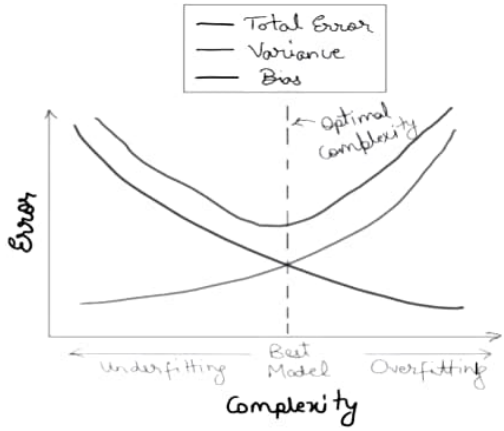
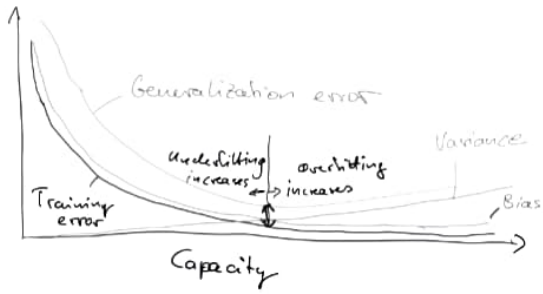
1 — Explain Bris and variance with proper digram

Bias and variance are inversely connected. It is impossible to have an ML model with a low bias and a low variance. When a data engineer modifies the ML algorithm to better fit a given data set, it will lead to low bias—but it will increase variance. This way, the model will fit with the data set while increasing the chances of inaccurate predictions. The same applies when creating a low variance model with a higher bias. While it will reduce the risk of inaccurate predictions, the model will not properly match the data set. It's a delicate balance between these bias and variance. Importantly, however, having a higher variance does not indicate a bad ML algorithm. Machine learning algorithms should be able to handle some variance.





2 — Write a short note on

1) Support vector Kernels 2) hyperplane or decision boundary

The Kernels in Support Vector Machine is a supervised learning algorithm mostly used for classification but it can be used also for regression. The main idea is that based on the labeled data (training data) the algorithm tries to find the optimal hyperplane which can be used to classify new data points. In two dimensions the hyperplane is a simple line. The decision boundary for a linear support vector machine is an (affine) hyperplane. For non-linear kernel support vector machines, the decision boundary of the support vector machine is not an hyperplane in the original feature space but a non-linear hypersurface (a surface of dimension n_features − 1) whose shape depends on the type of kernel. However, the kernel function can be interpreted as inducing a non-linear mapping from the original feature space to some kernel space. In the kernel space then the decision function of the SVM is an hyperplane. Here is a video that gives an intuitive descriptions of the relation between the two for the polynomial kernel.

4 — Difference between classification and Regression model

The main difference between Regression and classification algorithms that Regression algorithms are used to predict the continuous values such as price, salary, age, etc. and classification algorithms are used to predict/classify the discrete values such as Male or Female, True or False, Spam or Not Spam, etc.

(2) Ans⇒ First we need to Convert this into a frequency table

$$P(y|x) \propto P(x|y) * P(y)$$

outlook			Temperature			humidity			windy			play		
	yes	no		ya	no		yes	no		yes	no		yes	no
Sunny	2	3	hot	2	2	high	3	4	false	6	2		9	5
overcast	4	0	mild	4	2	normal	6	1	True	3	3			
rainy	3	2	Cool	3	1									

Imagine that x = { outlook : sunny, temperature : mild, humidity : normal, windy : false }.

$P(yes) = 9/14$

$P(\text{outlook} = \text{sunny}|yes) = 2/9$

$P(\text{temperature} = \text{mild}|yes) = 4/9$

$P(\text{humidity} = \text{normal}|yes) = 6/9$

$P(\text{windy} = \text{false}|yes) = 6/9$

$$P(yes|x) \propto P(\text{sunny}|yes) * P(\text{mild}|yes) * P(\text{normal}|yes) * P(\text{false}|yes) * P(yes)$$

$$P(yes|x) \propto 2/9 \times 4/9 \times 6/9 \times 6/9 \times \frac{9}{14}$$

$$\boxed{P(yes|x) \propto 0.0282}$$

$$P(no|x) \propto 0.0069$$

Since $P(yes|x) > P(no|x)$ then you can predict that the person would play golf given that the outlook is sunny, the temperature is mild.

5 — Write a short note on Bayesian belief network

Bayesian belief network is key computer technology for dealing with probabilistic events and to solve a problem which has uncertainty. We can define a Bayesian network as:

"A Bayesian network is a probabilistic graphical model which represents a set of variables and their conditional dependencies using a directed acyclic graph."

It is also called a Bayes network, belief network, decision network, or Bayesian model.