



# The Effects of Individual Traits on the Formation of Social Networks Among First-Year College Students

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SoCS: Explorations on the Effects of Pervasive Networking on Social Relationships and Resource Planning



## Research Issues & Questions

- Social Network Dynamics: Network ties form, dissolve and are re-negotiated in relatively narrow time windows
- Time Scales: If networks change at a faster rate than behaviors and traits, then we need to look at how traits affect network tie formation and maintenance
- Nodal (Vertex) Degree: Well know that there is heterogeneity (inequality) in degree
- Two Research Questions:
  - Why do some people have larger social networks? What individual traits predict network size?
  - How stable are people's social network? Do the traits that predict network size also predict how networks grow or decline?

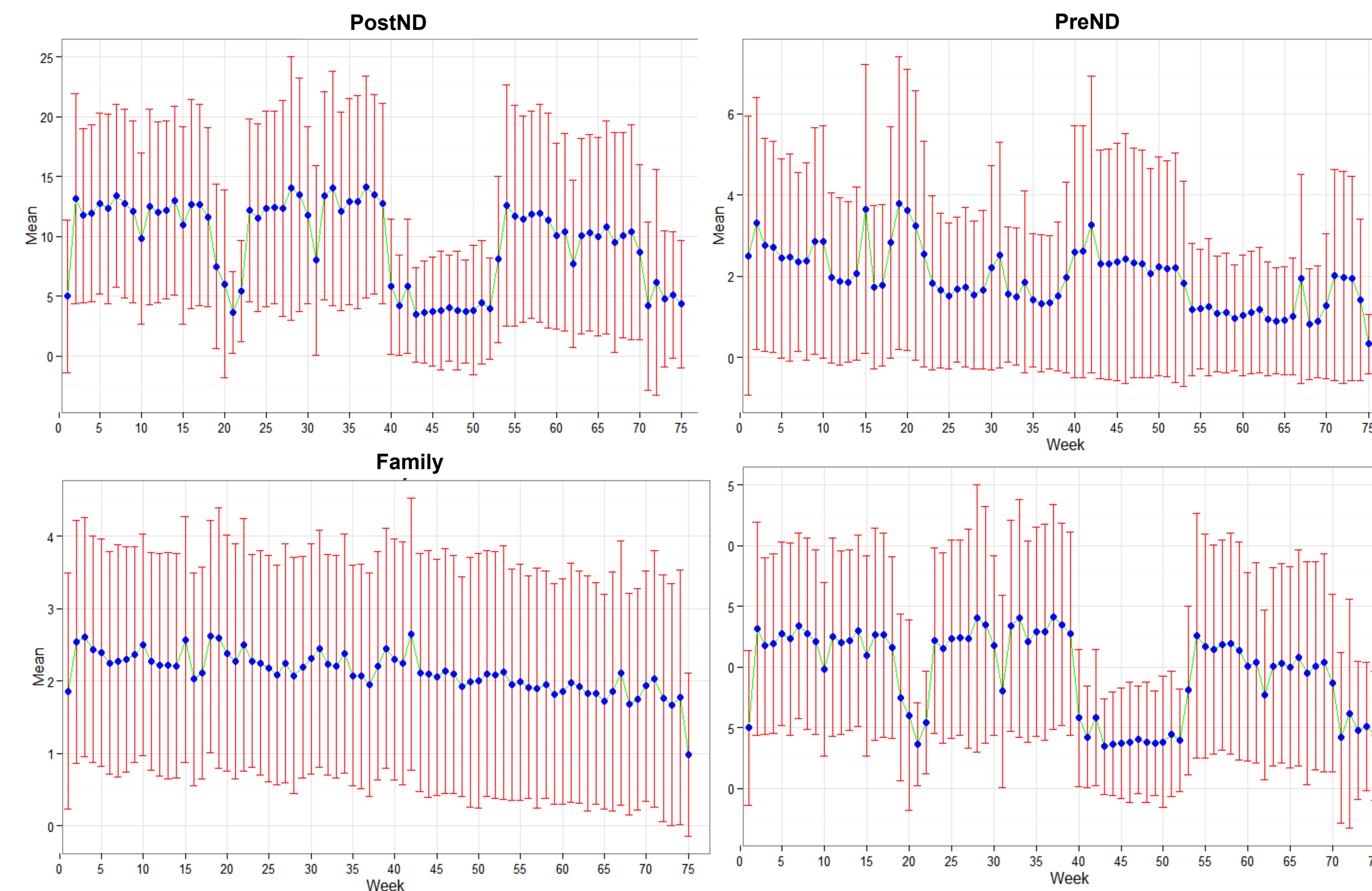
## NetSense Study

- Two-year data collection effort (now extended to 4), NSF-funded study subsidized by Sprint
- ~200 first-year students given a smartphone and free voice/text/data plans.
- Capture all communicative interactions: sender number, receiver number, time, date, communication form (voice, text). Not content.
- Random allocation of students to same-sex dorms.
- Survey data: Prior to arrival students completed two surveys (and then subsequently every 4 months)
  - Demographic/Attitudes/Tastes/Behaviors
  - Network Survey: Asked about their top 20 contacts

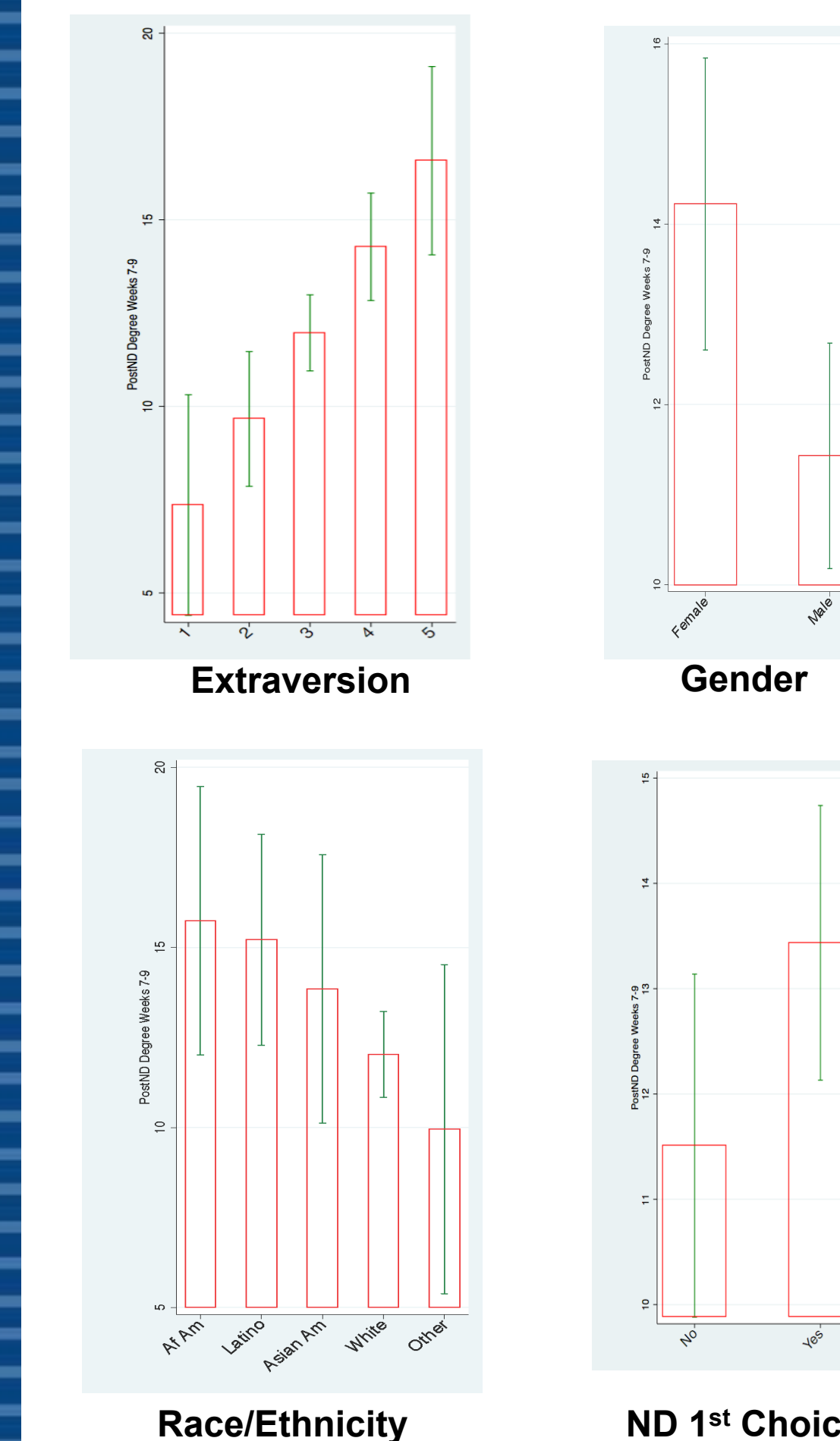
## Communication Data

- 185 students
- 75 weeks: all of first year and first semester second year
- ~23 million communication events (voice or text)
- ~46,000 ties (weighted edges): communication between someone in the study and another person (possibly also in the study)
- Vast majority of ties and communication are with other people who are not in the NetSense study
- 4 types of ties: Ties formed prior to arrival at Notre Dame (PreND), after arrival (PostND), Family, and unknown (residual category).

## Weekly Mean Degree Temporal Trends



## Predicting Initial Degree (Weeks 7-9)



## Vertex Degree: Multilevel Conceptualization

- We examine interactions between study participants ( $i$ ) and their contacts ( $j$ ) aggregated by week ( $t$ )
 
$$a_{ijt} = 1 \text{ If we observe an interaction between } i \text{ and } j \text{ during time period } t \text{ (mutual edges only)}$$
- We assign neighbors to disjoint groups  $l$  (whether tie to  $j$ th person is a PreND, PostND, Family, or unknown)
 
$$a_{i(j \in l)t} = 1 \text{ If we observe an interaction between } i \text{ and } j \text{ of type } l \text{ during time period } t$$
- Is the period-specific degree (network size) across each edge type
 
$$k_{ilt} = \sum_j a_{i(j \in l)t}$$

## Findings

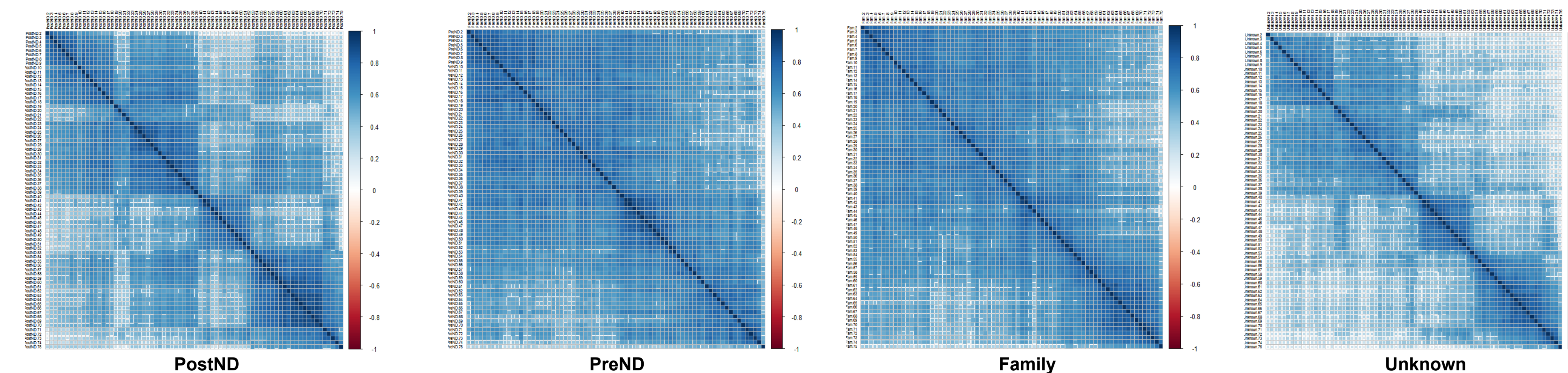
- Initial differences in degree are predictable:
  - Women and extroverts have ~3 more PostND ties by weeks 7-9
  - African-Americans, Latinos and Asian-American form more PostND ties than Whites.
- Stability of active degree (all types) over time
  - Diminishing stability with increasing time
  - Seasonality (period) effects for PostND ties indicated by low correlations between different time periods (on-campus, semester breaks, summer)
- Group differences in change in degree over time
  - Gender gap decreases as males experience some growth in degree
  - Extroversion effects persists
- Stability with change
  - Important process is initial time period (weeks 0-9) leading to initial degree.
  - After initial period, stability in degree
  - Catch-up and amplification processes
  - There can however be turnover in a person's contacts, so active degree indicative of a person's capacity

## Graduate Research Assistants

Sociology: Michael Penta, Bryant Crubaugh, Cheng Wang, Brandon Sepulvado

Computer Science and Engineering: Shu Liu, Lei Meng

## Inter-Temporal Rank Correlations



## Group Differences in Mean Degree Over Time: PostND Ties

