

Q1. We A/B tested two styles for a sign-up button on our company's product page. 100 visitors viewed page A, out of which 20 clicked on the button; whereas, 70 visitors viewed page B, and only 15 of them clicked on the button. Can you confidently say that page A is a better choice, or page B? Why?

Ans: A/B testing is just like two-sample hypothesis testing in which a single variable of two versions are tested. Here, it is tested against the clicked response to Page A against Page B and further determine which page is more effective.

From the given datasets, we can find the mean for how many visitors clicked the button for page A and B.

Case 1:

Mean: - Sign-up button clicked for page A = $20/100 = 0.20$

Case 2:

Mean: - Sign-up button clicked for page B = $15/70 = 0.21$

From the above the cases, I would say "B" is slightly better than "A". But only mean (for page A and page B) will not give any clue about statistical significance of the results. More information needed for to perform the test to get better results.

Q2. Can you devise a scheme to group Twitter users by looking only at their tweets? No demographic, geographic or other identifying information is available to you, just the messages they've posted, in plain text, and a timestamp for each message. In JSON format, they look like this:

```
{
  "user_id": 3,
  "timestamp": "2016-03-22_11-31-20",
  "tweet": "It's #dinner-time!"
}
```

Assuming you have a stream of these tweets coming in, describe the process of collecting and analyzing them, what transformations/algorithms you would apply, how you would train and test your model, and present the results.

Ans: - There will be three phases for this task:

1. Collecting the tweets stream: - First, we need to call the API (may be Restful or Soap) so that we can collect the tweets from twitter website. After getting the tweets data we need to format the data into the JSON format which will help in analyzing the tweets better.

2. Tweet data Transformations: – we need to create the feature vectors from the json tweet data so that it can be used for machine learning algorithms. For features transformations, we can use auto-encoders which will help to learn the complex representations and used later for similarity analysis.

3. Machine Learning Algorithm: We can use clustering algorithm (k-means or hierarchical clustering) that will help in making tweets cluster based on its features. After making the clusters, we can assign the different clusters to the user.

Q3. In a classification setting, given a dataset of labeled examples and a machine learning model you're trying to fit, describe a strategy to detect and prevent overfitting.

Ans: - Overfitting means that the model learnt the training data very well so negatively impact the performance of the model with new datasets. It depends upon the machine learning models but in general, we need to use resampling technique like k-cross validation to prevent overfitting which occurs due to training and testing data split. It will help to increase the performance of the model on the new data.

There are few machine learning models examples:

- a. K-Means: - use smaller values of k for clustering.
- b. Neural Networks: use regularization i.e. dropout to prevent overfitting and use less hidden layers

Q4. Your team is designing the next generation user experience for your flagship 3D modeling tool. Specifically, you have been tasked with implementing a smart context menu that learns from a modeler's usage of menu options and shows the ones that would be most beneficial. E.g. I often use Edit > Surface > Smooth Surface, and wish I could just right click and there would be a Smooth Surface option just like Cut, Copy and Paste. Note that not all commands make sense in all contexts, for instance I need to have a surface selected to smooth it. How would you go about designing a learning system/agent to enable this behavior?

Ans: - I think for these types of task, we need to use reinforcement learning strategy as we can't use rule-based mechanism for each behavior. Q learning algorithm will be helpful for such system to improve the experience. Based on the experience, it will help to predict the user action. We can set up a scenario like if the user correctly predicted the user menu then we will give rewards or else give penalty for wrong prediction. It can be done by using the agent(Q-Learning) which assign the rewards and penalty depending upon whether user correctly select the menu.

Other way around, one possible way is to use neural net for predicting the behaviors, but it required substantial amount of data and time to train the model before using it. So I think the reinforcement learning is best way in such scenario.

Q5. Give an example of a situation where regularization is necessary for learning a good model. How about one where regularization doesn't make sense?

Ans: - Regularization technique is used to prevent overfitting. This happens when model over learn the training data and thus have poor prediction on testing data. It causes training error consistently low while validation error is high (high variance but low bias). So, regularization technique is used to overcome the model overfitting.

Regularization doesn't make sense when model is underfitting. It occurs when model has low variance but high bias. It is because when it didn't take proper features from the data to trained it, resulting a very simple model. Regularization can further put adverse effect on the model.

Q6. Your neighborhood grocery store would like to give targeted coupons to its customers, ones that are likely to be useful to them. Given that you can access the purchase history of each customer and catalog of store items, how would you design a system that suggests which coupons they should be given? Can you measure how well the system is performing?

Ans: - I think this is classic case of recommendation system in which model learnt based on user preferences and his/her purchase history and his/her liking of the objects and recommend the objects in the store items. From this model will predict the likelihood of the objects the user which they may buy.

One machine learning algorithm which I think as of now, is K nearest neighbor algorithm. In this algorithm, we can club together the user with k similar users. The products will be recommend based on the preference of the chosen k users. One criteria, it will recommend the object most which is more frequently used by the chosen k users. E.g. Based on the history of test user we can recommend the product to buy.

how well the system is performing:

The model performance can be calculated by finding the Root Mean Square Error (rmse) over all test users data. It can be done by dividing the users into a training and testing set and then evaluate over rmse.

Q7. If you were hired for your machine learning position starting today, how do you see your role evolving over the next year? What are your long-term career goals, and how does this position help you achieve them?

Ans: - I am highly passionate about machine learning and the roles which excites me to improve the performance of deep learning in the field of health care as it will directly help to large community of the society. I will be highly interested to join healthcare firm. Another area which excites me computer vision and deep learning which will automate and solved lots of difficult problems. Down the line, I will have interested in the research profile which will help me explore and grow the endless possibility of machine learning and help me use more efficient and optimize machine learning algorithms.