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ARTIFICIAL INTELLIGENCE

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What is AI?

It’s a theory and methods

The field of artificial intelligence is essentially when machines can do tasks that typically require human intelligence.

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What is Machine Learning?

Application of theory and methods

AI encompasses machine learning, where machines can learn by experience and acquire skills without human involvement.

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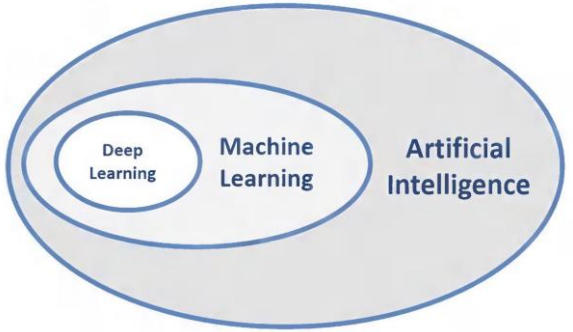
What is Deep Learning?

Subset of Machine Learning

Deep learning is a subset of ML where artificial neural networks, algorithms inspired by the human brain, learn from large amounts of data.

DL allows machines to solve complex problems even when using a data set that is *very diverse, unstructured and inter-connected*.

The more deep learning algorithms learn, the better they perform.



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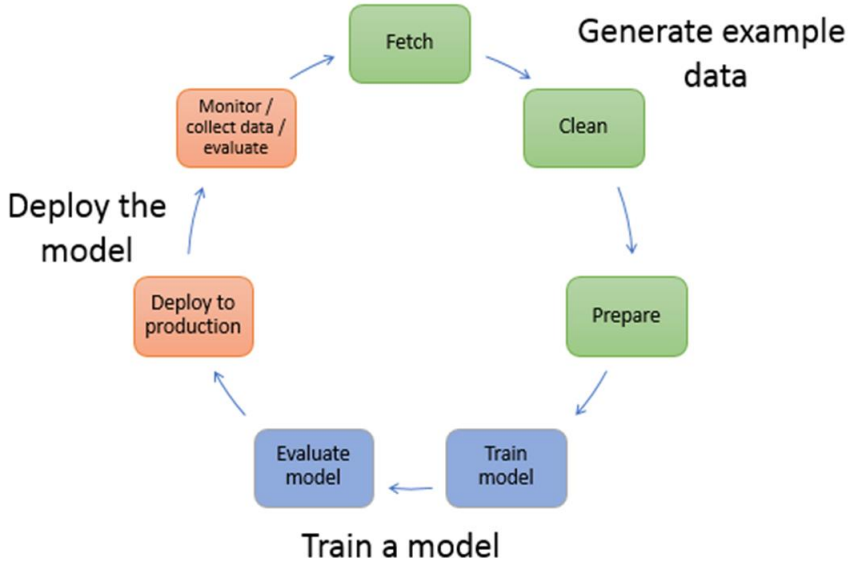
AI Development Lifecycle

Workflow



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Algorithms

Each algorithm solves a type of prediction problem

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Model Evaluation Metrics for Regression Problem

R Square

It measures how much of variability in dependent variable can be explained by the model. It is square of Correlation Coefficient(R) and that is why it is called R Square.

$$R^2 = 1 - \frac{SS_{Regression}}{SS_{Total}} = 1 - \frac{\sum_i (y_i - \hat{y}_i)^2}{\sum_i (y_i - \bar{y})^2}$$

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Model Evaluation Metrics for Regression Problem

Mean Square Error (MSE)

While R Square is a relative measure of how well the model fits dependent variables, Mean Square Error is an absolute measure of the goodness for the fit.

$$MSE = \frac{1}{N}\sum_{i=1}^{N}(y_i - \hat{y}_i)^2$$

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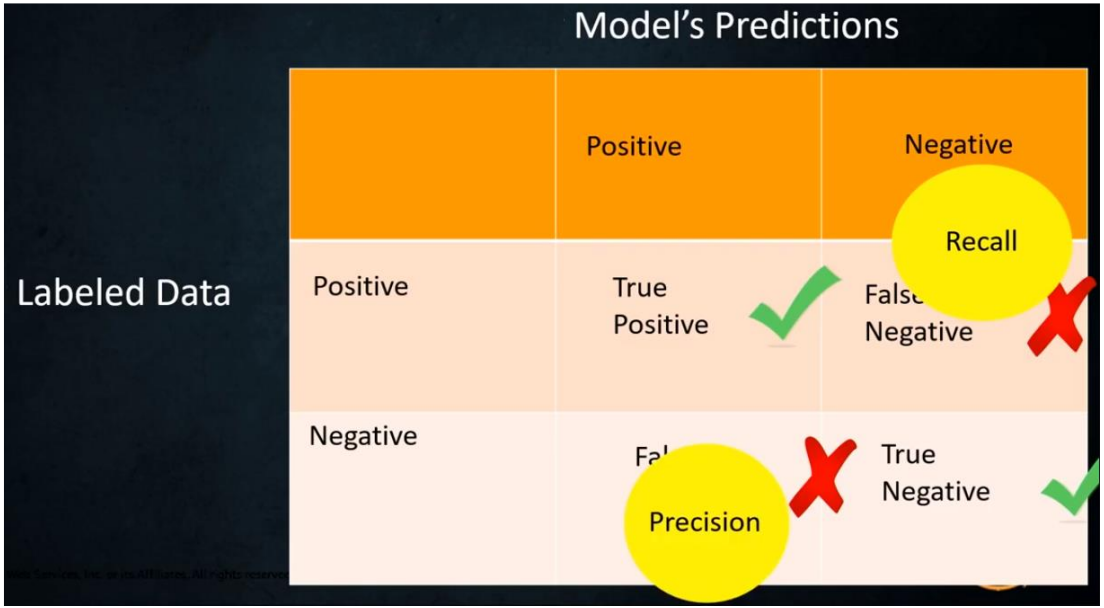
Model Evaluation Metrics for Classification Problem

Confusion Matrix

$$Precision = \frac{TP}{TP + FP}$$

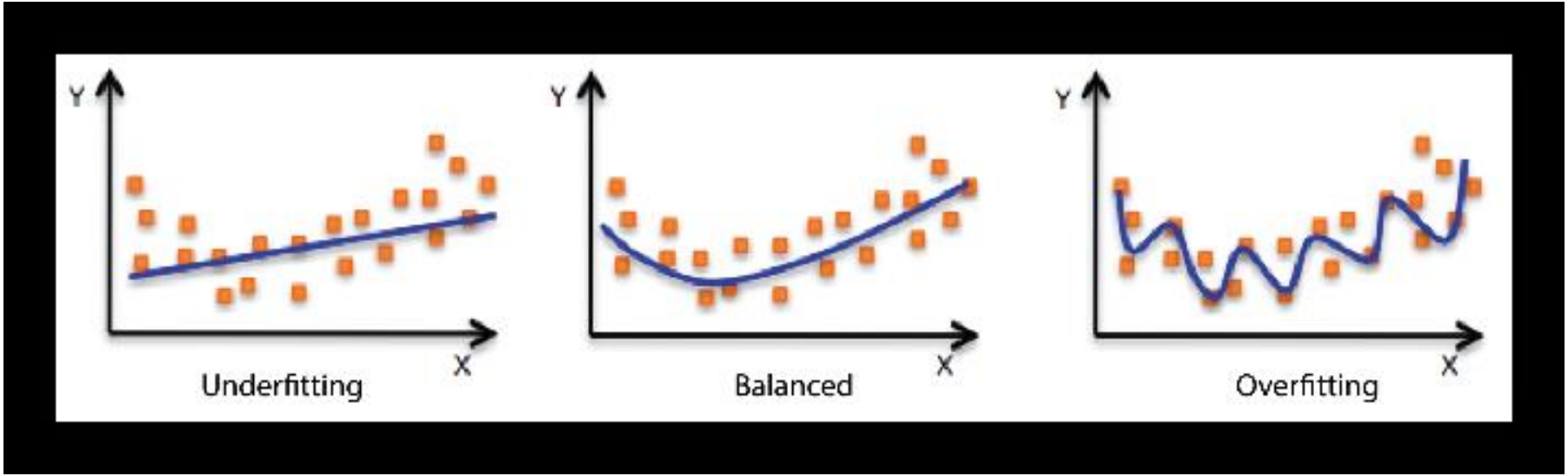
$$Recall = \frac{TP}{TP + FN}$$

$$Accuracy = \frac{TP + TN}{TP + FP + FN + TN}$$



Bias Variance Tradeoff

Underfitting vs. Overfitting



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Bias Variance Tradeoff

Underfitting

Problem: the model performs poorly on the training data

Reason: the model is unable to capture the relationship between the input examples (often called X) and the target values (often called Y).

- Poor performance on the training data could be because the model is too simple (the input features are not expressive enough) to describe the target well. Performance can be improved by increasing model flexibility. To increase model flexibility, try the following:

Solution:

- Add new domain-specific features and more feature Cartesian products, and
- Change the types of feature processing used (e.g., increasing n-grams size)
- Decrease the amount of regularization used

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Bias Variance Tradeoff

Overfitting

Problem: the model performs well on the training data but does not perform well on the evaluation data.

Reason: the model is memorizing the data it has seen and is unable to generalize to unseen examples.

Solution: It makes sense to take actions that reduce model flexibility. To reduce model flexibility, try the following:

- Feature selection: consider using fewer feature combinations, decrease n-grams size, and decrease the number of numeric attribute bins.
- Increase the amount of regularization used.

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Bias Variance Tradeoff

Poor accuracy on training and test data

Reason: the learning algorithm did not have enough data to learn from.

Solution:

The performance could be improved by doing the following:

- Increase the amount of training data examples.
- Increase the number of passes on the existing training data.

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USE CASE 1

Prediction of a Startup Profit

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USE CASE 2

Social Network Analysis

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THANK YOU