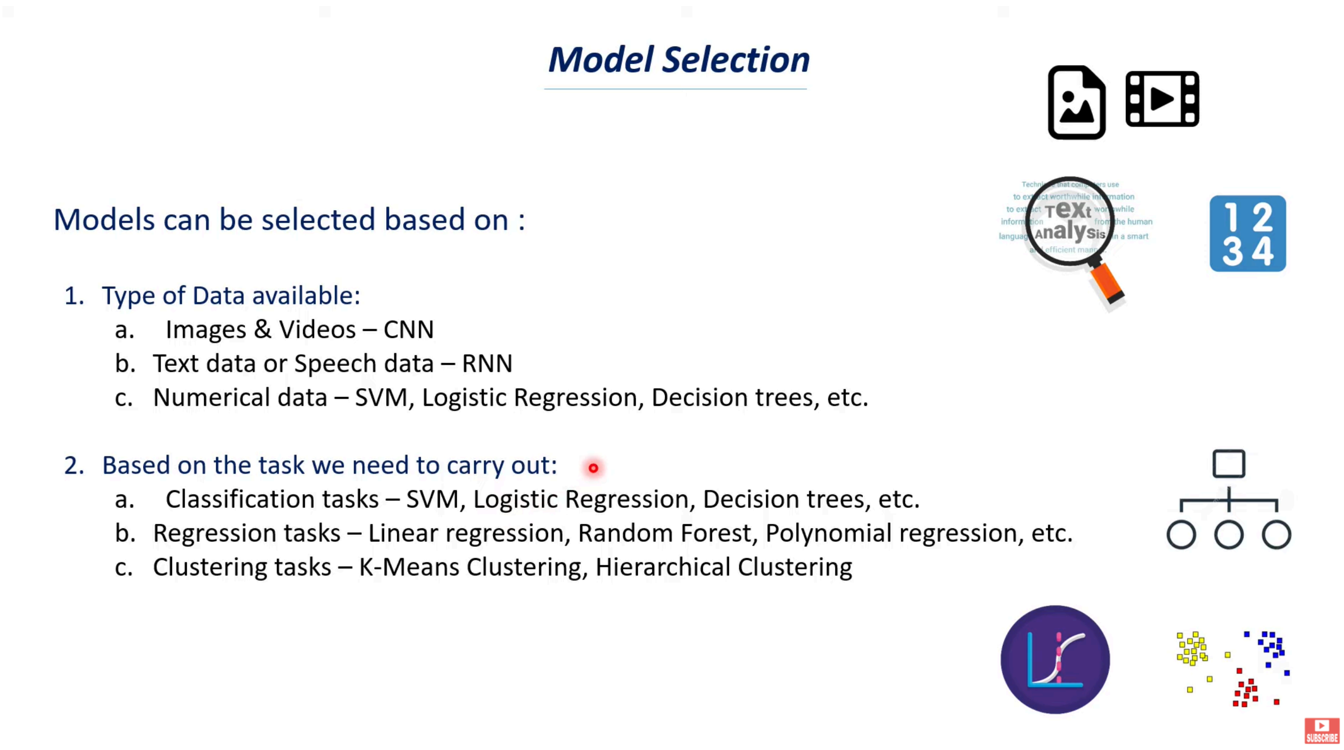
Model Selection

It is the process of choosing the best suited model for a particular problem. Selecting a model depends on various factors such as dataset, task, nature of model, etc.

This is a general Model selection



Model Selection

Models can be selected based on :

1. Type of Data available:
   a. Images & Videos – CNN
   b. Text data or Speech data – RNN
   c. Numerical data – SVM, Logistic Regression, Decision trees, etc.

2. Based on the task we need to carry out:
   a. Classification tasks – SVM, Logistic Regression, Decision trees, etc.
   b. Regression tasks – Linear regression, Random Forest, Polynomial regression, etc.
   c. Clustering tasks – K-Means Clustering, Hierarchical Clustering

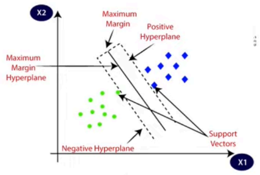
we can also use same model for Classification and Regression tasks depending on the task.

CROSS VALIDATION

Cross validation is a technique used in machine learning to evaluate the performance of a model on unseen data. It involves dividing the available data into multiple folds or subsets, using one of these folds as a validation set, and training the model on the remaining folds. This process is repeated multiple times, each time using a different fold as the validation set. Finally, the results from each validation step are averaged to produce a more robust estimate of the model’s performance

ex:

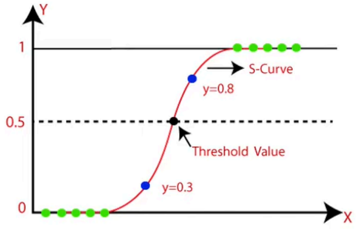
Lets compare SVM and logistic regression



Support Vector Machine

	Dataset					*Accuracy*
Iteration 1	Train	Train	Train	Train	Test	88%
Iteration 2	Train	Train	Train	Test	Train	83%
Iteration 3	Train	Train	Test	Train	Train	86%
Iteration 4	Train	Test	Train	Train	Train	81%
Iteration 5	Test	Train	Train	Train	Train	84%

$$\text{Mean Accuracy} = \frac{88 + 83 + 86 + 81 + 84}{5} = 84.4\ \%$$



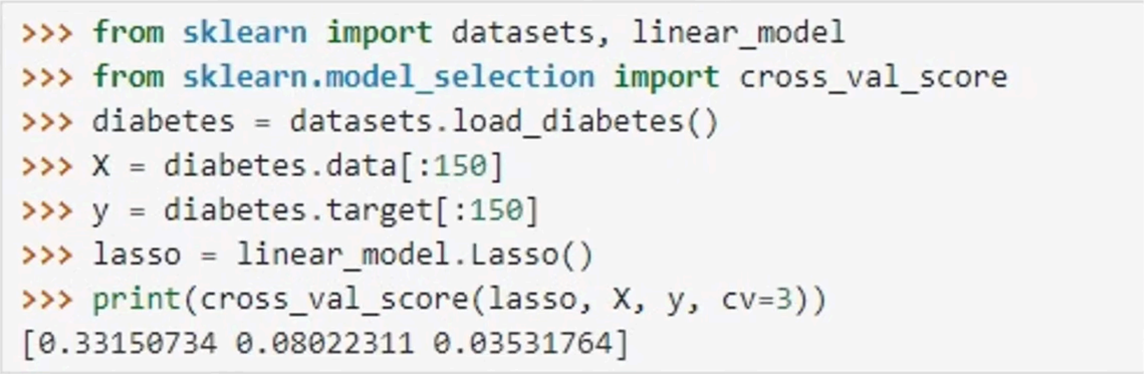
Logistic Regression

	Dataset					*Accuracy*
Iteration 1	Train	Train	Train	Train	Test	90%
Iteration 2	Train	Train	Train	Test	Train	88%
Iteration 3	Train	Train	Test	Train	Train	86%
Iteration 4	Train	Test	Train	Train	Train	91%
Iteration 5	Test	Train	Train	Train	Train	85%

$$\text{Mean Accuracy} = \frac{90 + 88 + 86 + 91 + 85}{5} = 88\ \%$$

Therefore for this particular dataset Logistic regression is a better choice.

Cross Validation Implementation:



```
>>> from sklearn import datasets, linear_model
>>> from sklearn.model_selection import cross_val_score
>>> diabetes = datasets.load_diabetes()
>>> X = diabetes.data[:150]
>>> y = diabetes.target[:150]
>>> lasso = linear_model.Lasso()
>>> print(cross_val_score(lasso, X, y, cv=3))
[0.33150734 0.08022311 0.03531764]
```