

Activity 2 – Matrix multiplication



Question 2

1 pts

Suppose \mathbf{A} is a 5-by-3 matrix and \mathbf{b} is a 3-by-1 vector. Which of the following statements is correct about the product $\mathbf{c} = \mathbf{Ab}$?

- \mathbf{c} is a row vector
- \mathbf{c} is a weighted sum of the five rows of \mathbf{A}
- The i th entry in the vector \mathbf{b} weights the i th column of \mathbf{A}
- \mathbf{c} is a Vandermonde matrix

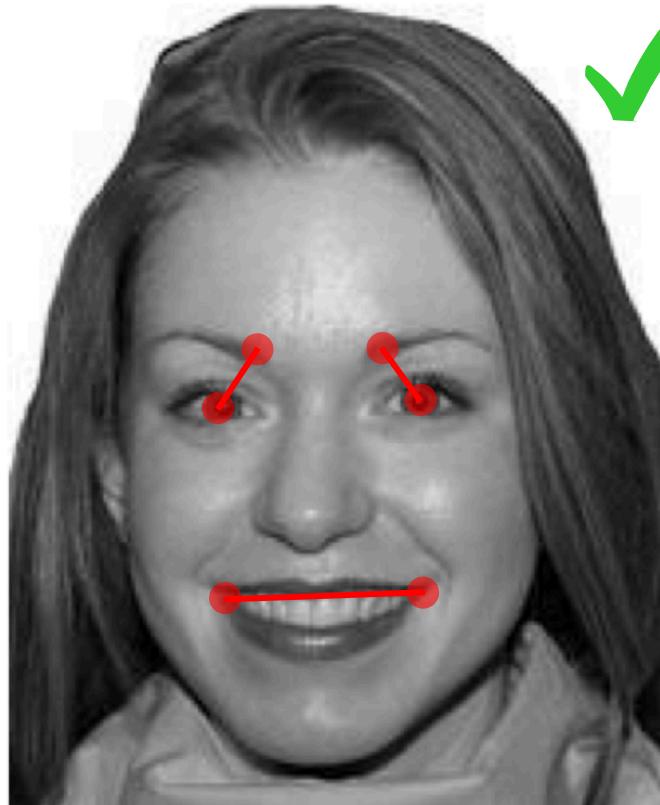
$$\mathbf{Ab} \quad (5 \times 3) \ (3 \times 1)$$

Two ways to think about matrix-vector multiplication

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \begin{bmatrix} 7 \\ 8 \\ 9 \end{bmatrix} = \begin{bmatrix} 1 \cdot 7 + 2 \cdot 8 + 3 \cdot 9 \\ 4 \cdot 7 + 5 \cdot 8 + 6 \cdot 9 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \begin{bmatrix} 7 \\ 8 \\ 9 \end{bmatrix} = 7 \begin{bmatrix} 1 \\ 4 \end{bmatrix} + 8 \begin{bmatrix} 2 \\ 5 \end{bmatrix} + 9 \begin{bmatrix} 3 \\ 6 \end{bmatrix}$$

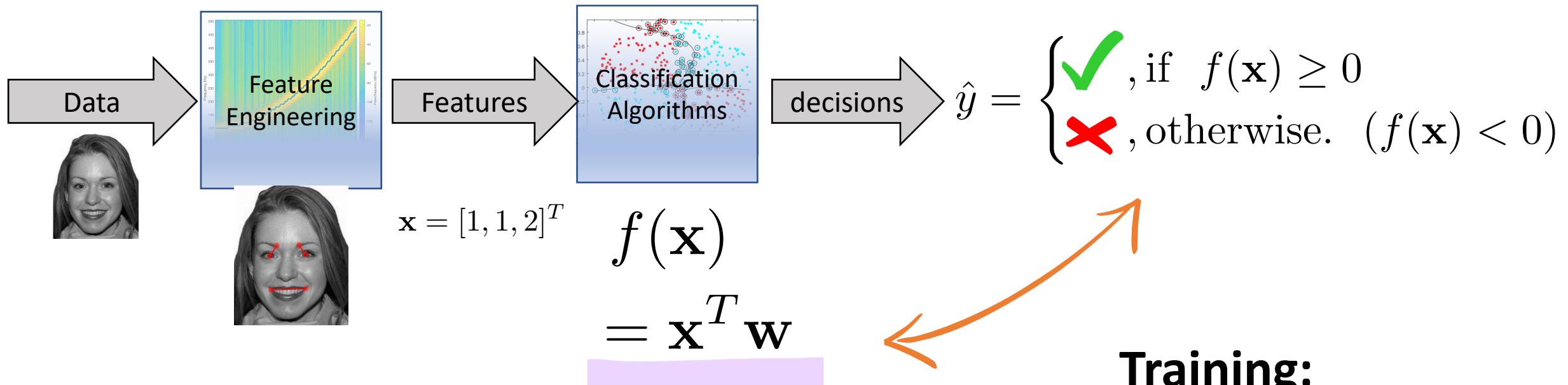
Activity 2 – Binary Classification



happy?

Activity 2 – Binary Classification

Linear



Training:
Find \mathbf{w} which minimizes
the training error

Activity 2 – Binary Classification



Bernard Parker, left, was rated high risk; Dylan Fugett was rated low risk. (Josh Ritchie for ProPublica)

[ProPublica, Machine Bias]

Will he recidivate?

Activity 2 – Binary Classification



NORTHPOINTE SUITE

Welcome Neal Goodloe | History ▾ | Logout | Submit Issue | Help ▾

Home Search Operations Reports Scheduling Administration Help Donald Demore ▾

Person Summary

Name: Donald Demore SID: 389493
Status: Open DOC #: 2883992
SSN:
Neal's Cool ID:
Race / Ethnicity: Caucasian / European Agent #:
Date of Birth: 10/23/1969 Agency: Northpointe
Gender: Male

Assessment and Alternative Screening Scores

Name	Assessment/Screening	Date	Score
Case Supervision Review	Case Supervision Review	05/27/2013	Consider Raising Current Supervision Level
Substance Abuse	Core All Scales 3-11 Incarcerated Language	09/09/2013	Highly Probable
Violent Recidivism Risk	Pretrial Matrix	09/16/2013	Low
General Recidivism Risk	Core All Scales 3-11 Incarcerated Language	09/09/2013	Medium

Assessments | Create | Actions ▾

Date	Case	ScaleSet	Screener	Status
09/20/2013	389493-4	COMPAS Core All Scales 3-11	Goodloe, Neal	Incomplete
09/16/2013	389493-4	Pretrial Matrix	Goodloe, Neal	Complete
09/09/2013	389493-1	Core All Scales 3-11 Incarcerated Language	Goodloe, Neal	Complete
05/06/2013	389493-1	Reentry Scales (129)	Kaufman, Jennifer	Complete
04/29/2013	389493-1	Core Community Language 1-9-13	Goodloe, Neal	Complete
04/20/2013	389493-1	"Big Five" Criminogenic Needs	Goodloe, Neal	Complete

Northpointe Suite version 8.13.10.5052
©2013 Northpointe Inc., All rights reserved.

2 Reminders 8 Alerts < Previous Next >

Activity 2 – Binary Classification



Welcome Neal Goodloe | History ▾ | Logout | Submit Issue | Help ▾

NORTHPOINTE SUITE

Home Search Operations Reports Scheduling Administration Help Donald Demore ▾

Assessment

- Summary
- Assessment
- Narrative
- Personalized Narratives
- Legacy Bar Chart
- Supervision Recommendation
- Bar Chart
- Pretrial Release Recommendation

Risk

Violent Recidivism Risk	Low	Medium	High
General Recidivism Risk	Medium	High	
Pretrial Release Risk	High		

Decile 1 2 3 4 5 6 7 8 9 10

Criminogenic Need Scales

Criminal Involvement

Criminal Involvement	Low	Medium
History of Non-Compliance	Medium	
History of Violence	Low	
Current Violence	Low	

Relationships/Lifestyle

Criminal Associates/Peers	Probable
Criminal Opportunity	Unlikely
Leisure and Recreation	Probable
Social Isolation	Highly Probable
Substance Abuse	Highly Probable

Personality/Attitudes

Criminal Personality	Probable
Criminal Thinking Self Report	Unlikely
Anger	Unlikely
Cognitive Behavioral	Unlikely

Northpointe Suite version 8.13.10.5052
©2013 Northpointe Inc. All rights reserved.

2 Reminders



Wisconsin has been among the most eager and expansive users of **Northpointe's risk assessment tool** in sentencing decisions. In 2012, the Wisconsin Department of Corrections launched the use of the software throughout the state. It is used at each step in the prison system, from sentencing to parole. [ProPublica, Machine Bias]

Activity 2 – Binary Classification

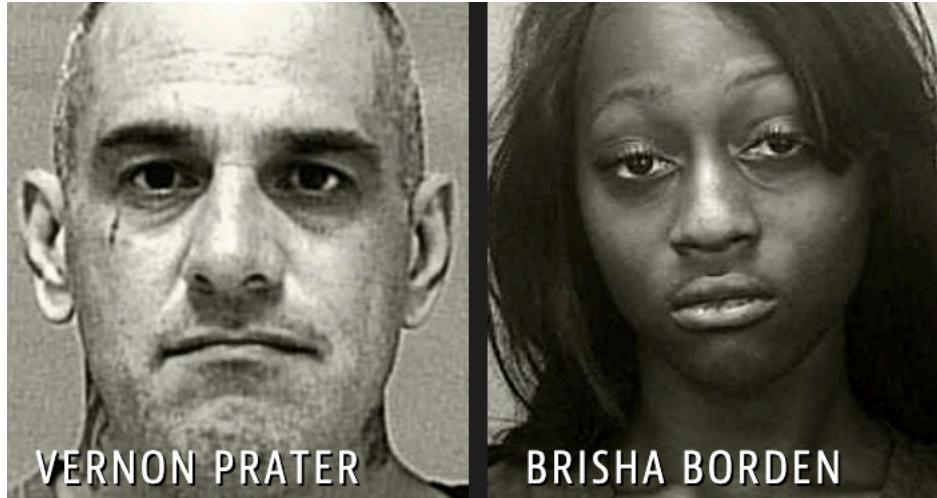
Violent Recidivism Risk Score = $(\text{age} * -w) + (\text{age-at-first-arrest} * -w) + (\text{history of violence} * w) + (\text{vocation education} * w) + (\text{history of noncompliance} * w)$

The size of the weight is determined by the strength of the item's relationship to person offense recidivism that we observed in our study data. The weighted items are then added together to calculate the risk score:

$$\mathbf{x} = \begin{bmatrix} \text{age} \\ \text{age-at-first-arrest} \\ \text{history of violence} \\ \text{vocation education} \\ \text{history of noncompliance} \end{bmatrix} \quad f(\mathbf{x}) = \mathbf{x}^T \mathbf{w}$$

Did it work well?

Activity 2 – Binary Classification



VERNON PRATER

BRISHA BORDEN

Prior Offenses

2 armed robberies,
1 attempted armed
robbery

LOW RISK

3

HIGH RISK

8

Prior Offenses

4 juvenile
Misdemeanors

- *The formula was particularly likely to falsely flag black defendants as future criminals, wrongly labeling them this way at almost twice the rate as white defendants.*

[ProPublica, Machine Bias]

AI Fairness!