Interpreting Brain activity and Behavioural quantification of Humans towards the challenge and visualization of the dataset

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Abstract: The main principle of brain organization is the functional integration of brain regions into interrelated networks. Analysing brain activity and performance is the key objective of the study. The study focuses on the activity of the brain after one hour of a certain activity, which includes reading, editing, painting and physical activities like jogging etc. The use of these methods, however, is not limited to studying behaviour in the wild or strictly ethological settings. Here the quantification of human behaviour after being assigned a particular work was monitored. The reflection over the period and its impact on life were analysed. The data discloses the different age groups with different tasks for an hour and we discuss open challenges that remain for behavioural quantification and highlight promising future directions. Inferential statistics were carried over to visualize the correlation frequency between one or two or more datasets and the packages like corrplot, psych, and ggplot2 were used for interpretation of the data.
Keywords – Brain activity, inferential statistics, Study focus, behavioural quantification, one hour

Introduction:

Behaviour is a zestful phenomenon that necessitates changes to an animal's pose over time. Unlike the tracking of body parts, quantification of the temporal structure is a radically strenuous problem without a clear ground truth. It is often presumed that behaviour can be described as a sequence of distinct behavioural states, such as 'walking' or 'grooming'. The type of behavioural quantification can ease comparison between instances of individual behaviours (for example, in reaction to specific sensory inputs or across exploratory conditions) and generate hypotheses about the neural circuitry that gives rise to them (for example, by defining event boundaries or timescales of computation). Animal behaviour, as defined by humans, The simplest way to define a behaviour is by designating a fixed set of rules that describe the criteria that must be met to determine its happening at a given instant. These can be as simple as codifying instances when the animal's centre of mass is moving at a speed greater than a minimum threshold as 'locomotion', but can quickly become complex when establishing detailed inclusion and exclusion criteria based on fine specifications of postural features. Although easy to evaluate and interpret, fixed rules may fail to apprehend the full variability of behaviours that can be flexibly manifested, particularly when subject to experimental artifices that may alter the statistics of the features used in the classification criteria [5]. In the present study, the primary data collection was done using experimental activities on the Brain for 30 days to study the behavioural change of a person. Several hypotheses and examinations of populations have been practised using programming languages. The behavioural change reflected in the person's life and their working environment was monitored for the results.

Objectives:

To study the population referred to the assigned task
To examine the behavioural changes in everyday life in samples subjected to the study
To analyse the dataset statistically

Materials and methodology:

The primary motive of this study was to analyse the patterns of concentration on a given task and also to study the impact of successful completion of the said task, especially how successful completion helps, build up a habit. The study was carried out on different age groups of people who were assigned tasks like reading, sketching, studying and various physical activities [8, 9]. Also, the gradual ageing with occasional memory patterns was also analysed [7]. The sample population volunteered for the thirty days of one-hour challenges on daily basis. The dataset represents the divergence and their activity in daily life was studied. Through this, the behavioural pattern of a person becomes noticeable towards the given object and situation [5, 10].

The present study promotes memory and is an effective way to build a habit. Every day the person's activity with the respective time utilised to complete the task was noted. Reading, writing, and colouring promote brain cell activity, which is the major communication practice area. Most of the population were going through depression and anxiety these days also measured for the performance of the Brain [2, 6].The five-factor model of personality was noted in this study such as neuroticism, extraversion and openness to adventure, acceptance and conscientiousness. The behavioural patterns [3] show gradual enhancement throughout the duration of the

study. It acts as an interlinked chain connecting the objectives and personality of an individual. Development of a sense of responsibility [4] as well as purpose towards the task, and also the observance capacity of the individual can be figured. Also, studies were performed in combination with nutritional food uptakes to increase the neuronal activity in the Brain [1].

The study also involved inferential statistics for the relationship analysis with one or two variable data. The rational linear or non-linear relationships between the dataset were interpreted using inferential statistics with the help of packages. General data visualization [15] performed using RStudio.

The Corrplot package [14] gave a correlation matrix that helped to detect the hidden patterns among variables. It is very easy to use and gives a rich array of plotting options in visualization methods. It gives p- values and confidence intervals to provide information about the significance of correlation in a statistical manner. Pearson correlation "psych package" [13] was used for scale construction using factor analysis, principal component analysis, cluster analysis and reliability analysis. Psych correlation is an extension of the pair's function that allows easy addition of regression lines, confidence intervals and several additional arguments and it creates a graph of a correlation matrix colouring the regions by the level of correlation The package called "ggplot2 package"(stands for The Grammar of Graphics)[11, 12] used here greatly improves the quality and aesthetics of graphs and gives more focus to almost every section of the data and it also gives efficient commands to create complex plots. Using this package, the scatter plot was observed for the correlation status between the data.

Location of the study - The primary data involved in the study was collected from the place Madurai, Tamil Nadu in India.
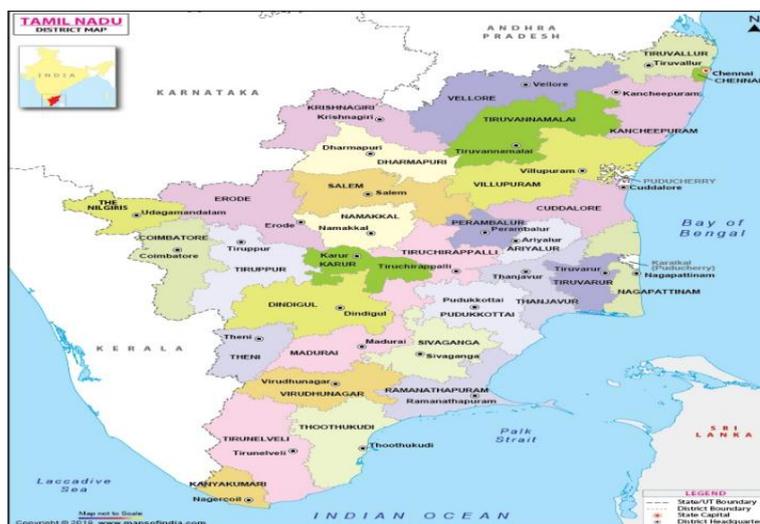

Fig.1: The study Location in India
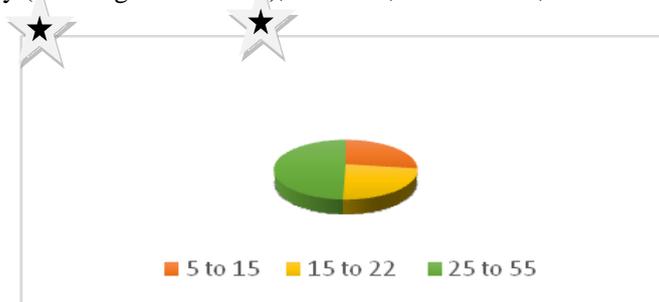- Annai Bharath Astrocity (Housing limited area), Madurai, Tamil Nadu, India

Fig.2: The pie chart represents the population taken for study according to their age.

The data analysis helped to understand the data clearly without missing out on any information. Also using statistical tools makes decision-making precise and frees, from any bias. The assigned task completed per day was converted to numerical data where the amount of assigned activity completion was reported. General statistics of mean, median and standard deviation were performed over the dataset.

Inferential statistical analysis was performed using software to interpret and explore the frequency distribution between the day's

progresses of an individual. Using tools, the efficiency and overall performance were identified using a graphical representation. Psych package was used to ascertain the correlation and confidence intervals among the variables. Corrplot package gave correlation matrix visualization in a different manner including shape, patterns, and colours. Ggplot2 package gave competent scatter plots of the matrix with the correlation.

Results and Discussion:

The raw data was collected by experiments for a month and the behavioural change towards the objects was screened. Noticeable positive changes in activity were seen, especially participants in the age group 5-15 showed a greater task completion rate. The stress over exams had been reduced and the behaviour pattern in doing chores was typically tolerable by routine rewards. There was a remarkable evolution pattern seen in academics and sports levels. Problem-solving abilities were

improved. In adults, between the age group 15-25, the characteristic process of learning things carved a different approach in tackling everyday challenges. This was applied to health and habits of automatic responses towards the force. Daily monotonousand academic growth was seen clearly. Most of the participants started becoming consistent. Most working young adults finished the task before deadlines. It was clear that self-reformation and increase in productivity caused positive results in the workplace, gradual commitments with the balance between work and family were seen and they were up for open and valuable communication medium. Elder citizens between the age group 25-55 found time for themselves through these experiments. They mostly seemed to be happy and free from trauma and stresses, and it was seen that regular walking improved the physical and mental health of a person. It reflected their positive ageing phase despite the trials in life, clearly mentioned in the below table.

Table.1: Projection of variations in life by the practice of challenge to Brain

Prominent changes in Life	According to Age		
	5-15	15-25	25-55
School/ College/ Work	Interest in asking more questions, determined for excellent academic performance in problem-solving	Open-minded for an efficient conversation, time management and self-moulding	Independent healthy working environment among the co-workers, positive ageing
At Home	Building good manners	Well-planned organization toward the activities	Stress-free smiling faces observed

By using RStudio, the data was interpreted for a better understanding of the study and several packages were used to find the relationship between the variables.

The fig.3 represents the boxplot of each variable minimum, maximum with the median value
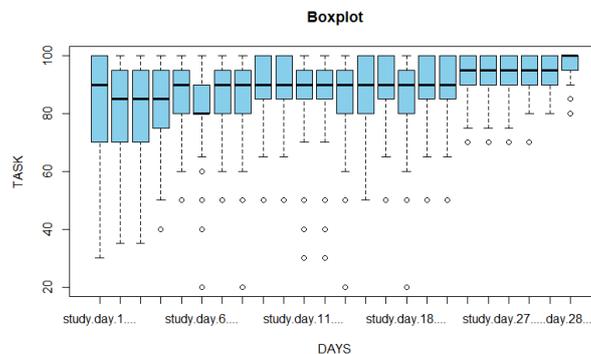
Fig. 3: Boxplot of data from day 1 to day 30
The corrplot represents the correlation matrix of days 1, 5, 10, 15, 20 and 30 in the manner of a circle
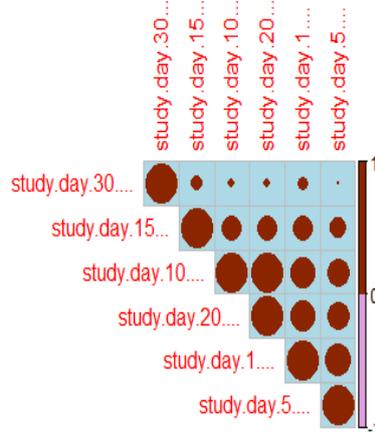

Fig. 4: Corrplot of the dataset

The below graph annotates the bivariate scatter plots of correlation between the variables, and the observed results of p- values illustrate that the null hypothesis is true.
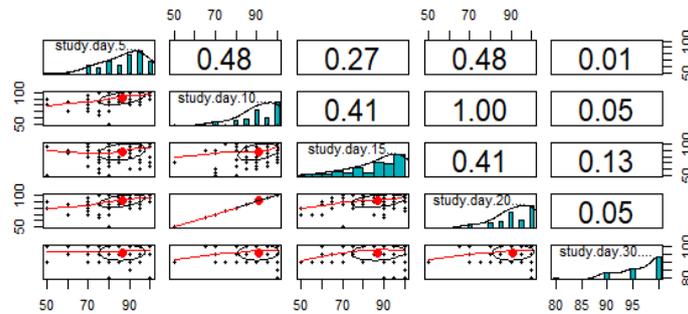

Fig. 5: Plot using "psych" package

The below scatterplot represents the performance of an individual with their activity scale over the time basis
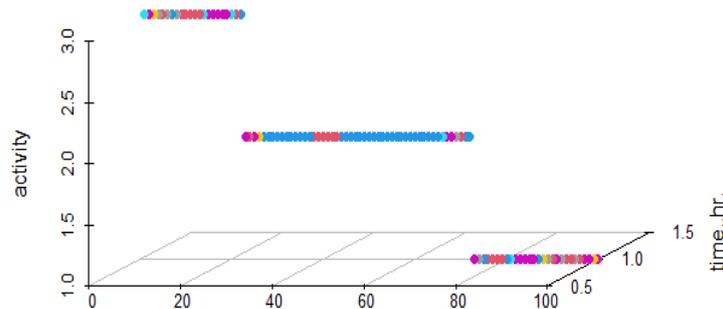

Fig. 6: Plot using the "ggplot2" package

Discussion:

Constant growth levels in studies and activities like reading, and problem-solving were perceived and visible good manners were also observed. This challenge helped them to build a habit and roots in a good work environment. The raw data expresses the persistent growth of healthy and stress-free life. Out of the test sample population, the 5-15 years old population shows 95% overall improvement and 15-22- and 25-55-years old shows 100% improvement. By this study, it is evident that improvement in confidence levels and healthy good habitual activity were clearly detected.

Further, the statistical analysis was performed to interpret the dataset to get the significance level. The p-values of the sample population showed a positive correlation and the values demonstrations null hypothesis is true. Without losing the data, each variable was pictured in various graphs using packages which provide the interpretation of big data.

Summary:

The study mainly focused on the performance activity before and after the experiments and its impact on their behavioural pattern and confidence level was studied with different age intervals. The population of volunteers was constantly supervised to build a habit and their instant satisfaction over the task after completion was collected. The changes from physical to mental state were recorded for quality purposes.

Inference:

The statistical approach of the dataset shows a positive correlation and the significant p-values accept the null hypothesis. Also, graphs obtained using packages like corrplot, psych and ggplot2 provide comprehensive information to interpret the data.

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