Intro ML & AI

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Problem 1. Find regression line that fits $(-2,2), (2,4), (3,8), (5,11), (4,7)$

part a

$$\theta_0 = \frac{\sum_{i=1}^{n} (y^i - \theta x^i)}{m} \qquad \theta_1 = \frac{\sum_{i=1}^{n} x^i (y^i - \theta_0)}{\sum_{i=1}^{n} (x^i)^2}$$

$m = 5$

$$\sum_{i=1}^{n} (x^i)^2 = (-2)^2 + 2^2 + 3^2 + 5^2 + 4^2 = 58$$

$$\theta_0 = \frac{(2 - \theta_1(-2)) + (4 - \theta_1(2)) + (8 - \theta_1(3)) + (11 - \theta_1(5)) + (17 - \theta_1(4))}{58}$$

$$\theta_0 = \frac{2 + 2\theta + 4 - 2\theta + 8 - 3\theta + 11 - 5\theta + 17 - 4\theta}{5}$$

$$\theta_0 = \frac{42 - 12\theta_1}{5}$$

$$\theta_1 = \frac{-2(2 - \theta_0) + 2(4 - \theta_0) + 3(8 - \theta_0) + 5(11 - \theta_0) + 4(17 - \theta_0)}{58}$$

$$\theta_1 = \frac{-4 + 2\theta_0 + 8 - 2\theta_0 + 24 - 3\theta_0 + 55 - 5\theta_0 + 68 - 4\theta_0}{58}$$

$$\theta_1 = \frac{151 - 12\theta_0}{58}$$

$$\theta_1 = \frac{151}{58} - \frac{12}{58}(\theta_0)$$

$$\theta_0 = \frac{42}{5} - \frac{12}{5}(\theta_1)$$

$$\theta_1 = \frac{151}{58} - \frac{12}{58}(\theta_0)$$

$$\theta_0 = \frac{42}{5} - \frac{12}{5}(\theta_1)$$

$$\theta_1 = \frac{151}{58} - \frac{12}{58}\left(\frac{42}{5} - \frac{12}{5}(\theta_1)\right)$$

$$-\frac{72}{145} + \theta_1 = \frac{151}{58} - \frac{252}{145} + \frac{72}{145}(\theta_1) - \frac{72}{145}(\theta_1)$$

$$\frac{145}{73}\theta_1 \frac{73}{145} = \left(\frac{151}{58} - \frac{252}{145}\right)\frac{145}{73}$$

$.8655$

$$\theta_1 = 1.719$$

$$\theta_0 = \frac{42}{5} - \frac{12}{5}(1.719)$$

$$\theta_0 = 4.2744$$

$$y = b_0 + b_1 x$$

$$y = 4.2744 + 1.719x$$

$$b_0 = 4.2744$$

$$b_1 = 1.719$$

$$y = 4.27 + 1.719x$$

Problem 1

Part c

$b_0 = 4.0807$

$b_1 = -0.4424$

$$y = 4.0807 - 0.4424x$$