AI STRESS LEVEL DETECTOR DURING SLEEP

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The Project

What you'll know today

The Problem

What the problem is, who is getting affected, where it can be used, why is it needed

Working

What the model is, How the model works, what it does, technicality behind the model

Future Scope

The future of this model, potential implementations

The Problem Today

Why do we go to sleep? To relax ourselves, to relieve ourselves from the stressful activities of the day. But the real truth is, in today's world, most of us do not get good sleep. In turn, the purpose of sleep being a powerful stress reducer is lost. From high school students to working parents, every part of a family is rarely stress relieved.

Our body has various physiological aspects which factor into the way we sleep; our respiration rate should be a certain level, there should be enough sleep hours, our body must be at a certain temperature, etc. These aspects must be regulated during sleep to bring down one's stress level, if it is high.

For the purpose of this regulation, we first need to know what the stress level is. Without that, we cannot come up with a solution to bring it down.

The Model

Overview

01

What it is

This model gives a measure of the stress level of the person during their sleep on 4 levels: 0-low, 1-medium low, 2-medium, 3-medium high, 4-high.

02

How it works

It takes in various physiological aspects of the human body, puts it into the model and then predicts the output. Here we use heart rate, respiration rate, snoring rate, sleep hours, body temperature, blood oxygen, limb movement and eye movement.

03

Technicality

The model has been trained on an artificial neural network. The data input is split to give the training and testing data. The model trains on the training data, then works on the validation dataset, and returns its accuracy.

The Model
(A more detailed look)

First five rows of data

	snoring rate	respiration rate	body temperature	limb movement	blood oxygen	eye movement	sleeping hours	heart rate	stress level
0	93.80	25.680	91.840	16.600	89.840	99.60	1.840	74.20	3
1	91.64	25.104	91.552	15.880	89.552	98.88	1.552	72.76	3
2	60.00	20.000	96.000	10.000	95.000	85.00	7.000	60.00	1
3	85.76	23.536	90.768	13.920	88.768	96.92	0.768	68.84	3
4	48.12	17.248	97.872	6.496	96.248	72.48	8.248	53.12	0

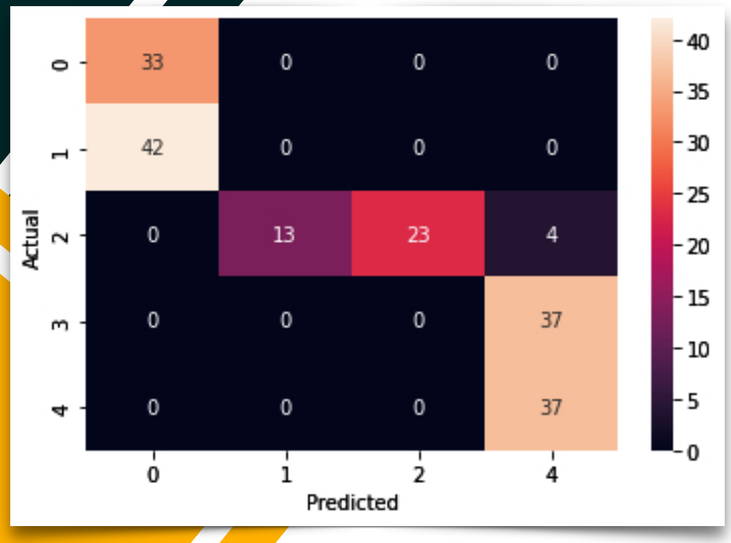
The model initially starts off with the most basic thing: Importing the data. The data imported is read using the python **pandas package.**

This helps us to describe the data and also run a check if any null values exist in the data.

Once this is done, we start working on the data using the **scikit-learn package** which helps us to split the dataset for training and testing. This model takes 25% of the data for testing. After this the data is transformed to a standardised version using **StandardScalar**.

Then we convert our categorical data to binary data, which is easier for the machine to read. This is done using the **to_categorical** method of the **Keras package**. The **Keras** and **Tensorflow** packages help us to develop and train artificial neural network models.

The Neural Network



Model Heatmap

Packages

Keras: A powerful, easy-to-use, free open source Python library for developing and evaluating deep learning models.

Tensorflow: A graph-based programming language that allows developers to view the neural network's creation.

Layers (Sequential model)

Dense: Regular deeply connected neural network layer; does the below operation on the input and return the output

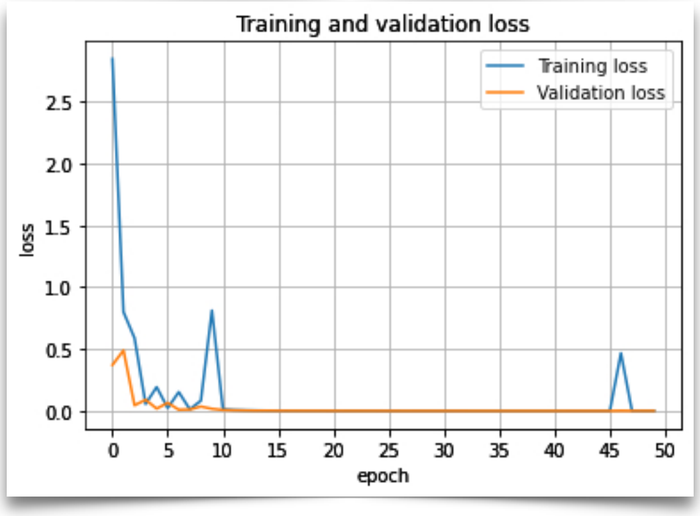
Dropout: Randomly sets input units to 0 with a frequency of rate at each step during training time, which helps prevent overfitting.

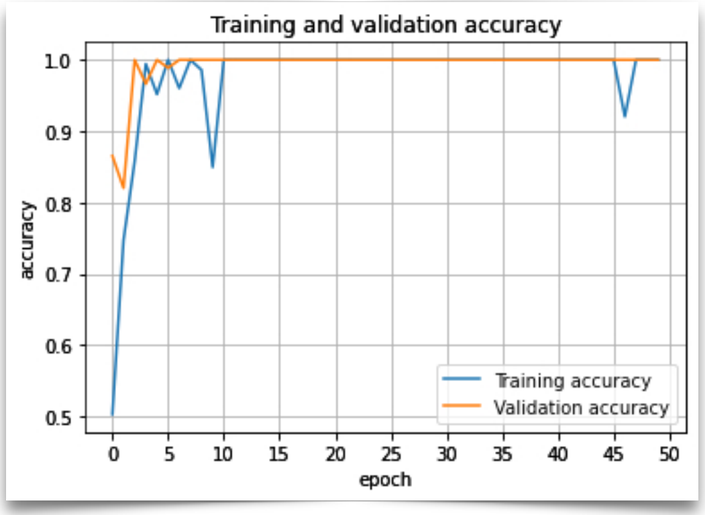
Compiling

Loss compiled using categorical cross entropy. Model optimised using 'Adam' optimiser. Metric evaluated: accuracy.

Training

x_train, y_train parameters; Epochs: 20 cycles; Data shuffled; batch size is 1; 20% data used as validation set.





Future Scope

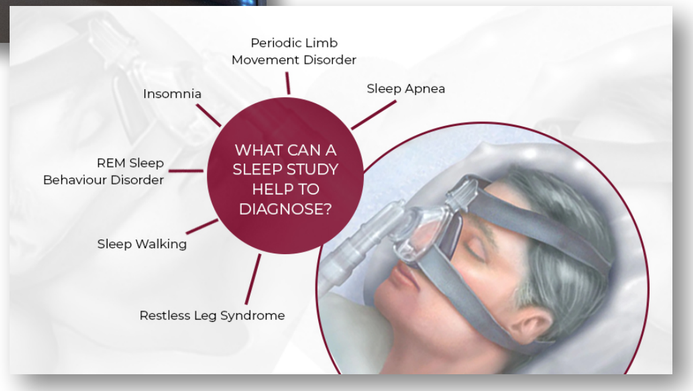
This model allows several areas of usage. But for this model to work, we require data.

One of the most common way to track sleep and health is through smartwatches. Smartwatches these days have most of the parameters required. Hence, the data collected can be used to, thus track stress during sleep.

Another effective way to acquire this data is through sensors. These sensors can be fixed in maybe a pillow, which will collect the required data and directly input it into the model.

These methods help the user track their stress levels and hence take the required measures to improve upon their situation.

This model could also be used in a sleep study, under different conditions. Various experimentations and scenarios would have to considered and a sleep study would actually prove useful to help improve the preciseness of this model.



Thank You