SEIS 764 Artificial Intelligence
Assignment 3
Due: midnight Friday 3/5/22 on Canvas

Individual effort

Part 1:

In the last assignment, you worked on the concrete dataset and built a regression model with one Dense unit. Using the same dataset, this time build a deep neural network for regression. Use a 70-30 train-test split. You should try the following:

- Different number of hidden layers.
- Different number of units in each of the hidden layers.
- Different learning rates
- Different optimizers

You should summarize and explain about which architecture gave you the best results.

Part 2:

In class we worked on the customers.csv dataset and trained a NN with 2 hidden layers (with relu) and one unit output layer (with sigmoid). Use that model to perform prediction on the following customer:

- Credit Score: 600
- Geography: France
- Gender: Male
- Age: 40 years old
- Tenure: 3 years
- Balance: $60000
- Number of Products: 2
- Does this customer have a credit card ? Yes
- Is this customer an Active Member: Yes
- Estimated Salary: $50000

Part 3:

In this part of the assignment, you will perform classification with a deep neural network. The dataset is based on an online store and we would like to predict the user actions. The columns of the dataset are as follows:

- Is_mobile (0/1): This tells us if the user is visiting our site on a mobile device or not.
- N_products_viewed (int >=0): The number of products the user has viewed during a session.
- Visit_duration (real >=0): This will tell us how long in minutes the user was on the site.
- Is_returning_visitor (0/1): 0 if the user is a new user, 1 if it is returning user.
- Time_of_day (0/1/2/3 = 24h split into 4 categories): Categorical column where the 24 hours of the day are divided into 4 categories of 6 hours each.
- User_action (bounce/add_to_cart/begin_checkout/finish_checkout): bounce means the user left your site, add_to_cart means the user added to cart but did not begin the check out process, begin_checkout means they started the checkout process but never completed it, finish_checkout means the user paid and checkout process was completed.

Data preprocessing that you should be performing:

- Numerical columns N_products_viewed and Visit_duration should be normalized using standardization.
- Time_of_day column should be one-hot encoded.

Build a deep NN to get the best classification performance on the dataset (70-30 train-test split). You should be trying out different architectures of the NN before settling on the best one. Explain the results while comparing the different models.

Submission:

- Each of the above parts should have a clear heading in your notebook.
- Your code should be well commented and easy to read (either with text cells or comments in code cell).
- Make sure each of the cells have been run with the output shown right below. Now, export the notebook as .html file.
- Submit the **.html** file and **.ipynb** notebook on Canvas.

Note: You will lose points if the notebook is not structured properly or if all the cells are not already run before converting to HTML.