Social mimicry and small networks

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Part 1: Social Mimicry

We are trying to model the following behavior:

A type of behavior which is involuntary

Families were invited to a lab to eat together

Each family member was wearing a aaaa that tracked bites.

A bite consists simply in the action of taking food to your mouth

We are interested in two questions

Today's Talk

1. Social Mimicry
   - Can we identify it?
   - If there is any, how can we model it?
2. Small network (statistics)

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But first, a detour!

Ranting about R

- SAS is easier than R: e.g. read a CSV file

```r
dataset <- read.csv("mydata.csv")
```

```sas
PROC IMPORT DATAFILE = "mydata.csv" GETNAMES = yes OUT = dataset REPLACE;
  getmames = yes;
run;
```

- SAS is required for drug tests by the NIH
- SAS is 'better' at matrix algebra

- For the first question, right now we are using a permutation test.
- But first, let's take a look a the structure of the data

A DIAGRAM GOES HERE

Formal description

Mathematically, we can describe the data as follows:

- For each individual i we observe a vector $T_i \equiv \{t_1^i, t_2^i, \dots\}$ with i's bites timestamps. You can think of this as a poisson process.
- Let n_i denote the size of T_i.
- Also, define the function $R : T_i \times T_j \mapsto T_j$ as that which returns the **leftmost close** bite of j to i, i.e. the inmediate bite of j before i took a particular bite:

$$R(t_i^n, T_j) = \begin{cases} \text{Undefined}, & \text{if } (\forall t_j^n \in T_j) \exists t_i^m \in T_i \text{ s.th. } t_i^m \in (t_j^n, t_i^n) \\ \arg\max_{\{t_j^n : t_j^n \in T_j, t_j^n \leq t_i^n\}} t_i^n - t_j^n, & \text{otherwise.} \end{cases}$$

For now we will focus on the cases where this is defined.

- A possible statistic is to take the average time gap between i and j's bite, formally, assuming $R(t, T_j)$ is defined for all $t \in T_i$, we have

$$S_{ij} = \frac{1}{n_i} \sum_{t \in T_i} (t - R(t, T_j))$$

Data

- At the dyadic level, we observe two vectors of timestamps (when the bites occurred per individual), e.g.

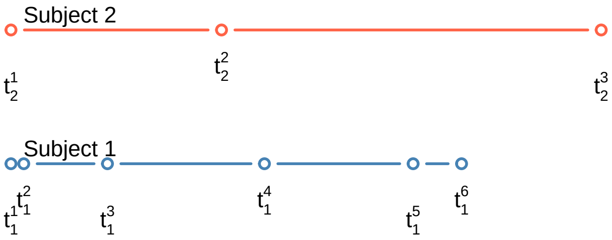

Figure 1: Simulated dyad

- For the previous example, $T_1 = \{t_1^1, t_1^2, t_1^3, t_1^4, t_1^5, t_1^6\}$, and $T_2 = \{t_2^1, t_2^2, t_2^3\}$

$$R(t_2^2, T_1) = t_1^3$$

Permuting time intervals

- Imagine we observe the followin: $T_a = \{0, 1, 3, 6\}$, then we have $3! = 6$ total permutations as what is swapped are time intervals.

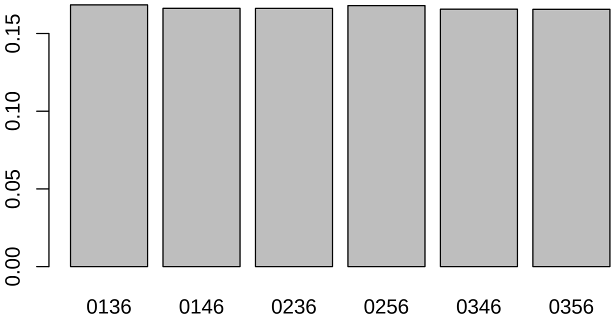

Figure 2: Distribution of permuted set (50,000 permutations).

Part 2: Small Network

- Observe small teams perfoming several tasks in a lab,
- Team members are surveyed before and after each task.
- From their responses, collective intelligence indicators were built.
- Also, they were asked about their perceptions of the social networks: leadership, advice, etc. Call this social cognition.

We are interested in the following question

- How important is, if important at all, social cognition in group performance?
- **Our problem**: Teams studied here (and everywhere) are usually very small, raging 4 to 5 members.
- Our current approach: We defined an statistic that measures some sort of correlation:

$$S_T \equiv 1 - \frac{1}{n(n-1)} \sum_{\{(i,j):(i,j)\in T, i<j\}} H(i,j)$$

  Where $H(i,j)$ is the hamming distance between i and j's perceived social structures.
- $S_T \in [0,1]$, where 1 means *perfect correlation* (all subjects have the exact same perception of the graph.)