How fmri analysis is a perfect candidate for QC – resource and space intense – spatial and temporal

**Observations of von nuemann entropy differences in the functional connectivity in ADHD vs TDC**

**How entropy could be a potential biomarker**

**ROIs?**

**DMN : Pcc, precuneus,inf parietal**

**Subcortical – caudate, thalamus, hippocampus, amygdala**

**What networks are these? Why choose these? How significant?**

**Why these seed regions and how does it justify the entropy differences?**

**Adhd index- ??**

**Adhd type -??**

**Phenotype description:**

**Age group, adhd score, iq measures**

**Back up the results using nx graph metrics, cliques, tsp**

**Atlas used: functional vs anatomical**

**Atlas comparison**

**Fmri : explain the 4 signals – for mean signal**

**Statistical diff between adhd type 1 and 3?**

**Mean corr difference b/n adhd and tdc**

**Roi/n/w where there were no significant diff observed**

**Significant anatomical variations?**

**Dmri analysis??????**

**Plots:**

1. **Relplots: entropy vs diff scores in phenotype**
2. **Density plot – kde for entropy**
3. **Bar plots with SD line**
4. **Heatmap(entropy for each n/w for adhd, then tdc)**
5. **Mean time series signal**
6. **-vely correlated regions**

**Structural differences**

At the level of the circuitry of the brain, this study concluded dysfunction in the superior longitudinal fasciculus (SLF) and cortico-limbic areas [11]. Another research study conducted by Martin Hoogman et al., lesser surface area was found to be present in frontal, temporal and cingulate regions of the cerebrum. These findings indicate a shrinking of many important areas of the brain. Additionally, other brain regions with abnormalities identified in people with ADHD are the frontoparietal, sensorimotor, and orbitofrontal areas. Atypical resting rates in the frontoparietal region show abnormalities in control-networks [12]. The sensorimotor area’s cortical morphology has also been observed to be in an altered and undesirable state, and findings tell that this alteration persists into adulthood [13]. In the ventral aspect of the frontal lobe, specifically on the anterior cranial fossa sits the orbitofrontal cortex. This cortex’s functions perform a multitude of functions, some of which are being the junction for sensory integration, changing the cadence of innate reactions as required, decision making for reward-based behaviors. In ADHD affected patients, the orbitofrontal cortex seems to be in an impaired state [14] [15] [16].

Density matrix

Partial/reduced density matrix

Entropy

Transfer entropy (TE) is an alternative measure of effective connectivity based on information theory, which is inherently non-linear and does not require a mathematical model of neural system. In contrast to DCM, TE does not need an initial hypothesis about the interactions between the nodes, so it is a particularly useful tool for exploratory analysis of effective connectivity networks. Unlike GC, TE can capture high order correlations, and it is well suited to detect nonlinear interactions across brain networks, which are believed to be part of brain cognitive activity at multiple spatial and temporal scales.