Regression

- statistical method
- analyze, understand

↓

relatnship betn 2+ variables

- Which factors are important

- " " " ignored

- how they influence each other

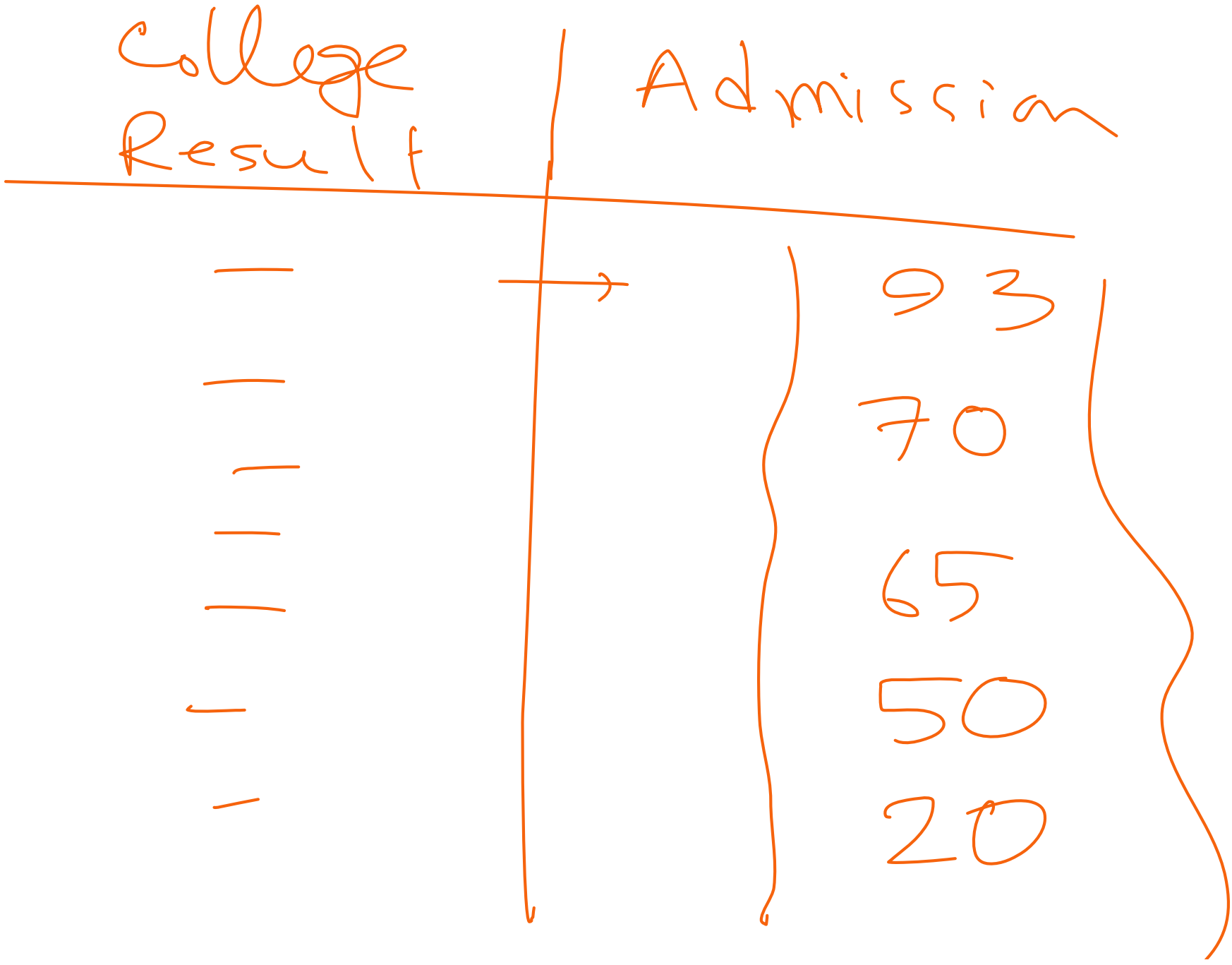
≥1 independent → 1 dependent

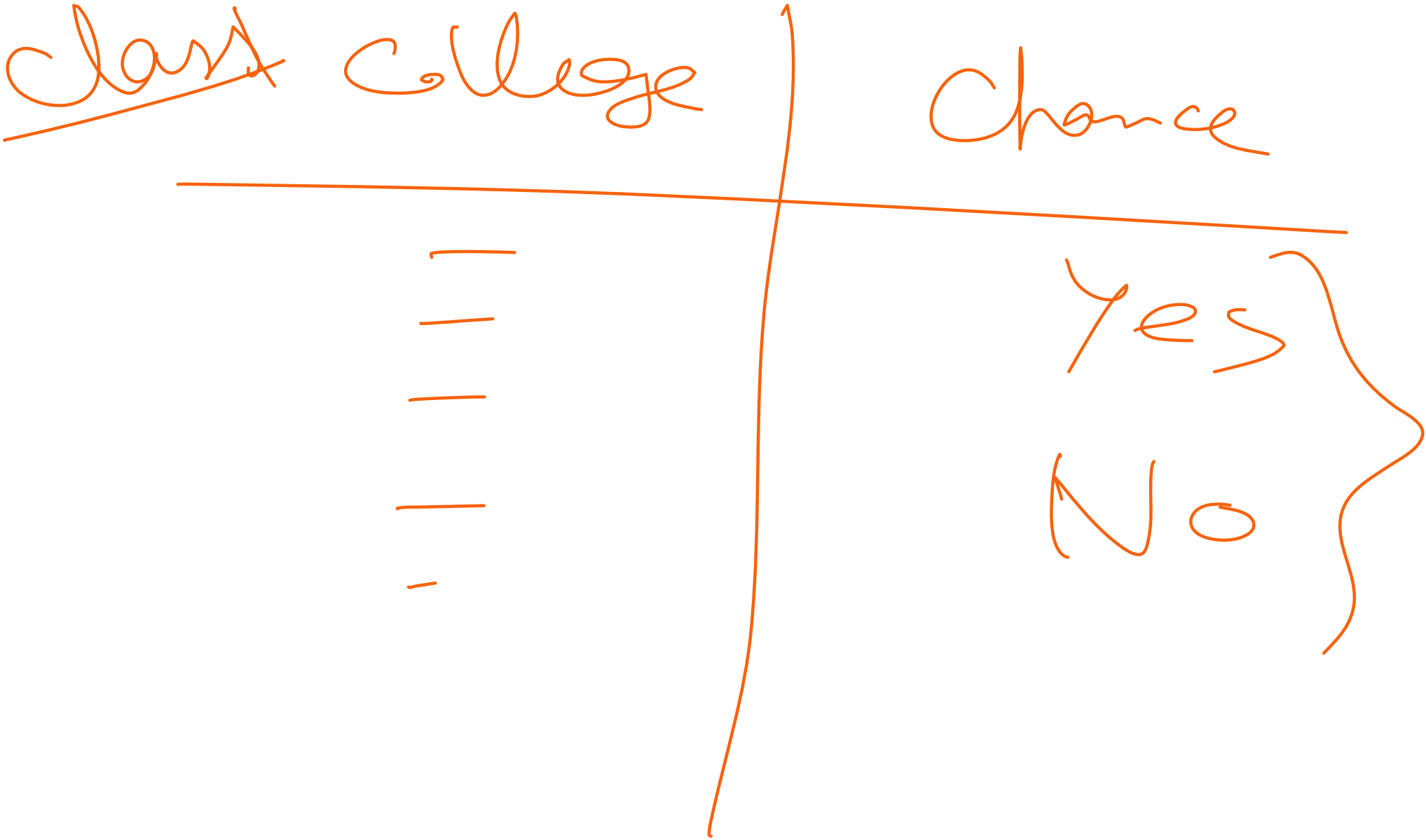
- "regress"

- Prediction, forecasting

- Financial
- Marketing
- Manufacturing


Medicine


college
Result
Admission
93
70
65
50
20


Last college
Chance
Yes
No

Types

- Linear
- Logistic

— Polynomial

Linear $\longrightarrow$ X_n Y

$$y = a_1 x_1 + a_2 x_2 + \ldots + a_n x_n + b$$

$\downarrow$ target variable

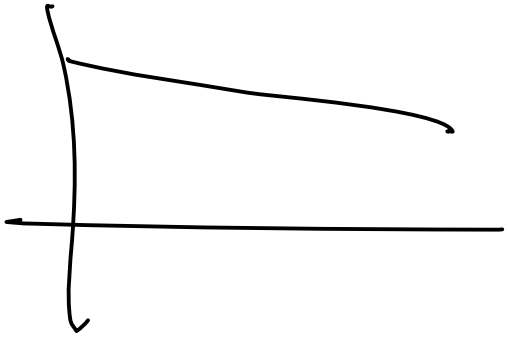
$x_1 \ldots x_n$ = features

$a_1 \ldots a_n$ = coefficients } parameters

b = constant }

Simple

$X \rightarrow y$



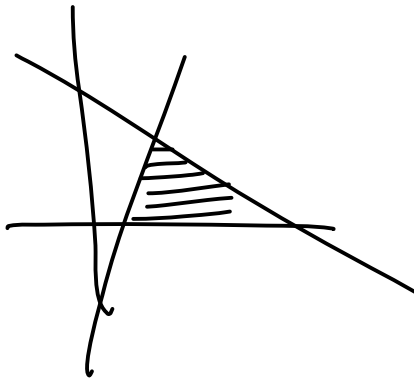
Multiple

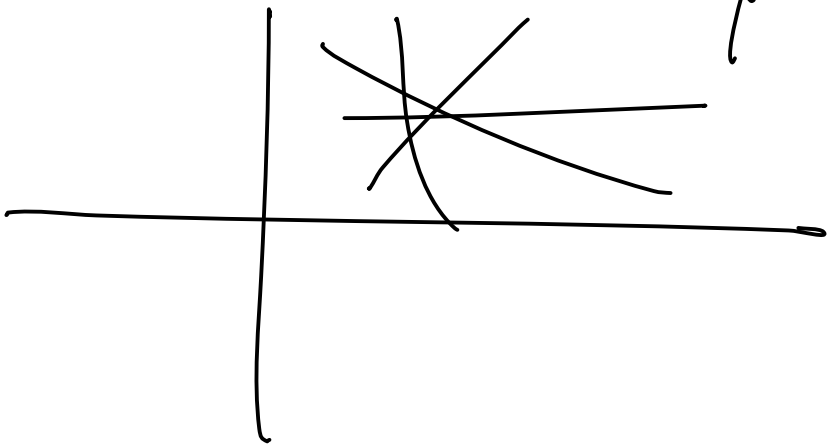
X_1

X_2

X_3

X_3





Main factor

- Variance betn variables

Assumption

- Linear Relationship
- Normality - Homoscedasticity
- Multicollinearity → নাই/কম

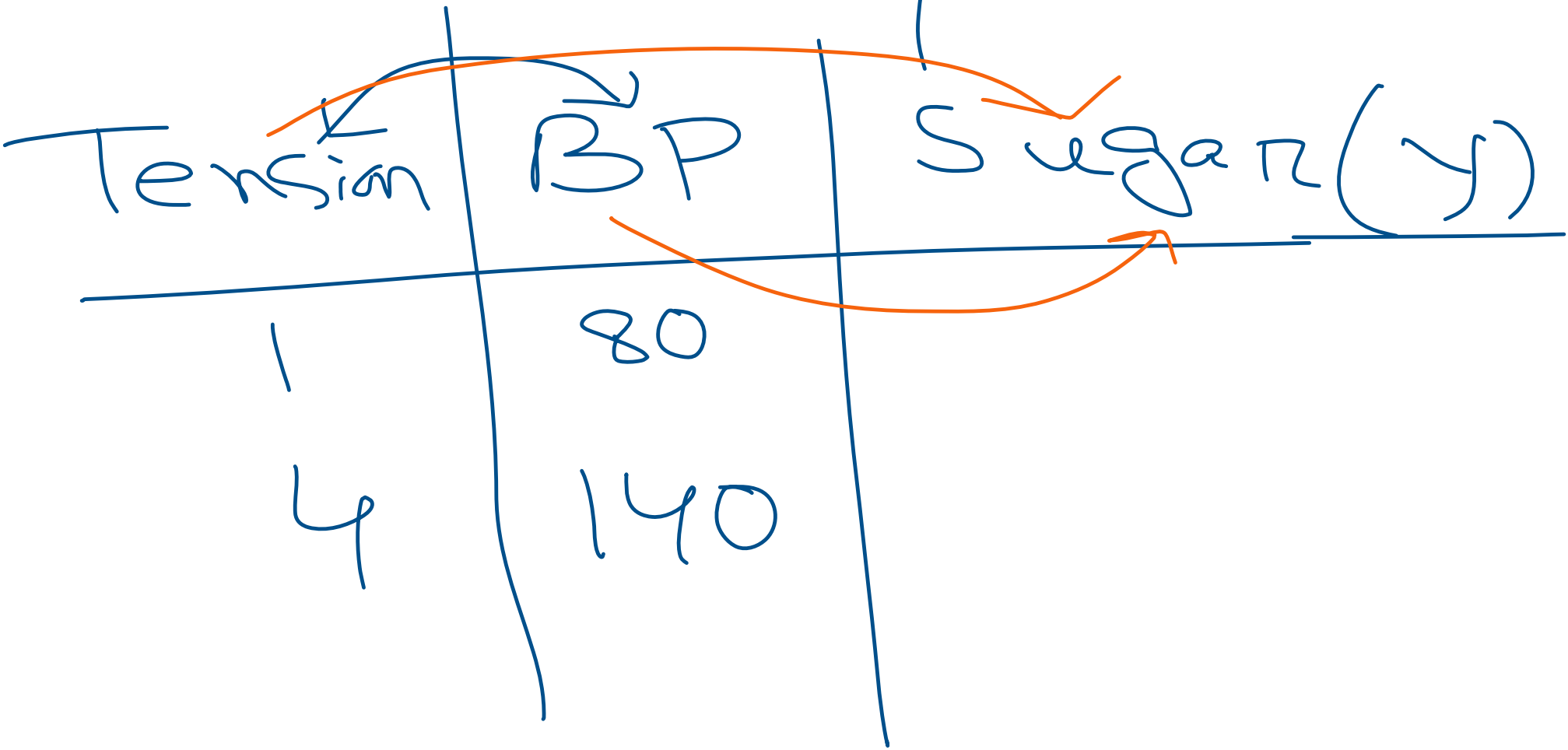
$H_0 \rightarrow$ Equal Variance → Homoscedasticity

$H_a \rightarrow$ Diff ,,

↘

Heteroscedasticity

Multicollinearity



Logistic Regression → Logit

↳ classification

- dependent → categorical

  - Binary
  - Multinomial

Multinomial → Ordered

→ Nominal

(unordered)

Process

- Consider classes of depend va
- Probability of happening
  - ↳ row
    - ↳ different weight
      - ↳ relationship sign

Sigmoid Function → 0, 1

$$P(y=1) = \sigma(z)$$

$$= \frac{1}{1+e^{-z}}$$

$$P(y=0) = 1 - \frac{1}{1+e^{-z}}$$

Assumptions

- depend. var → categorical
- No multicollinearity
- Binary → 1, 0
- Multiclass →

Linear Discriminant Analysis (LDA):

- classes known
- Future predict

- LR unstable

LDA

- Data small

- more than 2

→ Bayes Theorem

↓

Probability

Regularized linear models

- Used when overfitting
  - large # variables
  - Multicollinearity ↑↑

L1 Regularization → lasso

- Objective function

↓

minimize

penalty term

+ sum of absolute value of coefficients

Least Absolute Shrinkage Selection Operator (Lasso)

L2 Regularization → Ridge

- Minimize

- Penalty term → λ

+ Sum of sq. of coeff

Residual = (Actual - Predicted)

Loss function =

ordinary least squares

OLS $= S + \alpha \cdot \sum(\text{coeff})^2$

method

Elastic Net

$L_1 + L_2$

Mistakes

- Problemset ✗
- Binary class → Logistic