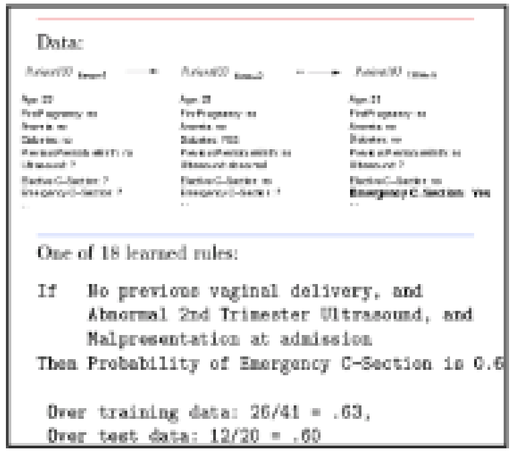
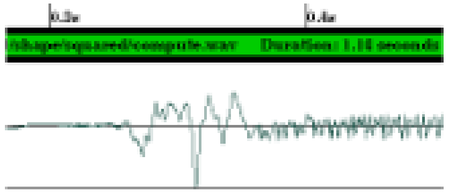
Machine Learning

Software Fellowship 2023

Machine Learning - Practice

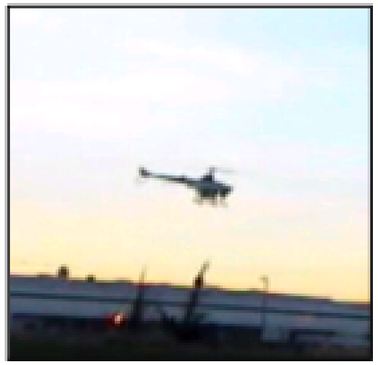


Mining Databases



Speech Recognition

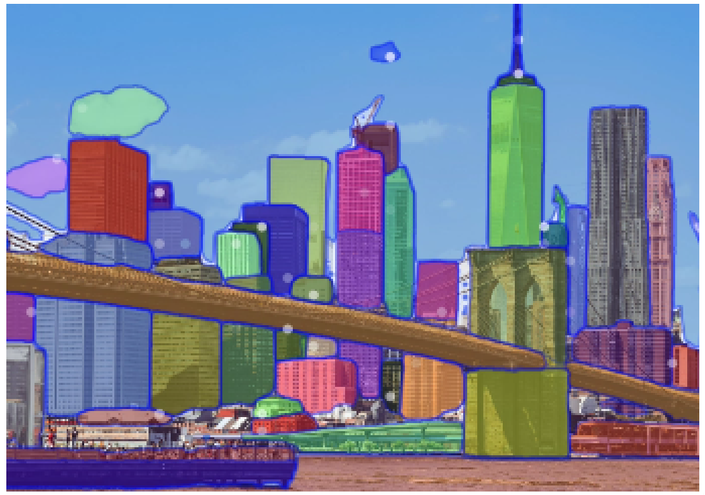
Object recognition



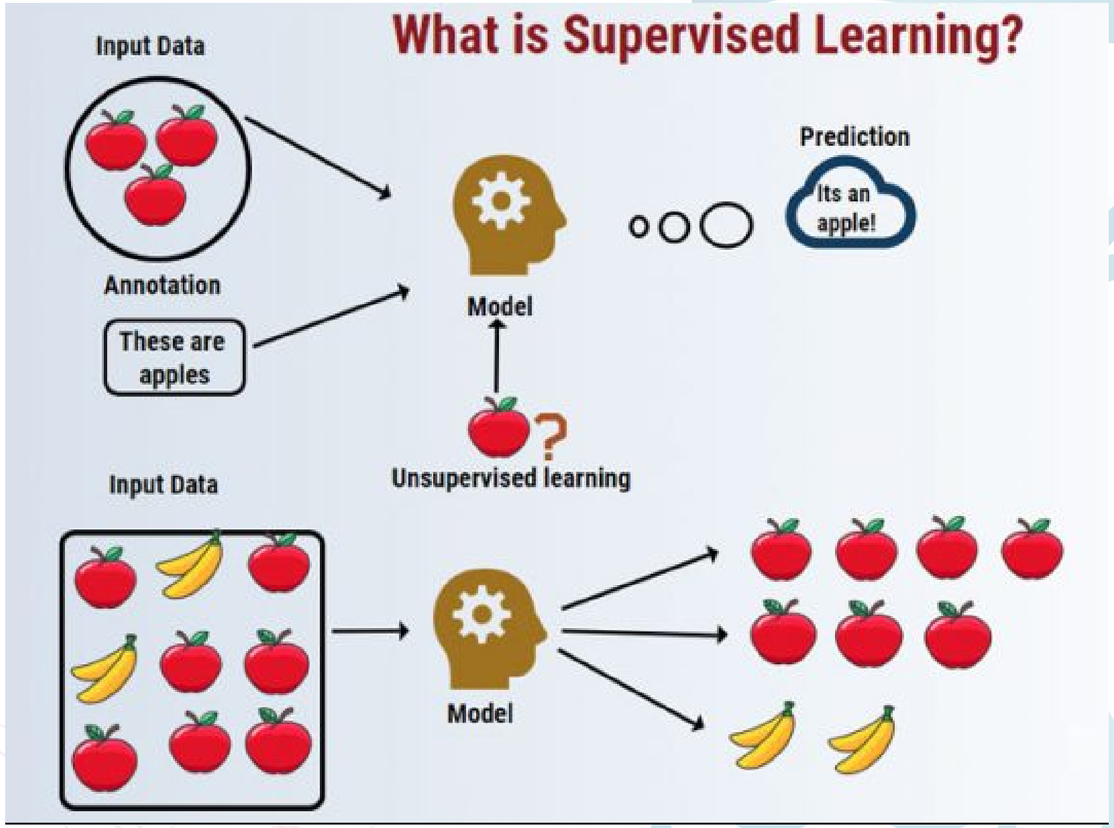
Control learning

Text analysis

Peter H. van Oppen , Chairman of the Board & Chief Executive Officer
Mr. van Oppen has served as chairman of the board and chief executive officer of ADIC since its acquisition by Interport in 1994 and a director of ADIC since 1986. Until its acquisition by Crane Co. in October 1995, Mr. van Oppen served as chairman of the board of directors, president and chief executive officer of Interpoint. Prior to 1985, Mr. van Oppen worked as a consulting manager at Price Waterhouse LLP and at Bain & Company in Boston and London. He has additional experience in medical electronics and venture capital. Mr. van Oppen also serves as a director of Seattle FilmWorks Inc. and Spacelabs Medical, Inc.. He holds a B.A. from Whitman College and an M.B.A. from Harvard Business School, where he was a Baker Scholar.



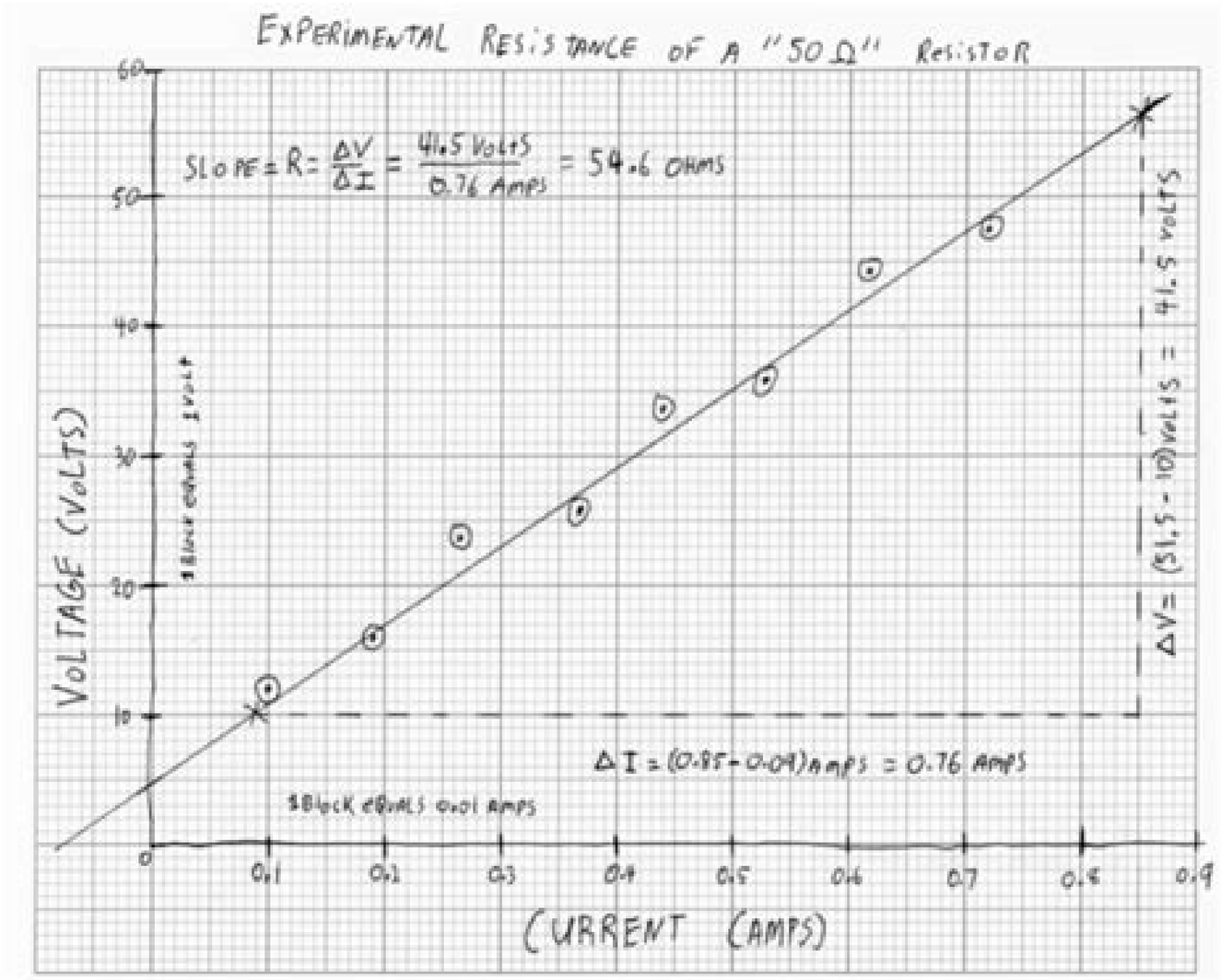
Machine Learning Techniques



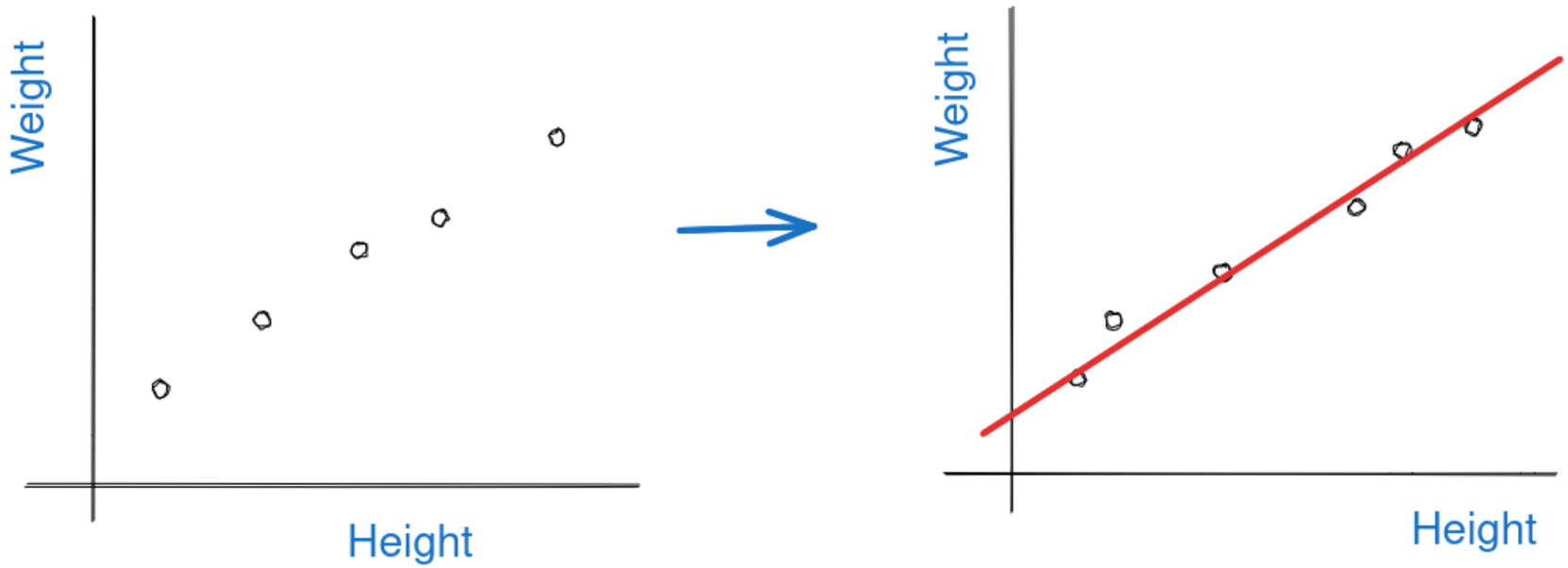
What we will focus on

Some other day

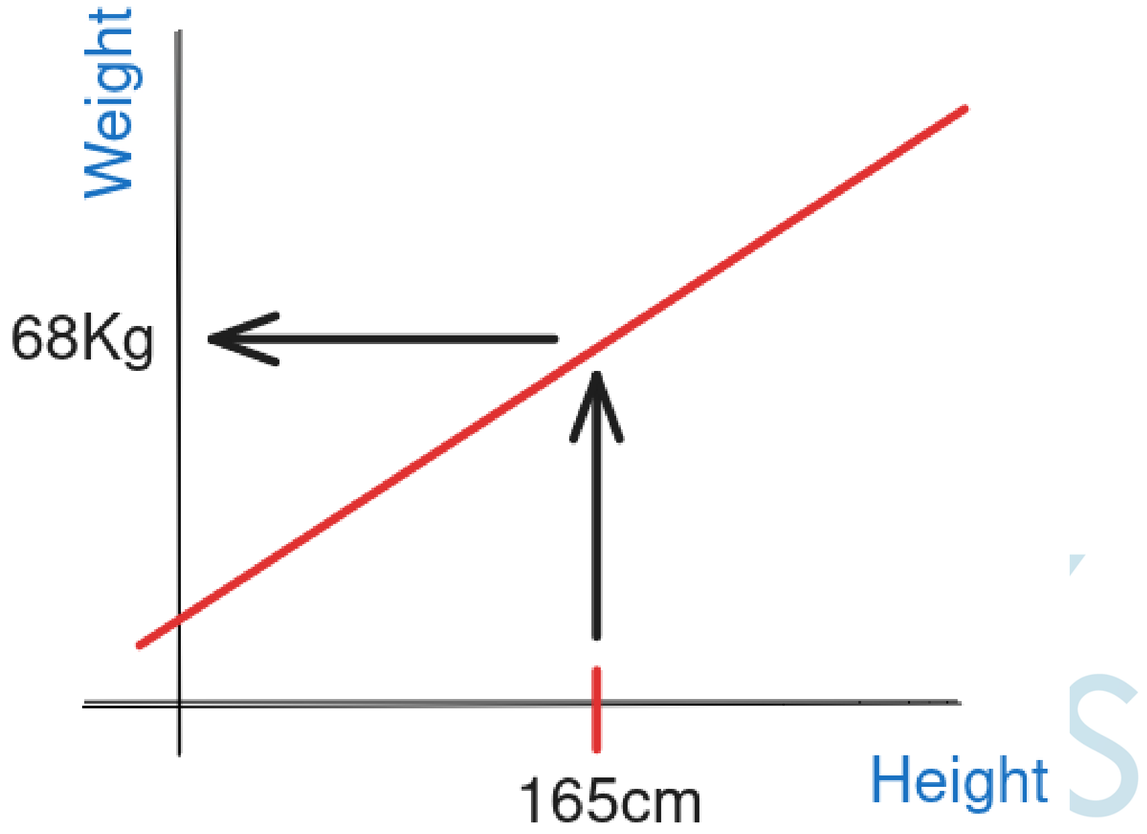
Done This in Physics?



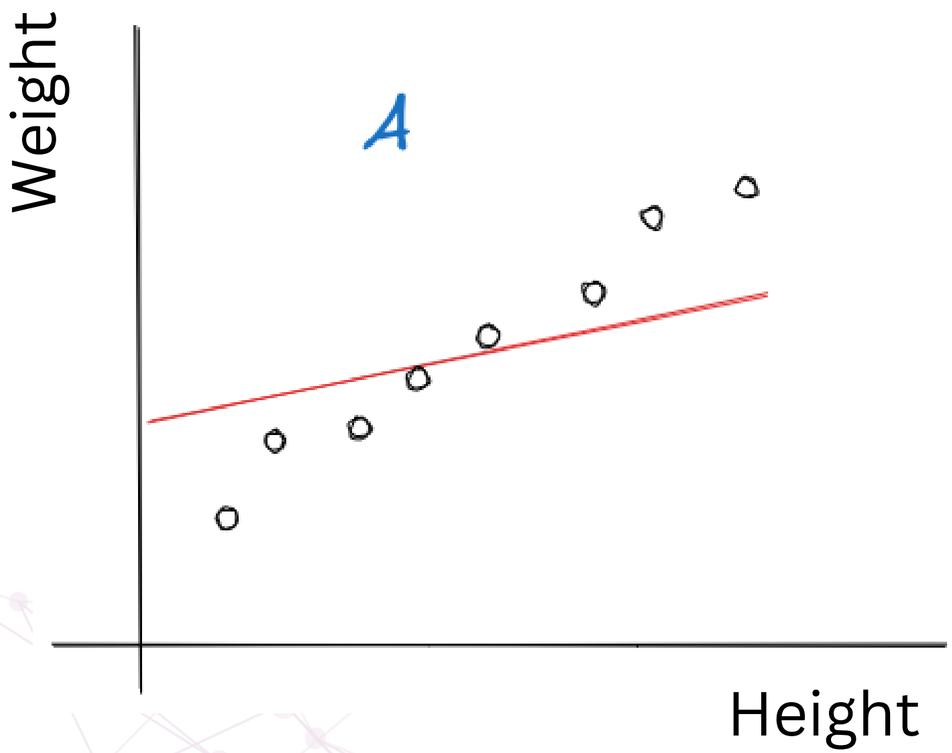
What we do in machine learning

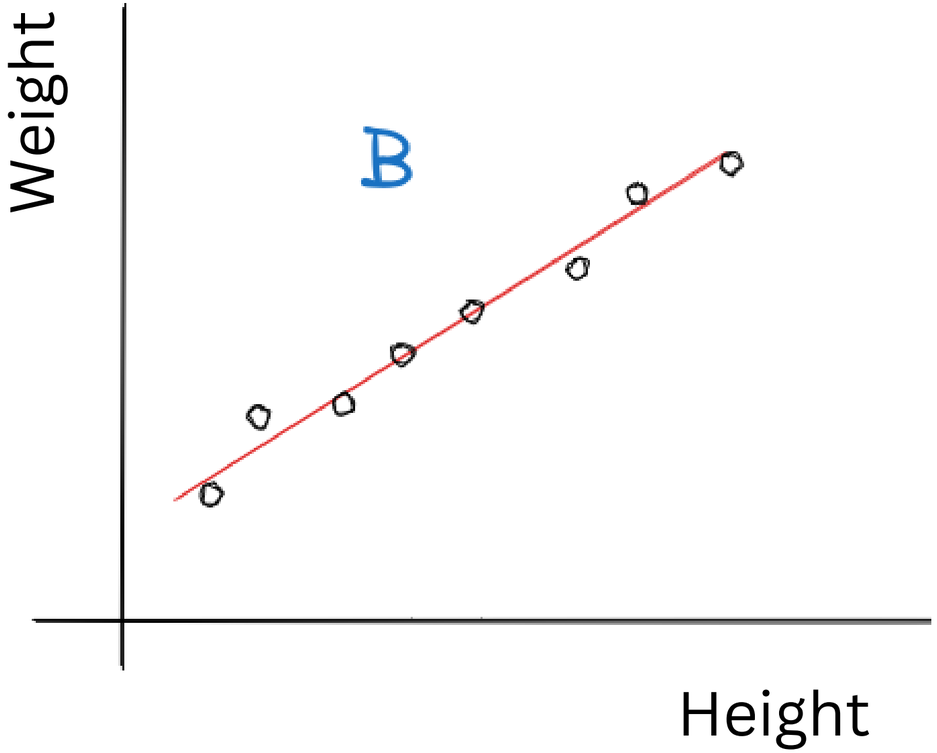


How to use it?



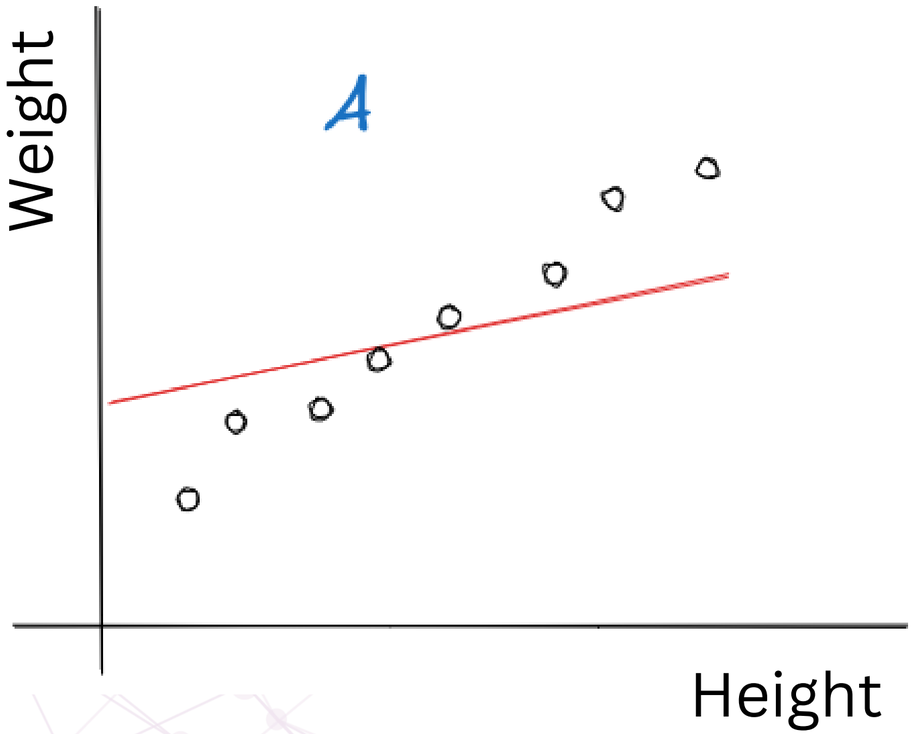
Which line is better ?

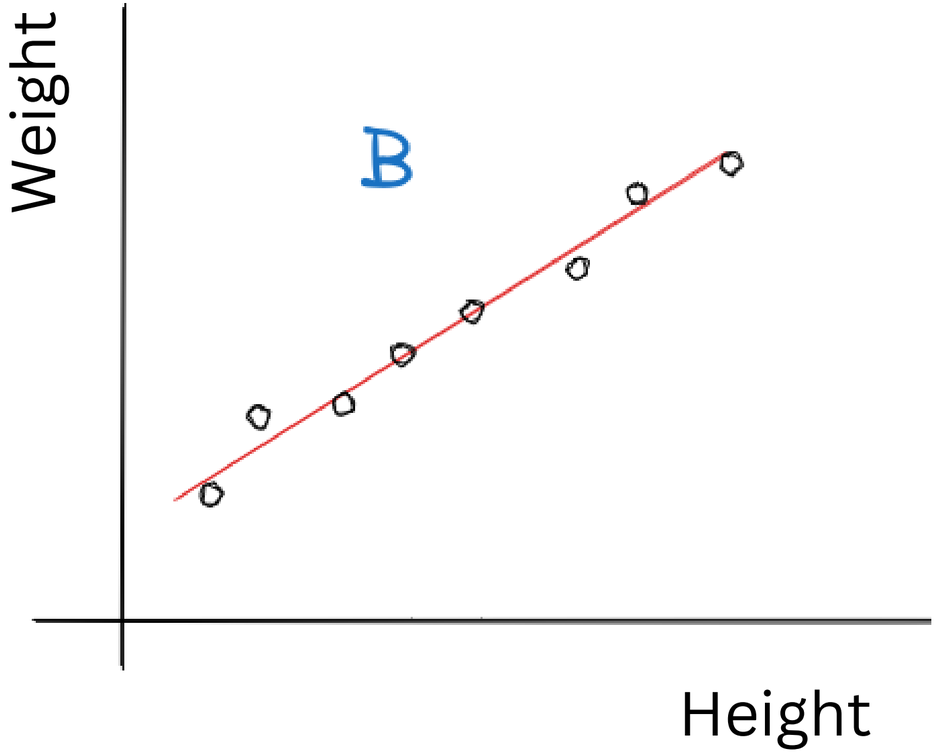




Which line is better ?

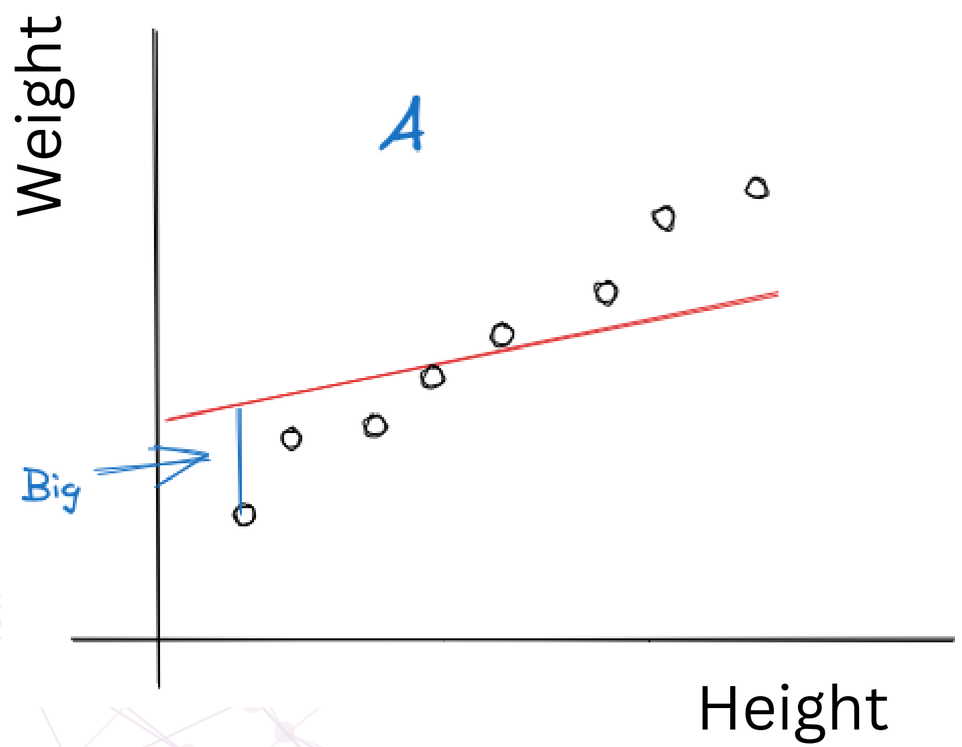
Why?

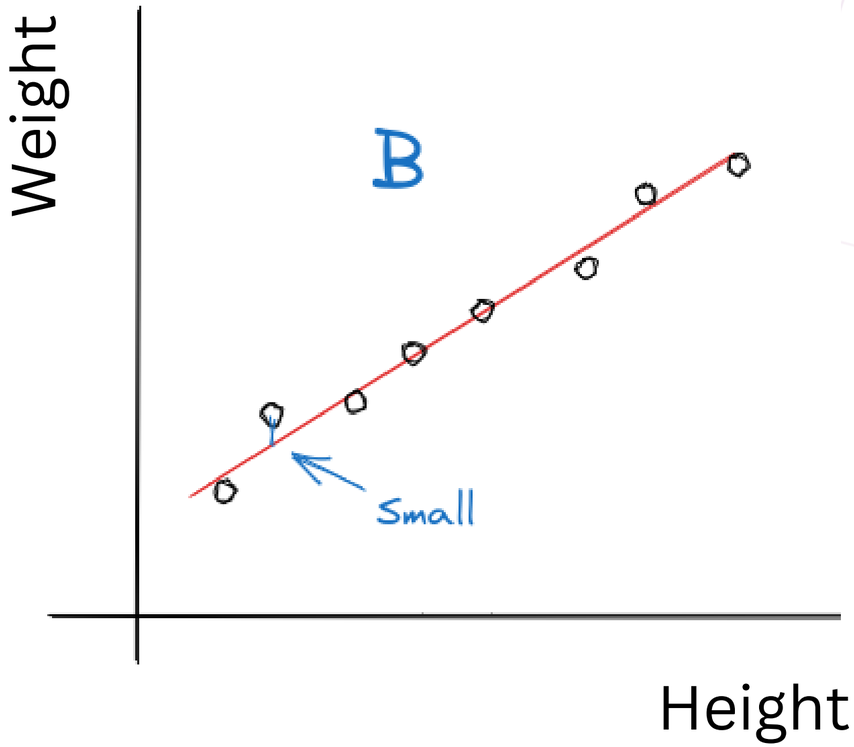




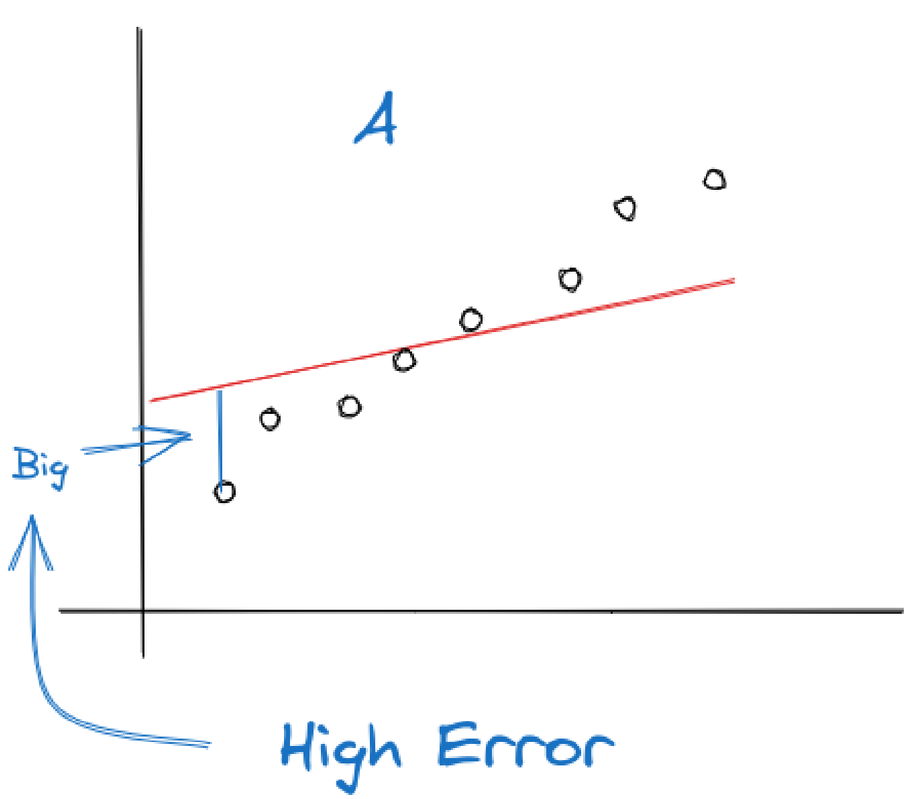
Which line is better ?

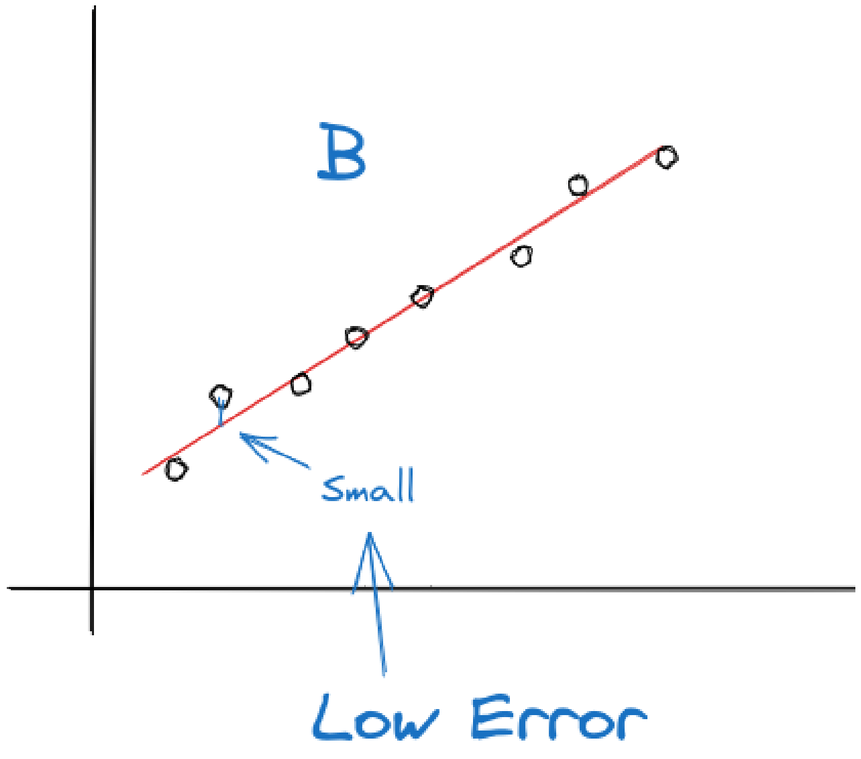
Why?



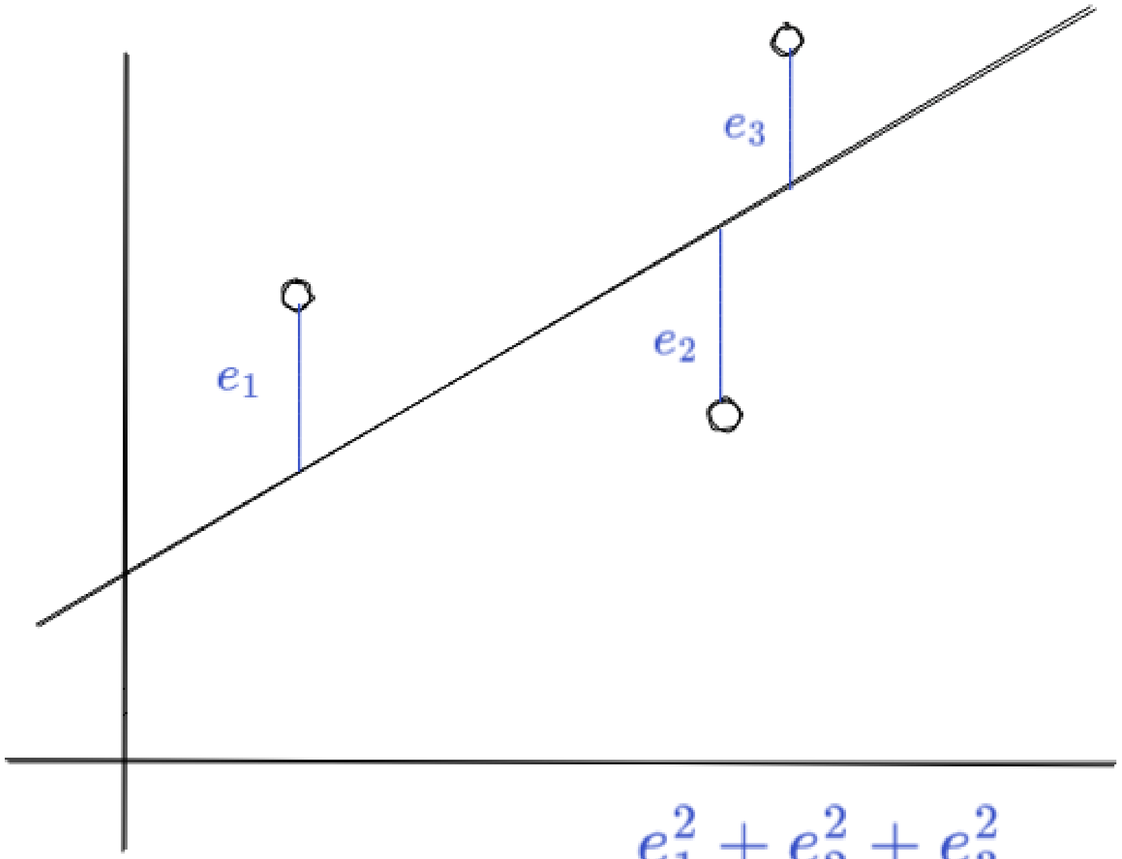


Error





Loss: Mean Square Error

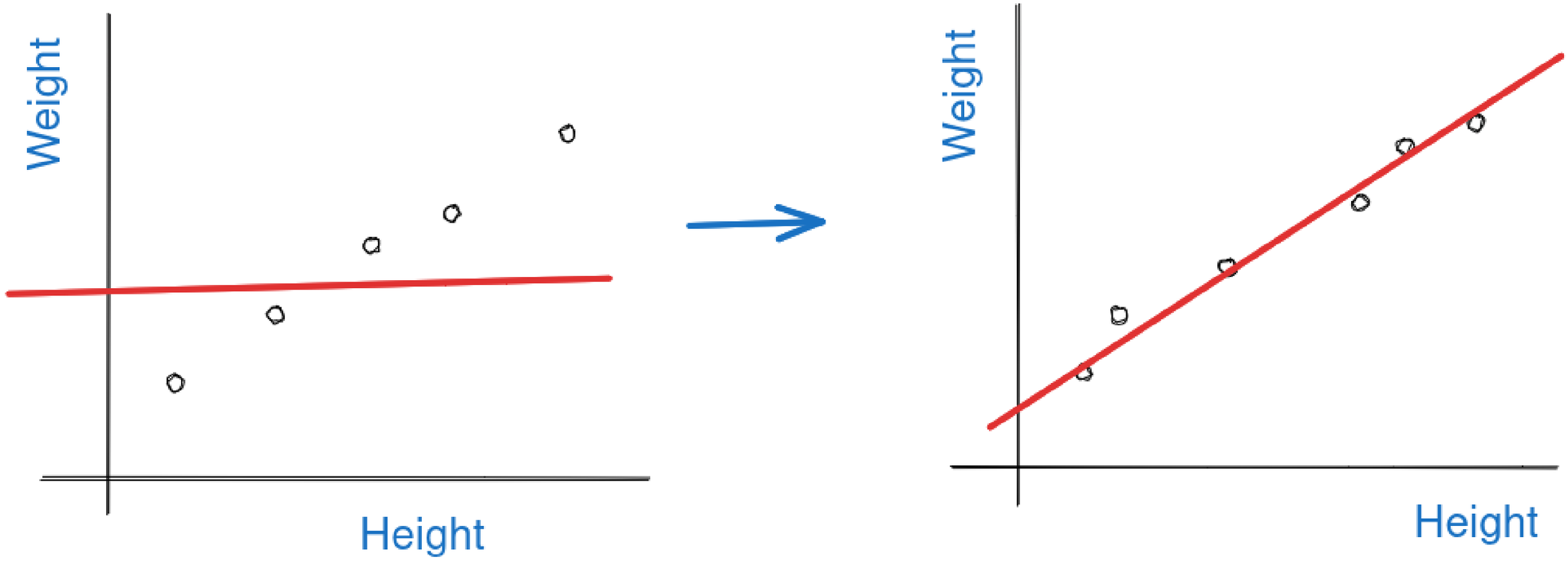


$$e_i = Y_{true} - Y_{pred}$$

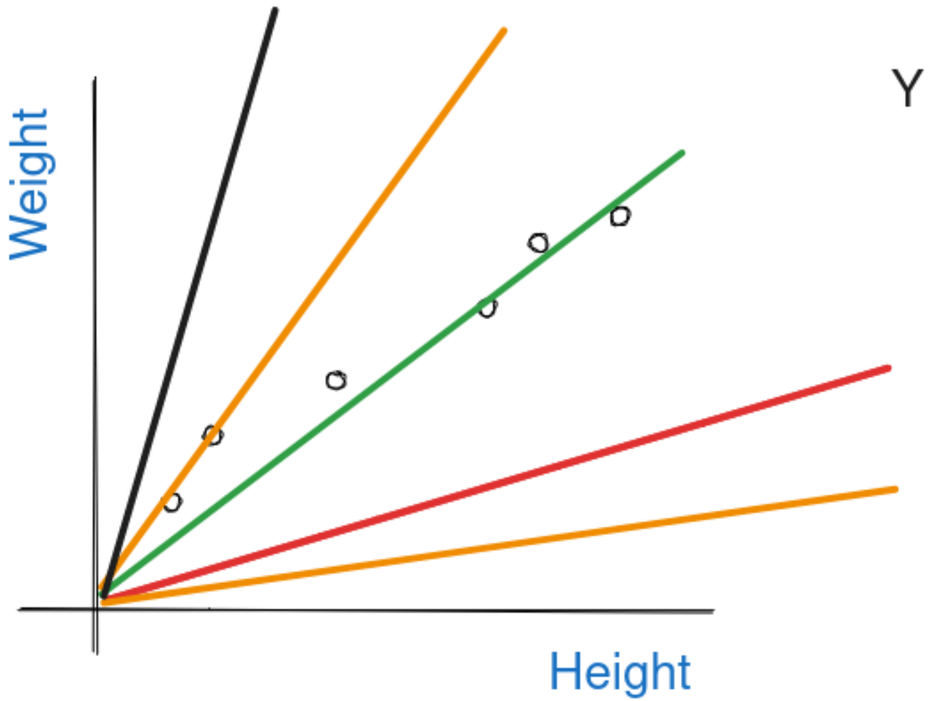
$$Loss = \frac{\sum e_i^2}{n} = \frac{\sum (Y_{true} - Y_{pred})^2}{n}$$

$$MSE = \frac{e_1^2 + e_2^2 + e_3^2}{3}$$

Goal

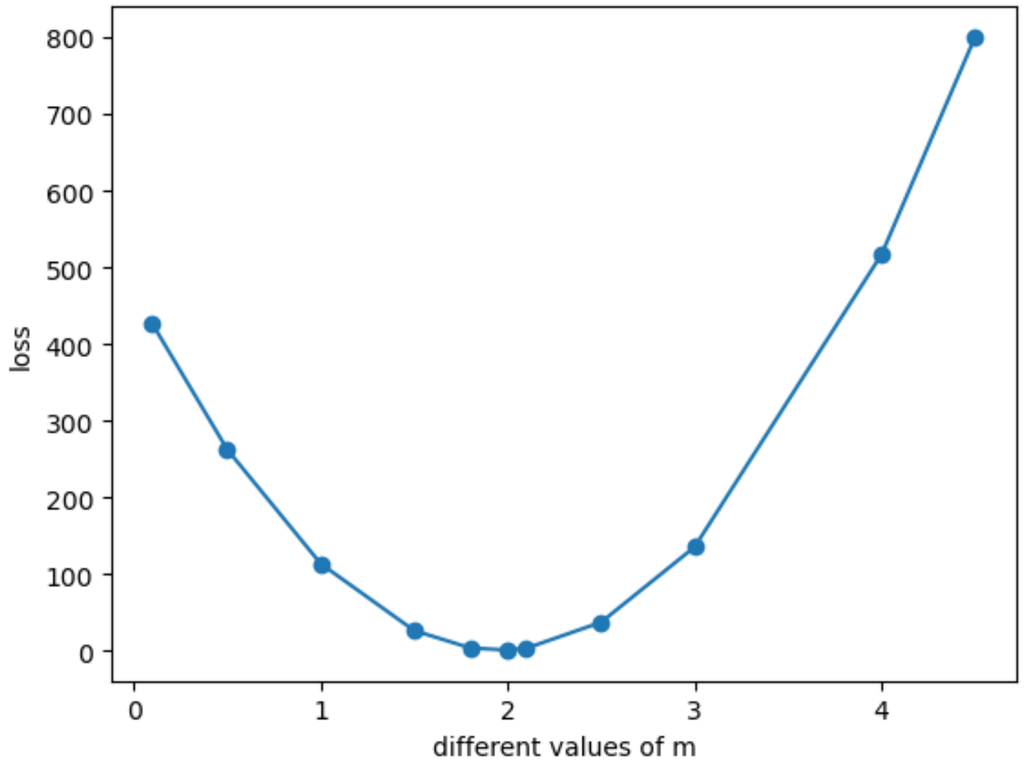


Line At Different Slopes

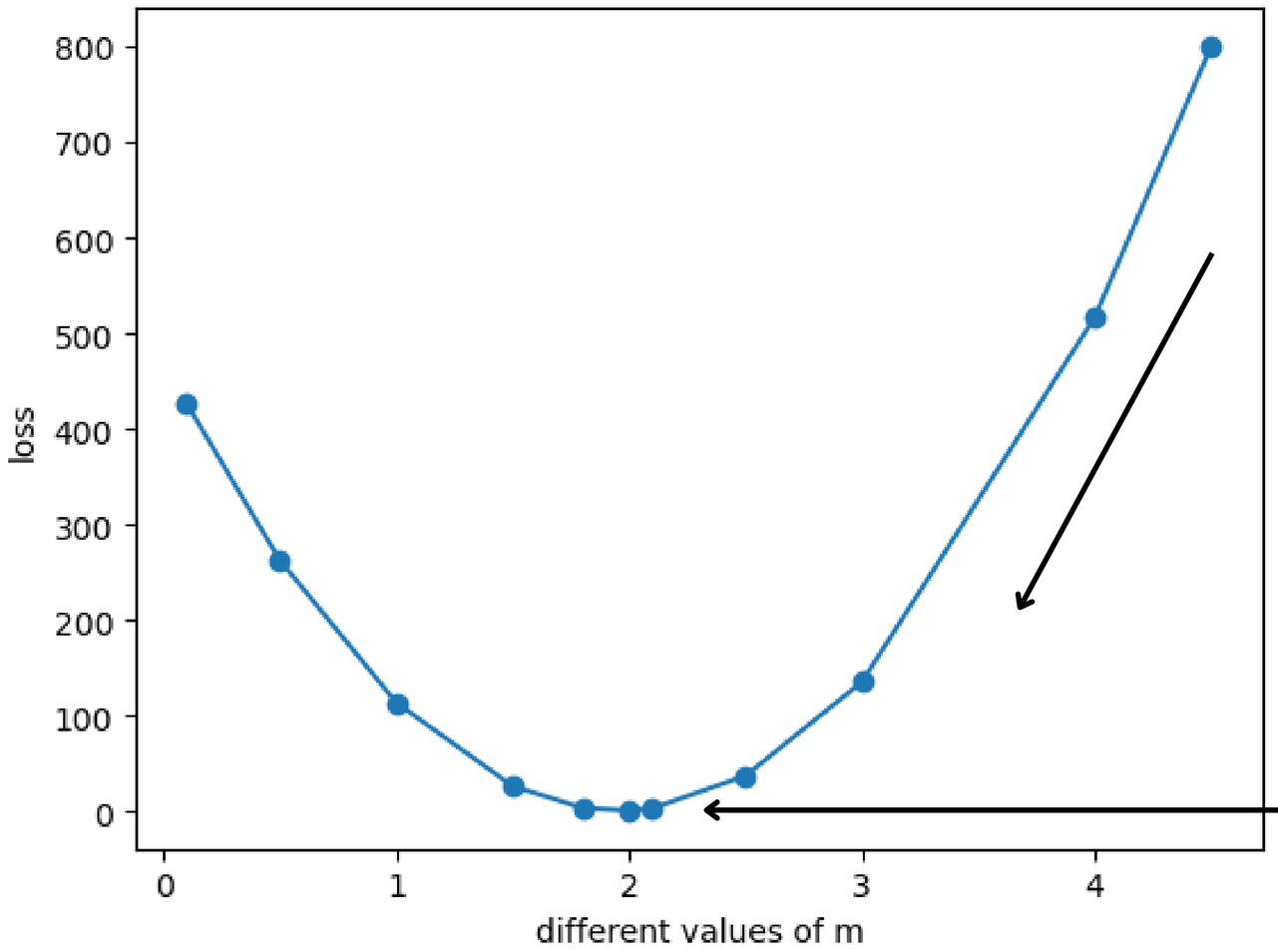


$Y = mX$

Different values of m



The Graph in Detail



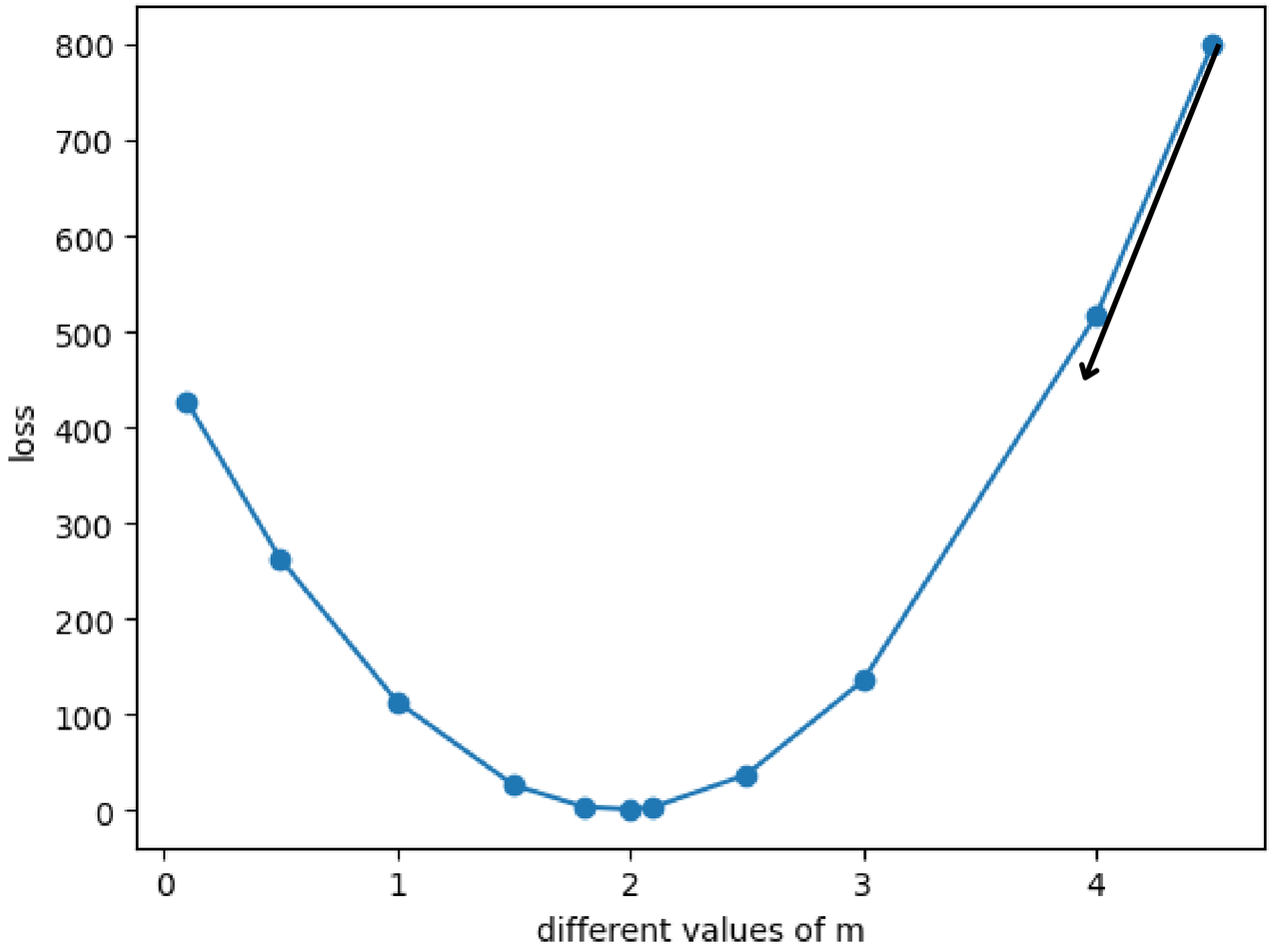
Starting Point

Direction We Wish to go

Where We Want to be At

Minimize loss with respect to m

Math Time: Gradient



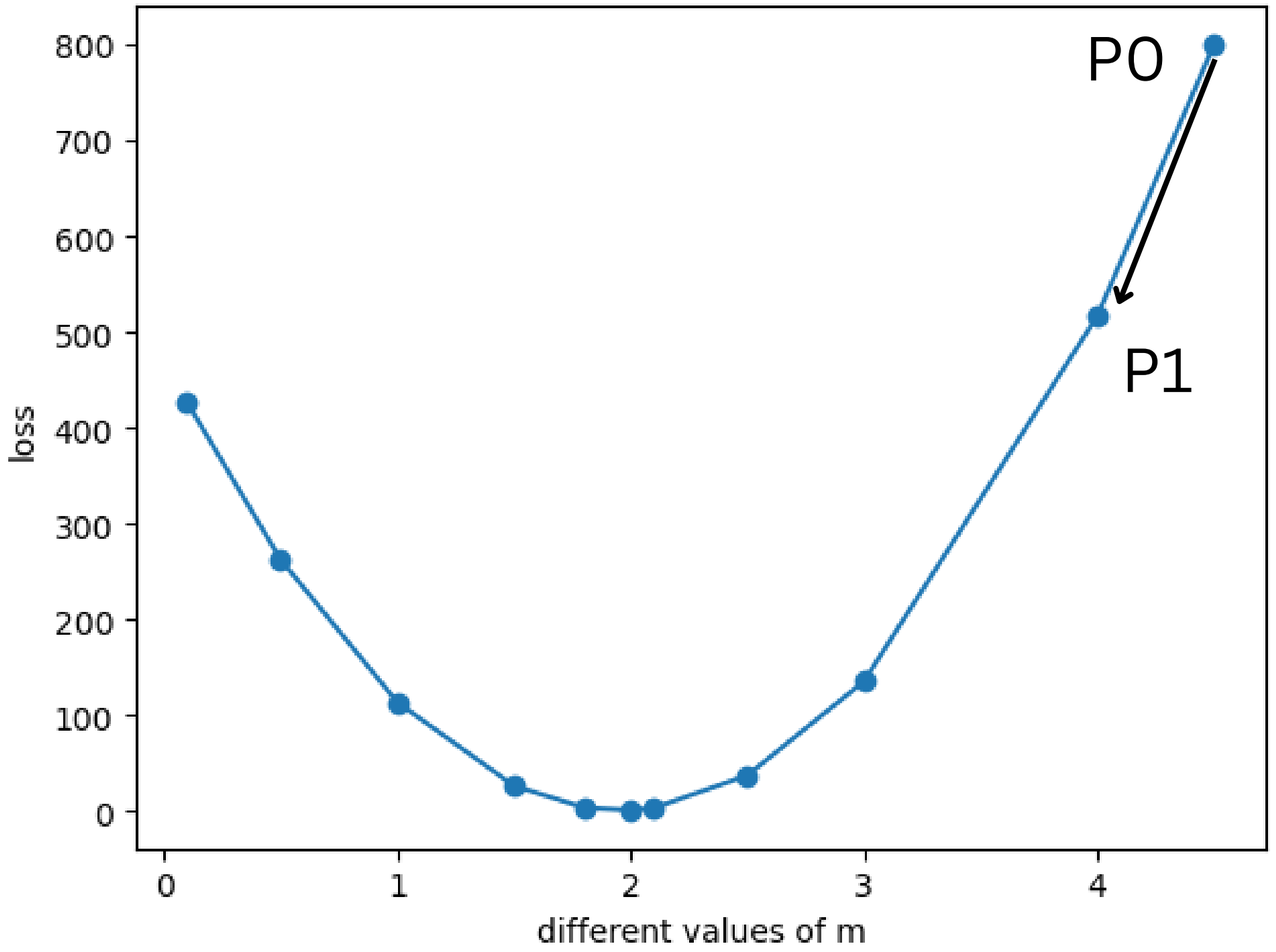
$$Y_{pred} = m * X$$

$$Loss = \frac{\sum (Y_{true} - Y_{pred})^2}{n}$$

$$\frac{\partial Loss}{\partial m} = \frac{\partial Loss}{\partial Y_{pred}} * \frac{\partial Y_{pred}}{\partial m}$$

$$\frac{\partial Loss}{\partial m} = \frac{2}{n} * \sum (Y_{true} - Y_{pred}) * (-1) * X$$

Math Time: Time to Take a Step

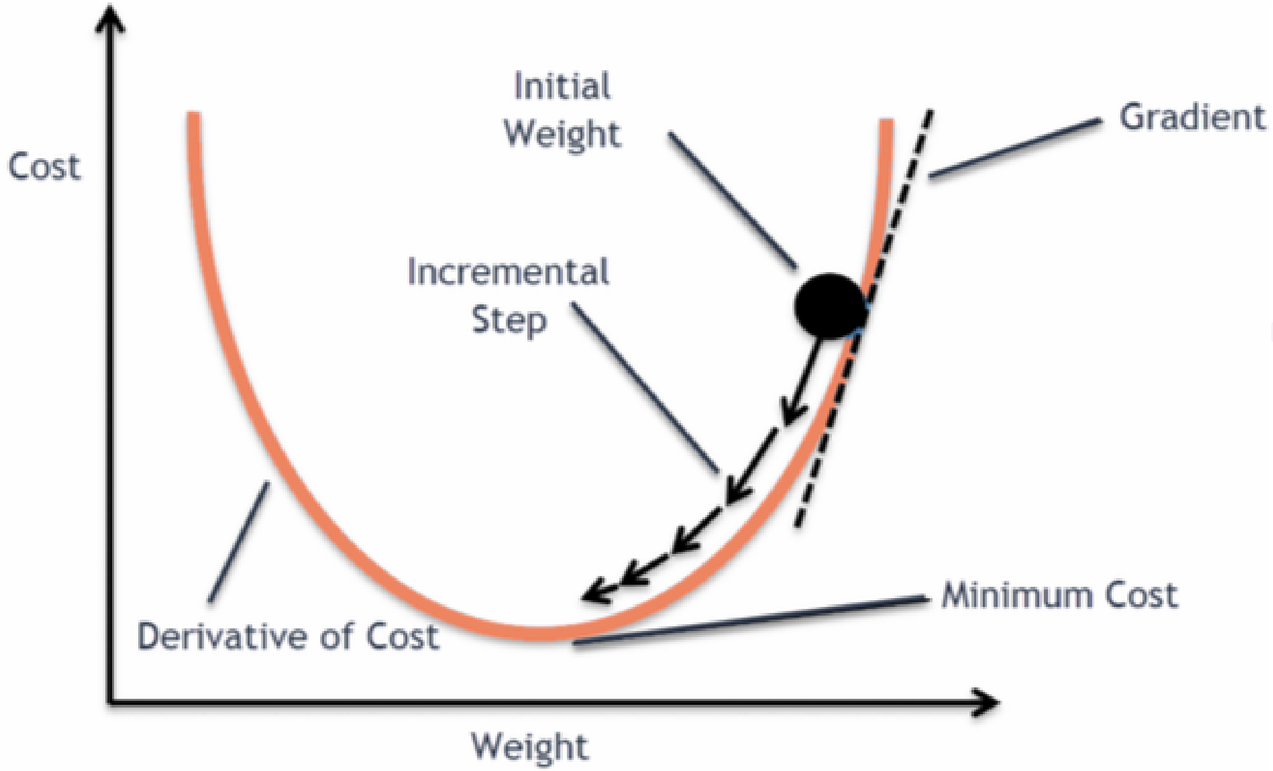


$$We\ have\ \frac{\partial Loss}{\partial m}$$

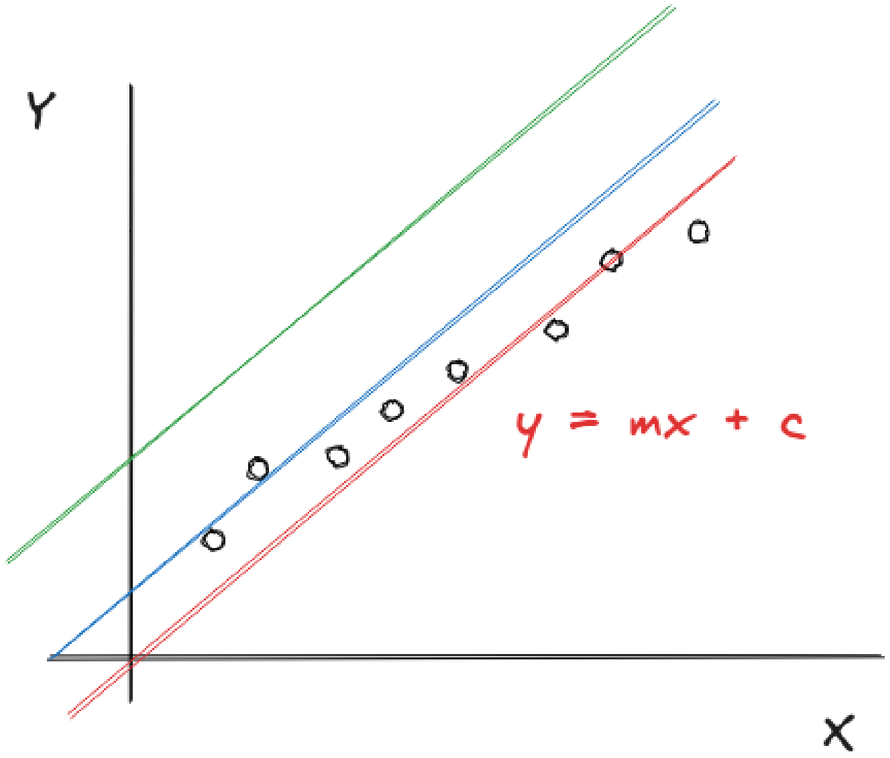
$$m \leftarrow m - \eta * \frac{\partial Loss}{\partial m}$$

$$\eta :\ Learning\ rate$$

In Conclusion: Gradient Descent



Oh We forgot the C



$$Y_{pred} = m * X + c$$

$$Loss = \frac{\sum (Y_{true} - Y_{pred})^2}{n}$$

$$\frac{\partial Loss}{\partial c} = \frac{\partial Loss}{\partial Y_{pred}} * \frac{\partial Y_{pred}}{\partial c}$$

$$\frac{\partial Loss}{\partial c} = \frac{2}{n} * \sum (Y_{true} - Y_{pred}) * (-1)$$

$$c \leftarrow c - \eta * \frac{\partial Loss}{\partial c}$$

Time for Hands-On


THIS IS YOUR MACHINE LEARNING SYSTEM?
YUP! YOU POUR THE DATA INTO THIS BIG PILE OF LINEAR ALGEBRA, THEN COLLECT THE ANSWERS ON THE OTHER SIDE.
WHAT IF THE ANSWERS ARE WRONG?
JUST STIR THE PILE UNTIL THEY START LOOKING RIGHT.
DATA
ANSWERS