Team Mechismu Racing

Tyre Data Analysis Using Deep Learning

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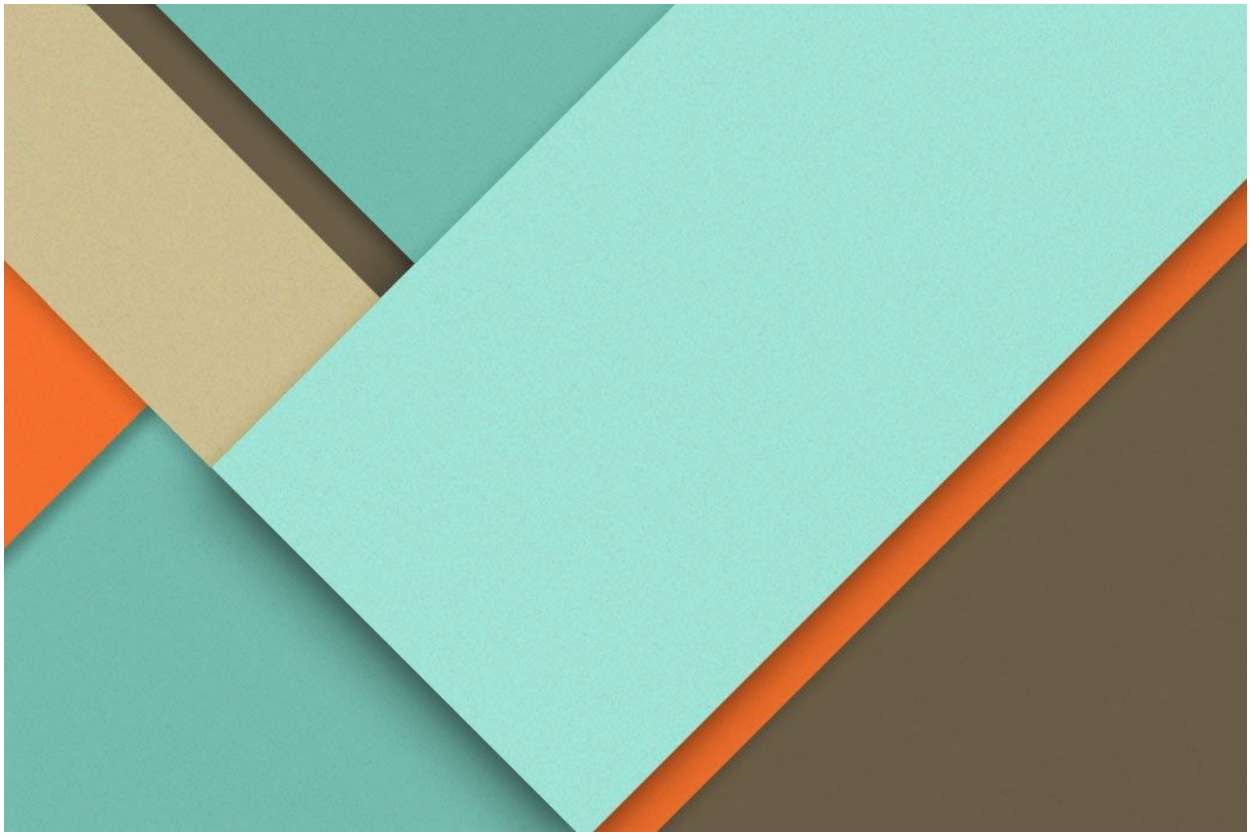

Slip Rate Prediction using Keras API using a given dataset

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—TDA_Build1 Models

Overview

Here is a report on the very first attempt of my approach towards predicting the SR (Slip Rate) values from our indigenous tyre dataset with 20 features. Tensorflow 2.0 ' s Keras API was used to create a regression model for the same.

USED:

Google Colab

Tensorflow Version 2.3.0

Keras Version 2.4.0

Python 3.6+

About the dataset

Dataset used : B1654raw48.dat

- The dat file was accessed on MS Excel and then saved as .csv(comma delimited).

Dataset Description:

21 columns (Features)

44901 rows (Instances)

Features Inputs (20 items):

`ET V N SA IA RL RE P FX FY FZ MX MZ NFX NFY RST TSTI TSTC TSTO AMBTMP`

Label Outputs (1 item to predict):

`SR`

Dataset Preparation(Making it trainable):

- The dataset was normalized manually but was not a hopeful approach
- In the first Build version model MinMaxScaler() was used which has shown some promising results
- 20% of the full dataset was splitted into Trainfull(80% of total) and Test sets(20%)
- 20% of the Trainfull Set was further splitted into Train(80% of Trainfull) and validation sets(20%)

Model Structure(Build_1 models):

Layers(Total 6 Layers)

- Input Layer
- 4 Hidden Layers
- Output Layer

Neurons Per layer:

1000->1000->500->500->250->1

The models are "normal" initialized and L2 regularized
(It was discovered that this formation worked better)

Activations:

Relu, Linear(output)

Optimizers:

Nadam, Adam

Patience:

10-30

Loss function + metrics:

MAE

What produced a variety of Build_1 models ?

Tweaking of:

- L2 rate
- Learning Rate
- Patience
- Selection of Optimizers
- Epochs

Created a variety of Build_1 models

Milestones

I. TDA_build1_1

```
Fully Accurate Predictions:
 6592
Predictions with an error of +/- 0.001:
 2389
Predictions with an error more than +/- 0.001:
 0
```

II. TDA_build1_2

```
Fully Accurate Predictions:
 7969
Predictions with an error of +/- 0.001:
 1012
Predictions with an error more than +/- 0.001:
 0
```

III. TDA_build1_3

```
Fully Accurate Predictions:
```

```
 5500
Predictions with an error of +/- 0.001:
 3481

Predictions with an error more than +/- 0.001:
 0
```

IV. TDA_build1_4

```
Fully Accurate Predictions:
 6590
Predictions with an error of +/- 0.001:
 2387
Predictions with an error more than +/- 0.001:
 4
```

V. TDA_build1_5

```
Fully Accurate Predictions:
 7903
Predictions with an error of +/- 0.001:
 1078
Predictions with an error more than +/- 0.001:
 0
```

Goals

1. Planning to increase the number of layers and neurons in the TDA_build2 models to see if they perform better. Along with BatchNormalization.
2. Also Planning to use SELU, ELU, Leaky Relu, Gelu in the TDA_build3 models to see if they perform better.
3. Might shift to decision trees and other conventional regression algorithms in case the model performs better in those.

4. I'll produce a final python program with proper EDA of the dataset after the final model and final purpose of prediction is fixed. This is just a basic model described to showing and suggesting a use of Machine Learning in tyre data analysis