$

$$= \boxed{\frac{5}{14}}$$

labels

names

values

thresh 0.5

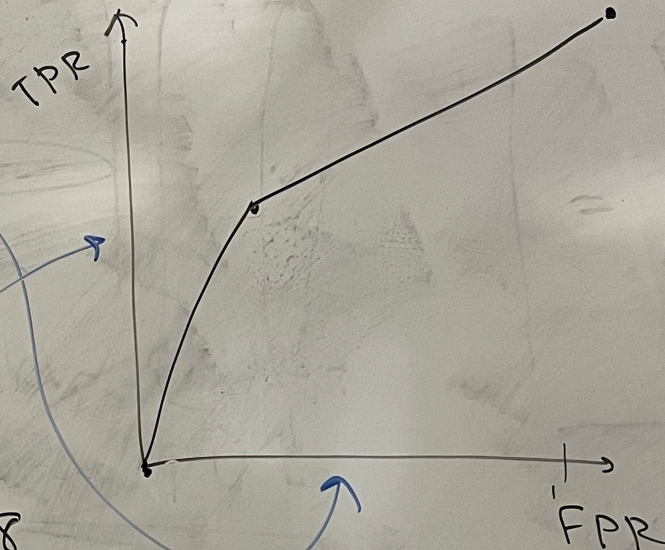
i	true	pred
1	-	-
2	-	+
3	-	+
4	+	+
5	+	+
6	+	+
7	+	+
8	+	+
9	+	+
10	+	+
11	+	+
12	+	+
13	+	+
14	+	+

⑤

pred

	-	+
-	42	8
+	8	12

fne



$$FPR = \frac{8}{42+8} = \frac{8}{50} = \frac{4}{25}$$

$$TPR = \frac{12}{8+12} = \frac{12}{20} = \frac{3}{5}$$

⑥

$$\text{error} = \frac{11+4}{99} = \frac{15}{99}$$

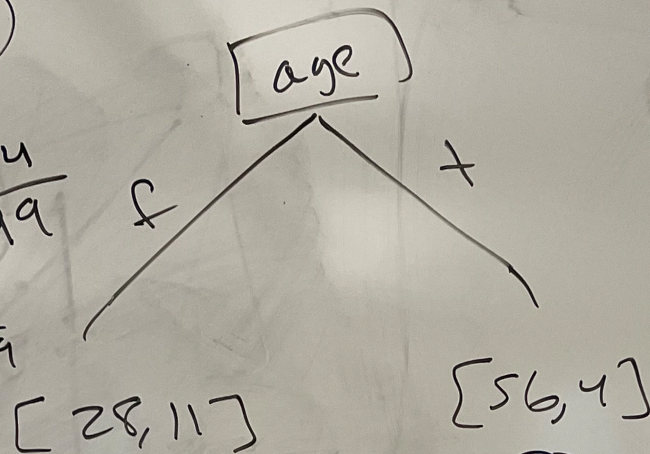
$$\text{error} = \frac{13}{99}$$

[0,

+

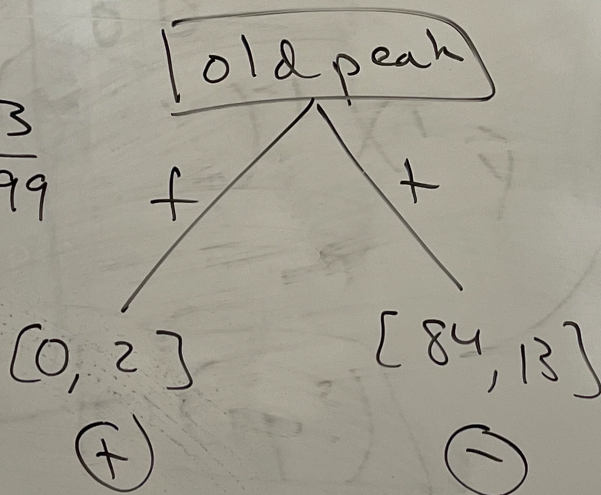
⑥

$$\text{error} = \frac{11+4}{99} = \frac{15}{99}$$



→
FPR

$$\text{error} = \frac{13}{99}$$



	-	+
-	28+56 =84	0
+	15	0

	-	+
-	84	0
+	13	2

