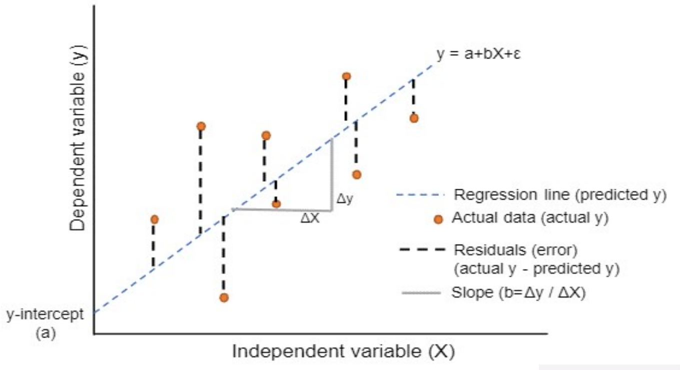
Sl No	Terminologies	Regression (Supervised)		
		Linear Regression	**Ridge / Tikhonov Regression**	**Logistic Regression (Classification)**
	Key Concepts	**R^2: Coeff of Determination:** Percentage variation in Y that is explained by Independent Variables [$0 < R^2 < 1$]. **R^2 = 1 - (unexplained variation / total variation)** **Adjusted R^2: = 1 - (1 - R^2) [(n - 1)/ (n-k-1)]:** When variable count increases, value of Adjusted R^2 increases, only when the added variables really adds to the model's explaination power. **MAE, MSE, RMSE, ANOVA (tests the null hypothesis that there is no relationship between the independent variable (X) and dependent (y) variable** **y = mx + c [m = Slope, c = Bias / intercept]** **Regularization (penalty) using Ridge (L2) or Lasso (L1)** **Overfit = Low Bias + High Variance** **Underfit = High Bias + High Variance**	**- Ridge regression is a model tuning method, used to analyse any data that suffers from multicollinearity.** **- This method performs L2 regularization.** **- When the issue of multicollinearity occurs, least-squares are unbiased, and variances are large, this results in predicted values being far away from the actual values.** **The bias increases as λ increases.** **The variance decreases as λ increases.** **y = c + m1x1 + m2x2 + [λ(m1² + m2²)]** **If λ = 0 then Ridge Regression = Linear Regression**	**Sigmoid Function:** **f(x) = 1 / [1 + e^-x] transforms Linear Regresion to Logistic Regression, Odd's Ratio**
1	**Category**	Regression Only	Regression Only	Multi Class Classifier Only
2	**Linear/Non-Linear**	Linear Data Only	Linear Data Only	Linear Data Only
3	**Method**	Distance Based	Distance Based	Distance Based & Probablistic
4	**Scaling**	Required	Required	Required
5	**Correlation Check**	Required	Required	Required
6	**Outlier Treatment**	Required	Required	Required
7	**H/W Requirement**	Low	Low	Low
8	**Reliability**	Low due to the model's simplicity. High chance of overfitting / underfitting		
9	**Assumptions**	Linear Relationship between x & y, Independence of Residuals (errors), Homogeneity of Variance, Normality (Normally Distributed)		
10	**Comments**	# Used to create Linear Relation between all Input and Output Variables # Prone to overfitting & underfitting due to simplicity	# Bias & Variance in Linear Regression can be balanced by Regularization (penalty) using Ridge (L2, resolves overfitting) or Lasso Regression (L1, resolves overfitting and also reduces dimension)	# Used to create Classification Model based on Regression Concept and Sigmoid Function # Rarely Used in industry
10	**Use Cases**	Housing Price, Financial Risk Analysis		Employee Attrition, Clinical Trials

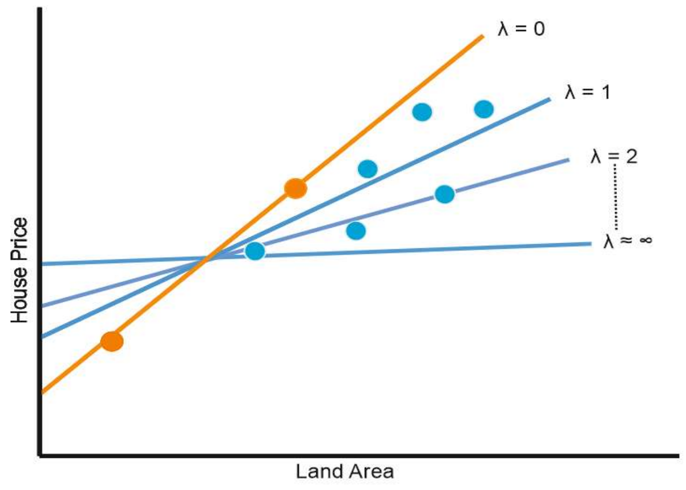
Y=mX+c

m → slope of the equation/coefficient
c → y intercept
Y → dependent variable
X → independent variable



$$R^2_{adjusted} = 1 - \frac{(1 - R^2)(N - 1)}{N - p - 1}$$

where
R^2 = sample R-square
p = Number of predictors
N = Total sample size.



$$P = \frac{1}{1 + e^{-y}}$$
$$P\left(1 + e^{-y}\right) = 1$$
$$P + Pe^{-y} = 1$$
$$Pe^{-y} = 1 - P$$
$$e^{-y} = \frac{(1 - P)}{P}$$

To remove exponential , take Log

$$\log_e e^{-y} = \log_e\left(\frac{1 - P}{P}\right)$$
$$-Y = \ln\left(\frac{1 - P}{P}\right)$$
$$Y = \ln\left(\frac{P}{1 - P}\right)$$