**Fined Tuned Transfer Learning across multiple Time Series: Ideas and Proposals.**

**Idea 1: identification of groupings and knowledge transfer in high-dimensional time series.**

1. Previous psychological analysis focused on the significant psychological associations that were present across all individuals. This allows us to detect psychological patterns present in all individuals.
2. In many cases, psychological patterns across individuals are heterogeneous. From this, patterns that are unique to individuals get cancelled, eliminated or ignored in the analysis.
3. Recent methods (GIMME and others) have focused on the estimation of common and individual structures across multiple individuals. This modelling choice allows for a more flexible recovery of what is common and what individual across subjects.
4. While beneficial, we may run into the issue that hidden \*\*group effects\*\* may still be present. We may also encounter the problem of “interference”, where the signals of several groups of individuals “cancel”, leading to a faulty estimate of “common structure”.
5. In this work, we are interested in developing a method that is able to detect latent subgroups among the study individuals, and perform common/individual structure estimation in these smaller identified groups, allowing for a better estimate of all
6. It would be extremely interesting to explore whether such groupings based on Time-series model similarity is associated with closeness across underlying clinical variables. For example: is it the case that gender or ethnicity are indicators of more common structure? Are the time-series networks of subjects with the same ethnicity similar?
7. Proposal: develop a method that first fits for each individual *i* the time-series network *Net\_i*, and divide all the networks *{Net\_1, Net\_2,…,Net\_n}* into groups *G\_1, G\_2,…,G\_K*. Each group will contain a set of individuals whose time series-induced networks are similar. Then, apply a method for common/individual structure estimation, not on the whole set of individuals *{1,2,3,…,n}*, but on the reduced sets *G\_1, G\_2,…,G\_K* separately. This will allow us to recover common and individual structure not at the “global” level, but at the levels of groups.
8. Further exploration: As of right now, the estimation of the subject groupings *G\_1, G\_2,…,G\_K* proposed in (7) is agnostic of any further information about the individual subjects. It would be interesting to explore in an application/ real data if these groupings end up reflecting patterns on clinical variables such as gender, ethnicity, age, etc.

**Idea 2: Covariate-aided groupings in high-dimensional time series data.**

1. Similar to the previous project, the goal would be to generate groupings of individuals on the basis of their network similarity.
2. In the previous proposal, we made our choice of groupings completely independent of supporting variables such as ethnicity, gender, age, etc.
3. In this project, the interest would be to find a way of creating similar study subject groupings *G\_1, G\_2,…,G\_K* based or aided by such complementary variables. Can we further improve our grouping with these variables?
4. Study in more detail the differences between the groupings induced by time-series similarity, groupings based on complementary variables, and groupings that exploit both information.