Q1) Explain how locally weighted regression differs from linear regression, including their formulas. What is an advantage of locally weighted regression over linear regression?

linear Regression: The formula for linear regression is,

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n$$

where β represents coefficients and x represents independent variables. The model for this is basically here fits a single, global straigth line to capture the relationship between indipendent variables x and the dependend variable y across the entire datasat. Linear regression assumes if a linear relationship between the simple and understand implement.

Locally Weighted

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Locally Weighted Regression:

this is very similar to linear regression but with weights "w-i" is assigned to each data point based on its proximitlly distance to the new data point x for which we are making a predection the formula is

$$y^* = \sum (w\_i * (\beta_0 + \beta_1 x\_i_1 + \beta_2 x\_i_2 + \ldots + \beta_n x\_in)) / \sum (w\_i)$$

where y is predicted value for the new data point (x^*). w_i is the weight assigned to the i-th data point based on its distance to x^* and β is bacically the coefficients. estimated using the weighted data points. beally from the neighbourhood. influencing the prediction, more this alowes the negession method to capture non-linear nebtionship aeeross the entire dataset. But this model eann handle non-linear nebationship, accurate prediction in sueh seenarions.

Advantage of locally weighted Regression:

The key advantage of this model over linear regression is its ability to capture non linear relationship between variables while linear regression assumes a straith relationships between variables while linear regression assumes a straith line fit. LWR can adapt to local trends in the data leading to potentialy more accurate prediction for non linear patterns. But it has some limitations, ~~whe~~ well it is more expensive it requires storing the entire dataset and the effectiveness of LWR depends on the chosen weights are assigned based on distance

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Q2) Given you want to apply a model to predict whether a patient has malignant or benign where output $y = 1$ means malignant $y = 0$ mens benign. Explain how the binary logistic regression model is used to train patient data and then predict tumor of a new patient Include formulas and learning

A shaped sigmoid function is used to logistig regression to convert the inner output

$$\log(\text{odds}(y=1)) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n$$

where β is the intercept term β_1 are the coefficient for each independent variable (x odds$(Y=1)$ represents having malignant tumor.

Bilfast

Q3) Give the output y (n), of 3 training items loffanne regression are represented by the followine ont hot veetors whore expanded form

$y \in \{1\ 2\ 3\}$; $y1 = [1 0 0]$ and $y3 = [0 0 1]$

softawne output function the stofman function $(y \in \{1; 2, 3\})$ The equation is

$f(z\_1; w) - exp(z\_i) / \Sigma (exp(z\_i)$

for all clasess (1 to k)

- $y_1 = [1 0 0]$ (all element are 0 exepect 1)
- $y_2 = [0 1 0]$ (all elements are 0 except the 2)
- $y_3 = [0 0 1]$ (all elements are 0 exeped 3)

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Q4) What is the penalty term of Ridge (L2 regularization and how does it reduce over fitting.

the model sum of squared coefficient

or β, is the penalty term in Ridge

regression (L2 regularization)

the penalty term in (2 regularization

- $\lambda = L(\beta\_in2)$

Q5) - Initialize and arbitary

2. loop

3 "policy Evaluation"

value

$V \pi (s')$]

y discount factor observed

a6)

$$Q(s,a) \leftarrow Q(s,a) + \alpha [R(s,a) + \gamma \max_{a'} Q(s',a') - Q(s,a)]$$

where α is the learning rate

$R(s,a)$ is the reward for taking action a from state s, γ is the discount factor