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What is bias in machine learning?
Bias is a prediction error that is introduced in the model due to oversimplifying the machine learning algorithms.

Bias is considered a systematic error that occurs in the machine learning model itself due to incorrect assumptions in the ML process.

Technically, we can define bias as the error between average model prediction and the ground truth.

What is variance in machine learning?
Variance refers to the changes in the model when using different portions of the training data set.

Variance: If the machine learning model performs well with the training dataset, but does not perform well with the test dataset, then variance occurs.
Simply stated, variance is the variability in the model prediction—how much the ML function can adjust depending on the given data set. Variance comes from highly complex models with a large number of features.

Models with high bias will have low variance.
Models with high variance will have a low bias.

Underfitting :
Underfitting occurs when the model is unable to match the input data to the target data.
This happens when the model is not complex enough to match all the available data and performs poorly with the training dataset.

Example
We have dataset of objects
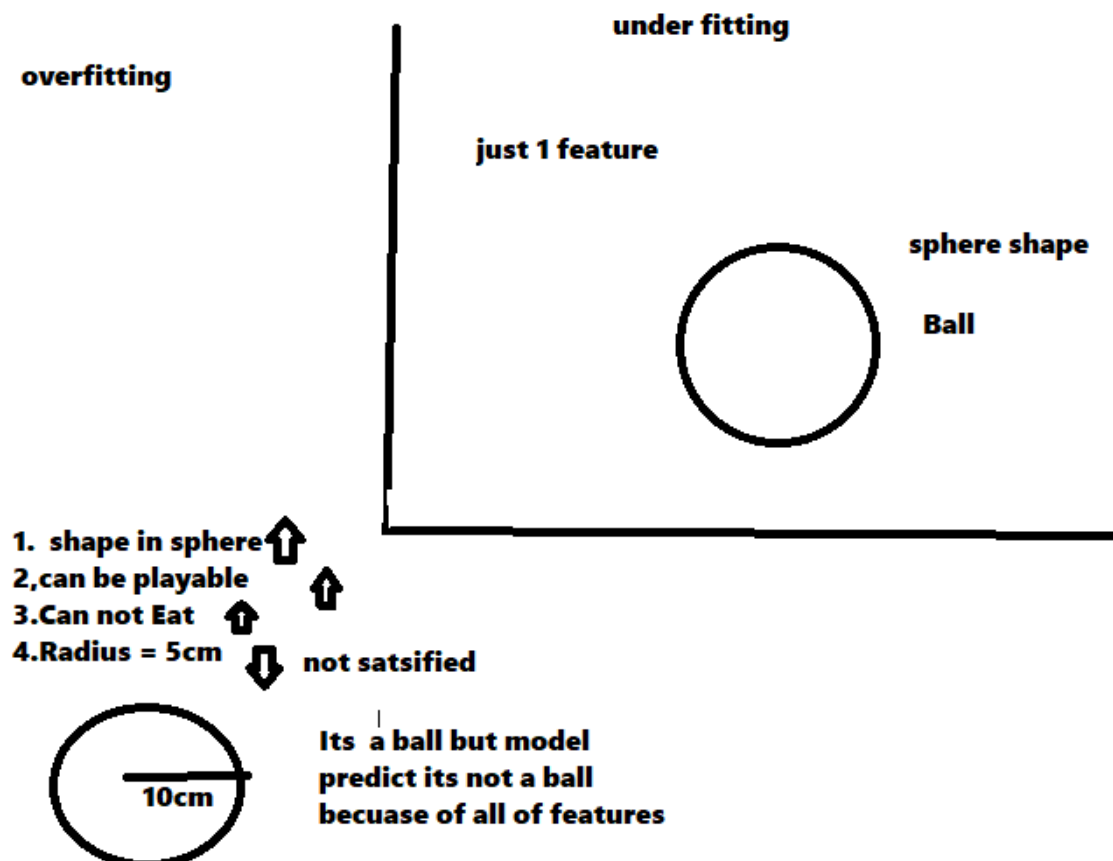If a object is in sphere shape its called predicted its a ball
but in test its called a apple thats its a A Ball ,
it's a underfitting because of less number of attributes its predicted wrong

Overfitting :
Overfitting occurs when our machine learning model tries to cover all the data points or more than the required data points present in the given dataset.

This occurs when dealing with highly complex models where the model will match almost all the given data points and perform well in training datasets

under fitting

overfitting

just 1 feature

sphere shape

Ball

1. **shape in sphere** ⬆
2. **can be playable** ⬆
3. **Can not Eat** ⬆
4. **Radius = 5cm** ⬇ **not satsified**

10cm

Its a ball but model predict its not a ball becuase of all of features

Example
We have dataset of objects to predict Ball
If a object is in sphere shape , can be playable ,Not Eat ,and its radius =5cm then its a **Ball**

1st condition is satsified shape in sphere
2nd cognition is satisfied can be playable
3rd condition is satisfied not Eat
4th one is not satisfied because we have a radius of 10cm

It was a ball but model predicted its not a ball so it overfitting