CA1

Jim Coen

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1 Definitions

AI
When humans consider the operation of a computer program as exhibiting intelligence, then that program has Artificial Intelligence.

Machine Learning
This is a type of Inductive Learning which 'learns' the prediction function. It can then make generalizations about new data. The prediction function is a probability estimate.

Deep Learning
In deep learning, the computer program is structured so as to mimic the human brain. This neural network is a replication of the interconnection between neurons via dendrites.

Parametric and Nonparametric models
A parametric learning model simplifies the prediction function to a known form and uses a fixed set of parameters to characterize the data. It learns the coefficients of the function from the training data. A non-parametric model learns the form of the prediction function from training data. They are a

balance between constructing a function that best fits the training data and the ability to generalize.

Supervised Learning and its components
In supervised learning, each observation is type-coded with a 'label'. For instance, 'Spam', 'Not Spam' for email data. Each observation has the same set of characteristic 'features'. The algorithm learns the mapping from features to labels and so can make predictions about new observations. The predicted output is a probability estimation. Representations include decision trees, rules and instances. Evaluation measures are squared error, absolute error and bias error. Gradient descent is one optimization technique.

Unsupervised Learning and its components
Data does not contain desired outputs or labels. The algorithm must interpret the inherent structure in the data. It finds clusters of similar feature vectors. It is also used in dimension reduction in order to transform the feature vectors into a more concise form. Representations include graphical models and support vector machines. The confusion matrix or ROC curve are evaluation measures for a binary classifier. Optimization methods are SVM loss and Entropy loss.

Common Types of Errors
Errors can occur 'in-sample' on training data or 'out-of-sample' on new data. Over-fitting is a problem that arises when the model is tuned to the training data. Tuning on the test set gives an incorrect estimate of the accuracy on out-of-sample data. Error can be due to bias (simplifying assumptions about prediction function) and to variance (sensitivity of the prediction function to specific sets of training data).

Q2 Please solve the case study (2.5*4=10 marks) (800 words)
The purpose of this assignment is to build your machine learning project plan. For this exercise, you can use any one of the example scenarios provided with a completely fictitious example of the problem. You will be developing a strategic plan for machine learning adoption within this company, and eventually proposing a structure for a successful machine learning project. You will start by describing your current overall state of machine learning readiness. You will then explain the business outcome your project is driving towards, and how business success will be evaluated. You will describe, at a high-level, what machine learning project you wish to undertake. Finally you will outline the risks of this approach, in relation to your stage of readiness

and the scope of the project.

Select any-one of them
You are in the social media division of a political party, and you want to keep better track of the party's profile and reputation online.
You are the head of the Corporate clients division of a major health service provider chain, and you want corporate health applications decided faster and better.
You are a software designer and you want to use ML to improve the user experience.

Answer the following questions 1) Provide a brief description of your company, industry, or business.
2) What business outcome are you supporting with your machine learning project? How is this outcome relevant and important for the company? How will you evaluate whether the desired outcome is being achieved?
3) What machine learning project will you propose to support this business outcome? At a high level, what will your machine learning model be doing? Make the case that this is a viable project (at least in theory) and relates to your overall business goals.
4) Given the state of readiness you have described and the scope of the project you're proposing, is this a risky project, broadly speaking? That is, is it appropriate to the stage your company is at or will it provide particular challenges?

Q3 Please write the summary of the journal paper you read and explain about the machine learning techniques you learn from the journal and what are the advantage and disadvantage of the application discussed in the research project. (800 words) (5 Marks)

Q4 Please also prepare presentation (10- 15 minutes) explaining Answer 2 and Answer 3 in detail. Presentation will be hold on 27-11-2020 on zoom during class. (20 marks)