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# MDL Quiz 1

George Paul
2021121006

1 a) $x_1 = 6$ $y_1 = 7$

$x_2 = 56$ $y_2 = 55$

$x_3 = 326$ $y_3 = 328$

$x_4 = 11$ $y_4 = 12$

$x_5 = 11$ $y_5 = 11$

$x_6 = 22$ $y_6 = 21$

c) $MSE = \frac{1}{m} \sum [f(x^{(i)}) - y^{(i)}]^2$

$= \frac{1}{6}$

| $f(x^{(i)})$ | $y^{(i)}$ | | squared |
|---|---|---|---|
| 7 | 6 | = 1 | 1 |
| 55 | 56 | = -1 | 1 |
| 328 | 326 | = 2 | 4 |
| 12 | 11 | = 1 | 1 |
| 11 | 11 | = 0 | 0 |
| 21 | 22 | = -1 | 1 |
| | | | 8 |

$\therefore MSE = \frac{1}{6} \times 8 = \frac{4}{3} = 1.33$

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1.e) $E[f(x)^2]$

$= (6^2 + 56^2 + 326^2 + 11^2 + 11^2 + 22^2) \frac{1}{6}$

$= 18362.33$

$E[\hat{f}(x)]$

$= (6 + 56 + 326 + 11 + 11 + 22) \frac{1}{6}$

$= 72$ , $E[\hat{f}(x)]^2$

$Var[\hat{f}(x)] = 18362.33 - 5184$

$= 13178.33$

f) for M2,

$E[\hat{f}(x)^2] = \frac{111044}{6}$

$= 18507.33$

$E[\hat{f}(x)] = \frac{438}{6} = 73$

$Var[\hat{f}(x)] = 13178.33$

$MSE = \frac{1}{6}(2^2 + 0^2 + 3^2 + 2^2 + 1^2 + 2^2) = \frac{22}{6} = 3.66$

(... continued)

4.
- Conversation AI ~~despite~~ can only hold proper conversation when exploiting certain things such as emulating a certain personality or ~~if~~ mental illnesses to artificially boost realism.
- Maps AI doesn't always account for certain locally true aspects of a route such as the ~~to~~ road condition.