Assignment#1(Artificial Neural Network)
15 Points
Due Date: 27 Sep 2023, 11.59 PM

Instructions:

You are given a medical cost dataset named insurance.csv. You are a ML engineer working in an insurance company. The dataset contains the following variables:

Independent Variables:
age: age of primary beneficiary
sex: insurance contractor gender, female, male
bmi: Body mass index, providing an understanding of body, weights that are relatively high or low relative to height, objective index of body weight (kg / m ^ 2) using the ratio of height to weight, ideally 18.5 to 24.9
children: Number of children covered by health insurance / Number of dependents
smoker: Smoking
region: the beneficiary's residential area in the US, northeast, southeast, southwest, northwest.

Dependent Variable:
charges: Individual medical costs billed by health insurance

The Ask:

Analyse the given dataset and build a NN/DNN to predict the medical cost incurred by individuals.

1. Perform an extensive exploratory data analysis (EDA) and provide the preliminary investigation of the dataset by discovering atleast five patterns in the data.

2. Perform all the steps that are crucial for ensuring that the data fed into your models is of high quality and suitable for your needs.
3. Build a neural network following the 5 steps in the NN model life-cycle as shown in figure1 below.
4. Use TensorBoard for visualization of model performance.
5. Write a conclusion and recommendation.

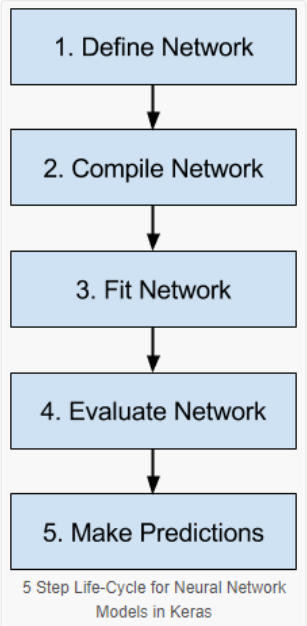

Figure 1: Life Cycle of NN

Rubric

Criteria	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (1-2)
Exploratory Data Analysis (EDA)	Comprehensive analysis with over 5 insightful patterns, excellent visualization, and interpretation.	Good analysis with 5 patterns, good visualization, and some interpretation.	Basic analysis with 3-4 patterns, limited visualization, and basic interpretation.	Less than 3 patterns, poor or no visualization, and lacking interpretation.
Data Quality and Preprocessing	Comprehensive data cleaning, scaling, encoding, and feature selection with justification.	Good data handling and feature selection with some justification.	Basic data handling and feature selection without justification.	Poor or no data handling and feature selection.
Neural Network Model Life-cycle and TensorBoard Visualization	Excellent architecture, compilation, training, evaluation, and fine-tuning with justification and used TensorBoard.	Good architecture and training with some justification and used TensorBoard.	Basic architecture and training without justification. Used TensorBoard.	Poor architecture and training, or unjustified choices. Did not use TensorBoard.
Conclusion and Recommendation	Clear, comprehensive conclusion with actionable recommendations	Good summary with some recommendations and ethical points.	Basic summary with general recommendations.	Poor or unclear summary, lacking recommendations and ethical considerations.

	and ethical considerations.			

Submission Format:

In the DC Connect, post a ran jupyter notebook file. Use the markdown cell in jupyter notebook to explain your findings, writing sections, subsections etc. Use the Code cell in jupyter notebook to write the python code.

[Any submission other than the format of a notebook file(.ipynb) will be graded to zero.]

Academic Integrity and Late submission:

Assignments are due by the due date announced in class and posted on DC Connect. At his or her own discretion, and depending on the nature of the assignment, each professor will provide a facility for the submission of late assignments up to a maximum of 72 hours after the assignment due date. All allowed late submissions will be assessed a penalty of 25% of the total possible grade for the assignment. Assignments should be submitted on time, on a regular basis, to enable you to stay on track within the class.

Any violation of academic integrity will not be accepted and will be given a grade of zero (0) and reported. Find more information on academic integrity here

https://durhamcollege.ca/mydc/learning-resources/academic-integrity

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