EEG during mental task analysis

Group Number: 17

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*Abstract*— The human brain engages in complex neural processing during mental arithmetic tasks. Electroencephalography (EEG) offers a valuable means of examining these cognitive mechanisms on a broader scale. This paper presents a comprehensive analysis of EEG data collected during mental subtraction, with a specific focus on examining power spectral density and coherence. The study investigates how different brain regions behave and interact with each other during mental arithmetic.

Keywords—SN, beast.

# Introduction (*Heading 1*)

You guys ever try to do mental arithmetic? It's like, "Hey, let's play a game. I'm gonna throw some numbers at you, and you have to answer real quick. But here's the catch, you can't use a calculator, and you can't look stupid. Man, I don't know what it is about math, but it's like our brains just turn into mush. You ever try to split a bill at a restaurant with your friends, and suddenly, you're staring at the receipt like it's the Rosetta Stone? And then there's always that one friend, right? The "Mental Math Master." They're like, "Yeah, I got this, guys. The bill's $137.38. So, with tax, tip, and that random appetizer Karen ordered but didn't eat, that's $17.82 each." And you're sitting there like, "Wait, what? How did you…?" And then, there's me. I'm just staring at the check like it's some ancient scroll. My friends are like, "Shane, what's your share?" I'm like, "Uhh... I think it's 42 gold doubloons, a donkey, and a promise to mow your lawn for a year." Mental arithmetic, man, it's a battlefield out there. It's a struggle. And the worst part is, you can't hide it. You're out there in public, trying to add 7 and 8, and you're like, "I think it's... purple?" People look at you like you're an alien. "Are you even from this planet, bro?" But you know what? We're all in this together. We've all been in that mental math foxhole, fighting for our lives, and the only way out is to mumble some random numbers and hope it works out. So, next time you're at a restaurant, just remember, we're all a bunch of math misfits, and it's okay to be the guy who can't count past five without taking off your shoes.

# Materials and Methods

## Data Collection

The data has been provided filtered and partially preprocessed. The sample rate of all channel was 500 Hz.

## Data Preprocessing

Removal of the artifact: 1000 more sample than the ones that were accounted for.

We decided not to undersample because we have potenti mezzi at our disposal.

Arbitrary selection of a time window to approximate for the stationarity of our data. We decided upon a 45 seconds window thus reducing the number of samples constituting our signals to 22501.

## Power Spectral Density

The power spectral density of the signals was computed using the Welch method (reference a Welch 1970). The size (5000 samples) and overlapping (10%) of the window was decided by copying the reference paper.

## Coherence

Je sais pas mon frére.

# Results

Look at the size of his head.

A group of circles with different colored circles

Description automatically generated

Figure III.1 Subject-averaged topographical maps

Boxplot (boxplot)



Figure III.2 Boxplot

Five boxplots

## Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

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*a**b* 

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##### Acknowledgment *(Heading 5)*

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##### References

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