

Community Network Project 2017

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Reference Notice

This report so far is only for circulation within the Minerva community. If you want to cite it in any context, especially one that will be open to the public, please contact Xiaofan first. It's a sensitive issue to show, discuss and interpret these outcomes with members outside of our community.

Overview

Community Network Project is initiated by Xiaofan, and now joined with Eliana Sullivan and Nicolás Gort to empirically study how Class 2019 is connected and how these connections have evolved. We want to explore big questions such as what does our community look like? How closely tied we actually are? How well are people from different regions mixed together? What separates people in clusters of groups? In total, 72 people in Class 2019 filled in a survey to contribute their friendship connections anonymously and 117 people are identified out of the total population 123 people in Class 2019 (including those that are no longer at Minerva). Considered some possible errors in data processing (nodes are mismatched), this project still has covered most of the Minervans in Class 2019. We recommend you to navigate this 15 pages report by opening the document outline (in Tools section) at the side.

An Introduction to Graph Reading

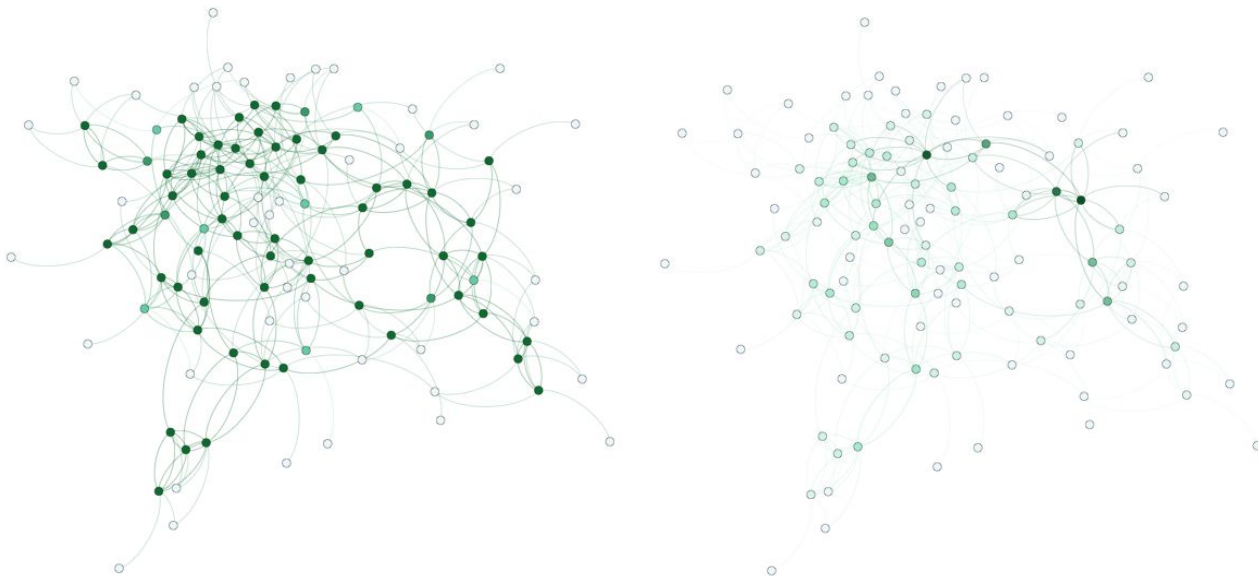
Let me start explaining how to read the graphs below. One node represents one person and the line that connects two nodes represents that one of the two nodes identify the other as his/her close connection. If two nodes both identify each other, there will be two lines connecting them. Directionality is recorded in the software and used to calculate network parameters, but is not visually present in the graphs.

The graph is generated based on Yifan Hu's algorithm. You can conceptualize its process as a physical field where nodes are stretched to different directions based on who connect them until the whole graph reached a balance of forces (or in technical terms, minimized energy)¹. Therefore, **nodes that are visually close to each other in this**

¹ Curious of more? Read the original research: http://yifanhu.net/PUB/graph_draw_small.pdf

graph can be loosely interpreted as more connected (but not necessarily being directly connected) and **vice versa**. For example, if A, B and C all identify each other as close friends, they will be very tight with each other. So you can also interpret **nodes that are close to each other as they have many common mutual friends**.

The Figure 1 is an out-degree map. The dark green ones are those who filled the survey and thus can have at most five outward connections. The light green ones are those who didn't fill the survey but identified by people who filled the survey. Those that are between the dark and light green colors are those who filled the survey but identified less than 5 people.



(Figure 1: Out-degree map, indicating people who filled the survey and those who didn't)

(Figure 2: Between centrality coloring on the same network)

The Central Individuals in the Network

There are many ways to measure the centrality of a network. Figure 2 calculates between centrality. It measures the number of times a node acts as a bridge along the shortest path between two other nodes. Therefore, **the darker**

green nodes in Figure 2 are individuals who are keys to hold the community together (aka keystone species to the ecosystem).

Who are these people then? Well, we are not supposed to tell you for the purpose of anonymity, but let's look at the meta data. Three are from Asia and one is from Europe! What? You asked why you should care about central individuals? Well there are implications for strategies to spread messages, run a campaign or even select candidate for ASM!

Evolution of Connections

Figure 4, 5, 6 and the GIF demonstrates the evolution of connections among Minervans from before Minerva to first year and second year. **66% of close connections are established in the first year, compared with 27% in the second year** (the rest of the 7% is Before Minerva). This indicates that people's friend zone does get crystallized in the second year, but there are still room for making new friends. Should we concern about the crystallization of friend zone or treat it as a natural process? Have we all been open-minded enough in the second year to explore new friendship? These are all questions that worth the community to reflect on.



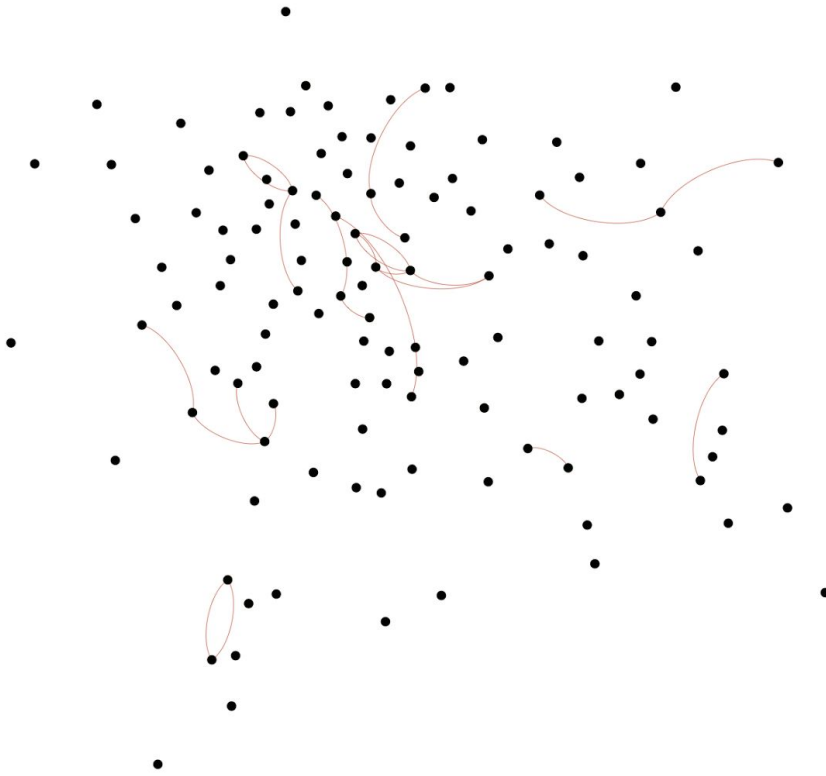
Figure 4: Before Minerva



Figure 5: First year



Figure 6: Second year



The GIF version of connections evolution

Connections by Countries/Regions

Welcome to the most fancy graph of the whole document! In Figure 7, you can see the network map colored by different countries/regions. **While reading, keep this in mind: this section hopes to demyth and show empirical complexity of connections, rather than reinforce or create new stereotypes of people from different countries/regions.**

At the first glance, it seems like we are in a well-mixed community. The northern part of the community has the most closely connected group because the connections are more mutual and intense. Two islands-ish group stand

out, one is the European-American (Yellow-red) cluster on the left-bottom of the graph and the African cluster (blue) on the right-bottom. The reason for forming such islands is that they are more likely to choose others within the group as mutual friends and less likely with others. However, such interpretation is too shallow without looking at graphs segmented by specific regions (see Figure 8, 9, 10, 11, 12, 13, 14, 15, 16). *If you want some mental challenges, slide to the graphs to do your own observations first before reading mine!*

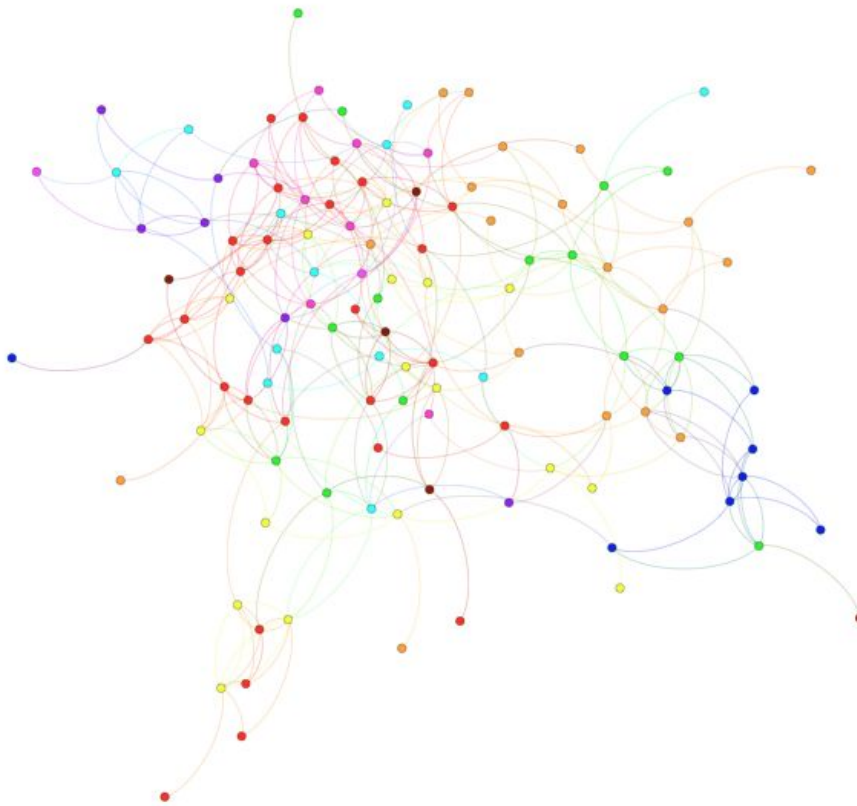


Figure 8: Network map colored by countries/regions

North Americans vs. Chinese

If we look at the network map by region/country, there are many interesting insights. Let's first look at North America vs. China because they seem to have the opposite geo-locations in the graph. The front lines of both groups still mix with each other, indicating friendships that go across both countries. But combined with graphs from other regions/countries, these two countries have significantly different patterns of connections at Minerva. American network has a lot more dots close to each other, while Chinese network is much wide-spread from each other. This indicates that North Americans have a lot more common mutual friends than Chinese. It also means that Chinese have very separate friendship circles that are not very integrated with each other. So, if all Chinese can introduce our friends to other Chinese, we will expand our friend zones dramatically (This lesson is also valid for Europeans who have similar wide-spread network as Chinese). For Americans, the lesson is opposite: you have most likely exploited your friends' friends and now it's the time to reach out to some people that you have absolutely no familiarities at all. How? You might be able to find answers by seeing what countries/regions that you are least connected with or reading Connections by Reasons section below.

The Regional Clusters

When we look at regional segregated maps, our community is less diversely connected than what the world map shows. In fact, if we use United States and China as the reference, we can see a more divided world. Americans have more overlapping geo-locations with Europeans, people from Middle East (mostly Israelis since only two of those are not from Israel) and half of the Southeast Asia, while Chinese have more overlapping geo-locations with Africans and the other half of the Southeast Asia. Notably, very few Americans and Europeans, Latin Americans and Middle Eastern have reached Africans and vice versa. This might be something that worth all these groups to reflect on. What's more, these groupings have formed beyond regional reasons, which will be revealed in the next section.

The Split of Southeast Asia

The one regions that immediately caught my attention is Southeast Asia because it has an interesting split at the left and right of the graph, which seems to be pretty disconnected from each other. Considered the left part of the graph is mostly Europeans/Americans, while the right part is Chinese, Southeast Asia seems to have two distinct friendship patterns. My personal guess is that some Southeast Asian countries have cultures that are close to China, while some are close to western style. However, we tested this hypothesis with cultural similarities edge property in a regionally segmented graph. Cultural similarities don't seem to be the biggest factor that causes the split. It's also possible that there are other reasons/factors compounded with cultural similarities that contribute to the split, even though people don't attribute the credits to cultural similarities.

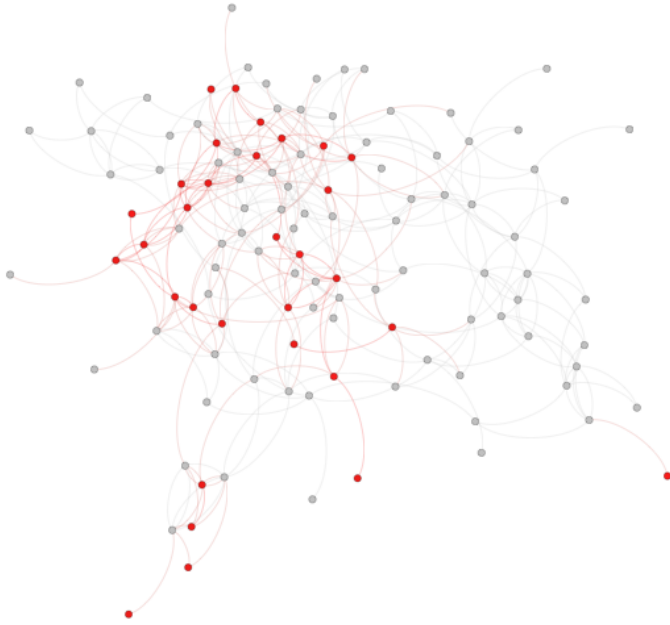


Figure 9: North America

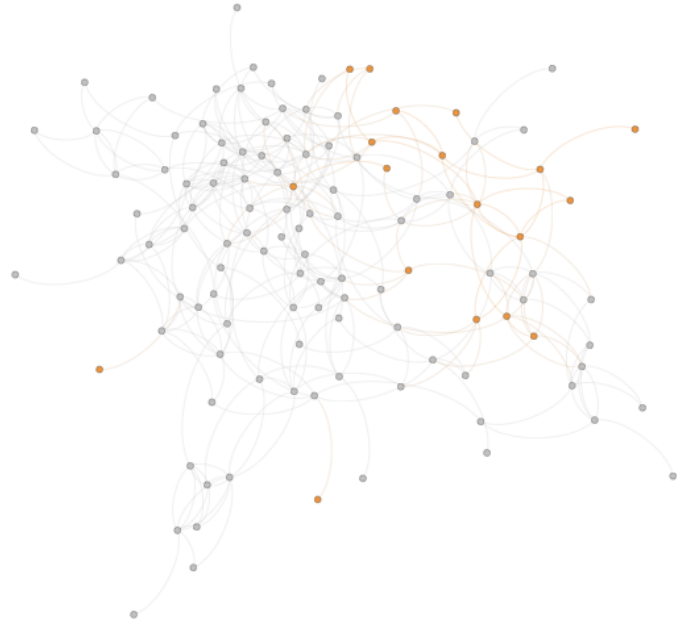


Figure 10: China

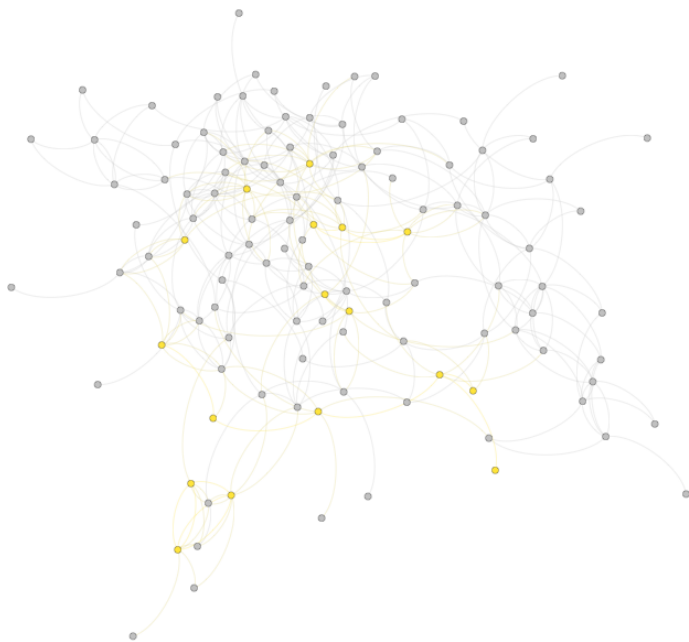


Figure 11: Europe



Figure 12: Latin America and Caribbean

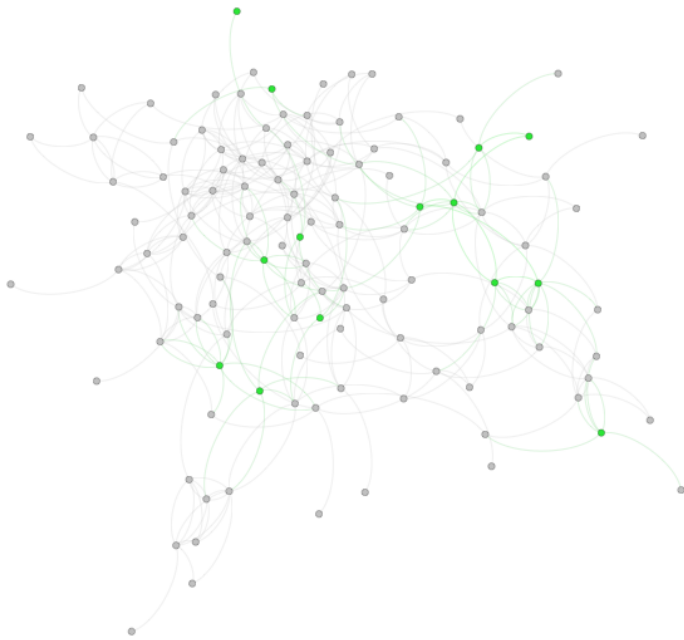


Figure 13: Southeast Asia

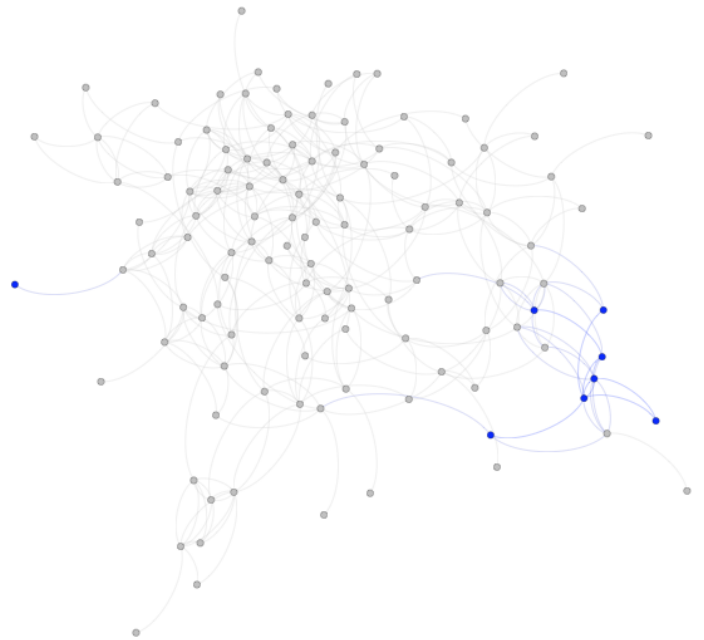


Figure 14: Africa

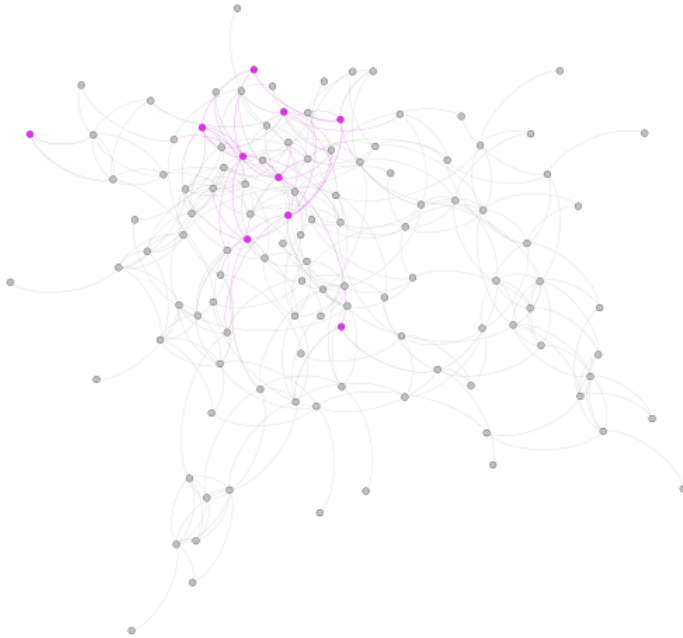


Figure 13: Middle East (Mostly Israelis)

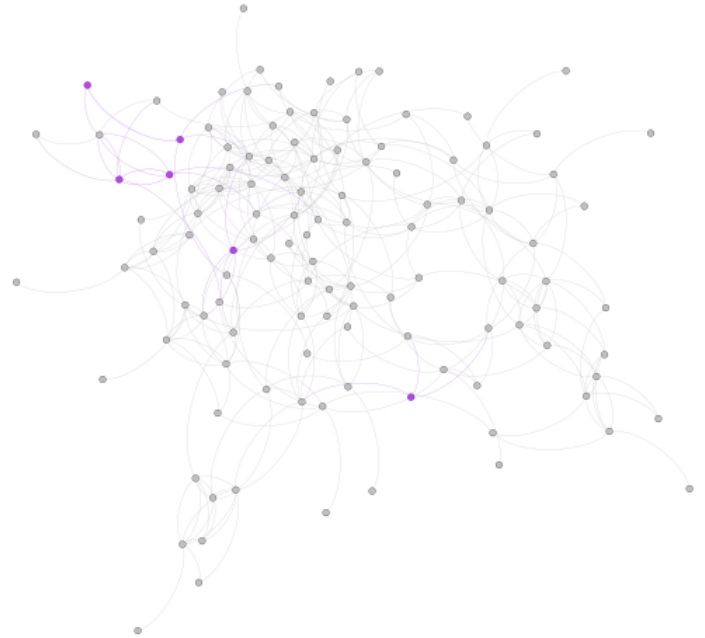


Figure 14: South Asia

Connections by Reasons

Knowing that countries/regions are not the only reasons forming the geographic clustering on the network, now we look at some other reasons that were popular hypotheses of what are important for shaping (not maintaining) friendships.

From data from the survey we get to know that 11% of the friendship are made through religious reasons, 26% through randomness, 29% through study buddies, 33% through food sharing, 34% through party, club and chilling buddies, 36% through physical distance, 40% through cultural similarities, 54% through shared experience and 57% through hobbies and interests (% don't add up to 100 because people are allowed to choose multiple reasons). We can see that Hobbies and Interests, Shared Experience and Cultural Similarities are the top 3 most popular reasons for friendships. Though Religion is the last, we have to consider the base rate bias (we only have a small population of strictly religious people). Physical distance, which was a highly debatable reason for having a community

residence at Seoul, is at the 4th positions of all reasons for ESTABLISHING friendships. It's possible that (from my conversations with some people) it has a greater value for MAINTAINING the friendships, especially for weak connections.

Note: the analyses below here are from a 1st edition that might have errors. We didn't have time to create the same analysis for the 2nd edition

Reasons x Time Dimension

From Figure 15 we can see that how different reasons evolve in different time periods. **In general, the importance/reliance on cultural similarities and party/club/chilling for friendship is decreasing.** Before Minerva, cultural similarities is the top one reason and then drop to the 3rd in the first year and 6th in the second year. This is the same for “party/club/chilling buddies” as it dropped from the 4th reason in the first year to the 8th reason in the second year.

Hobbies and interests and shared experience are the two reasons that have the most potentials to grow friendship because they are almost the top 2 regardless of first year or second year. Physical distance from 6th in the first year to the 2nd reason in the second year.

Reasons such as physical distance and randomness become more popular in the second year (compared with first year), which indicates that they might have the effects of either deepening friendship or jumping out of your local friendship maximum.

Special attention should be paid to religion as its growth rate for friendship establishment dropped dramatically in the second year. It makes sense given the limited population of people that shared the same religions at Minerva, but **for individuals who rely heavily on only this reason for friendship, their friend zones crystallization will be much faster than those of others.**

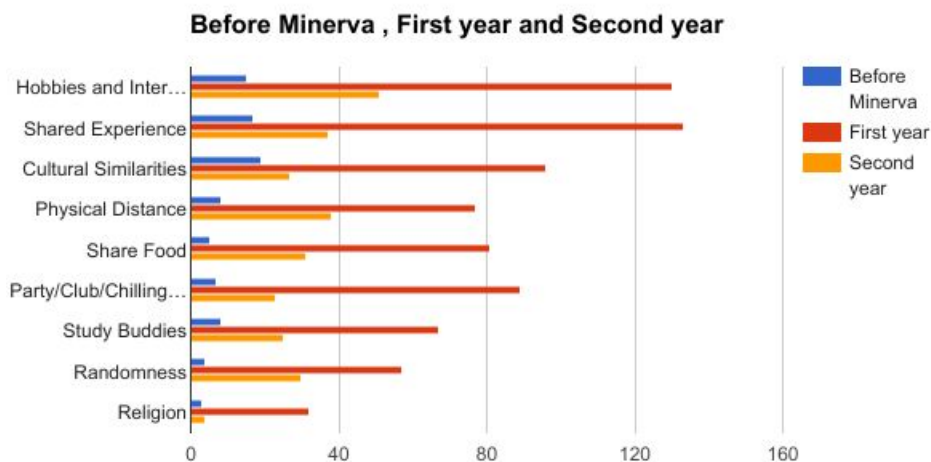
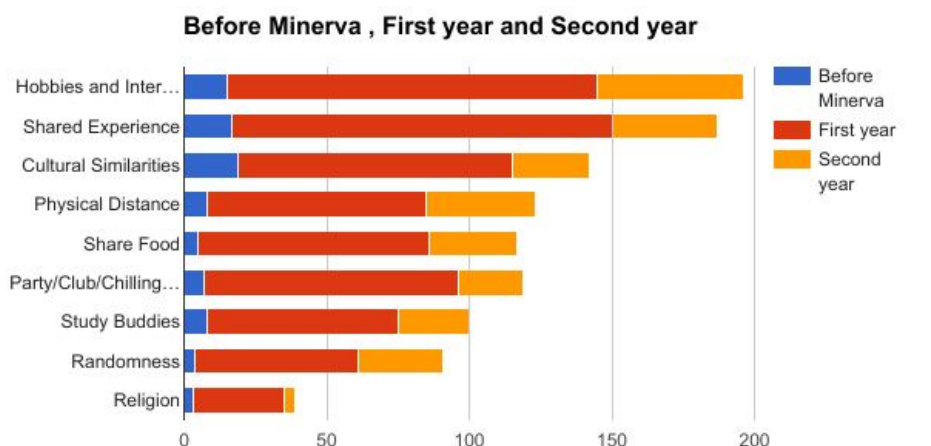


Figure 15: Proportion breakdown of reasons for friendship evolving along time

Reasons x Geographics

Remember how the connection map is roughly segregated in Connections by Countries/Regions section? This section we will explore whether certain connection reasons are more or less popular regarding certain regions. Couple things stand out for me particularly.

We have a clear split on the party groups that don't even cross a line. Combined with our knowledges that friends on the right part of the split are mostly Chinese, Africans and Southeast Asians (left vice versa), there could be three layers of interpretations: 1) friends on the right don't prefer to make friends through party/club/chilling, 2) friends on the left are very unlikely to party with friends on the right, 3) people in the middle vacuum alley, those who are

very likely to have connections in both left and right groups, make their cross-regional connections through reasons other than party/club/chilling.

We also saw two-ish religious clusters. One is Christianity for sure, involving most of the Africans, some of the Chinese and Southeast Asians, while the other is ambiguous (potentially Jewish) for me. Religion is the most important reason for African clustered connections but the least important reasons for the rest of the groups.

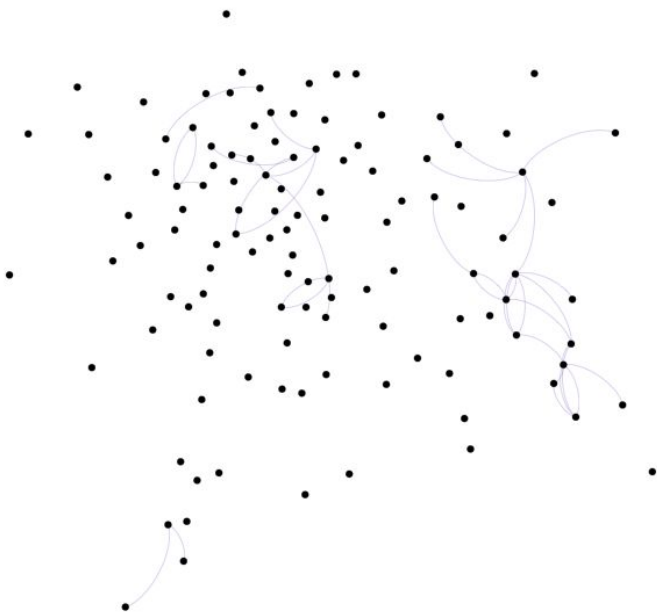


Figure 16: Religion

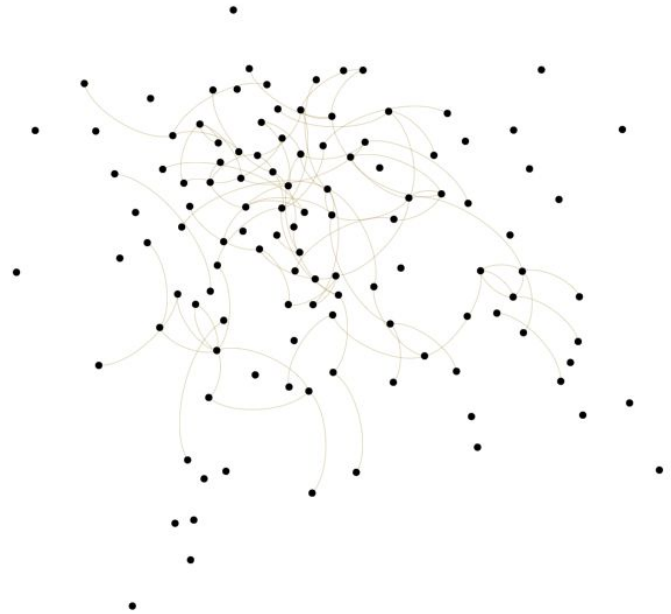


Figure 17: Randomness

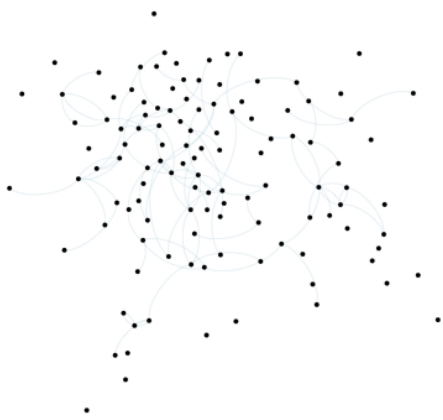


Figure 18: Study Buddies

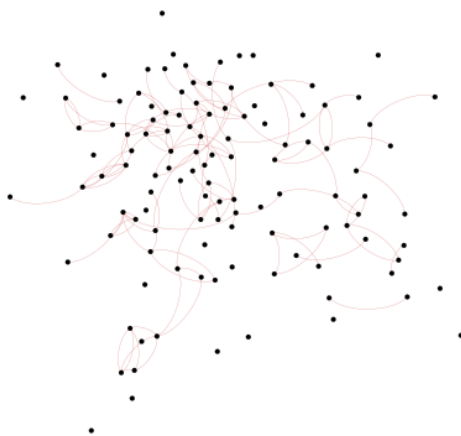


Figure 19: Physical Distance

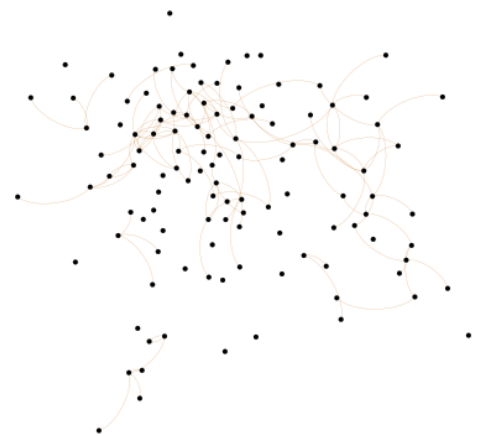


Figure 20: Food sharing

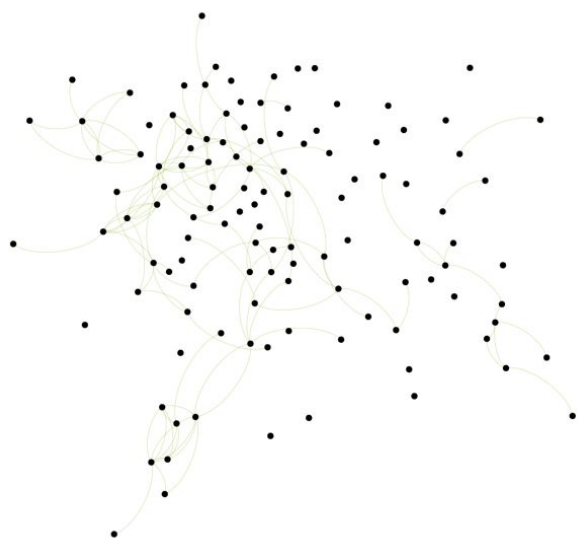


Figure 21: Party, Club, Chilling Buddies

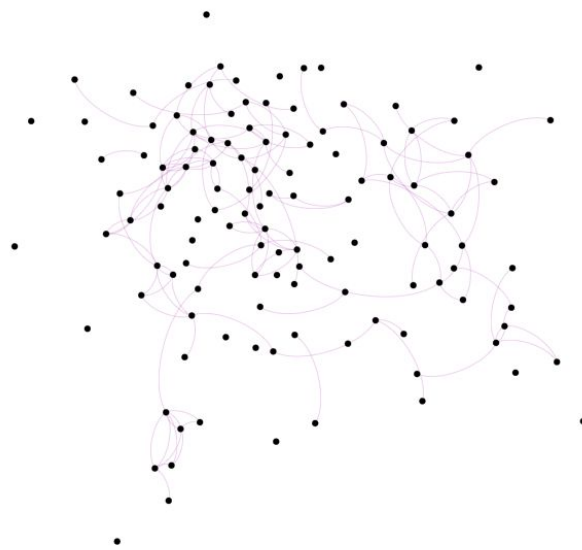


Figure 22: Cultural Similarities

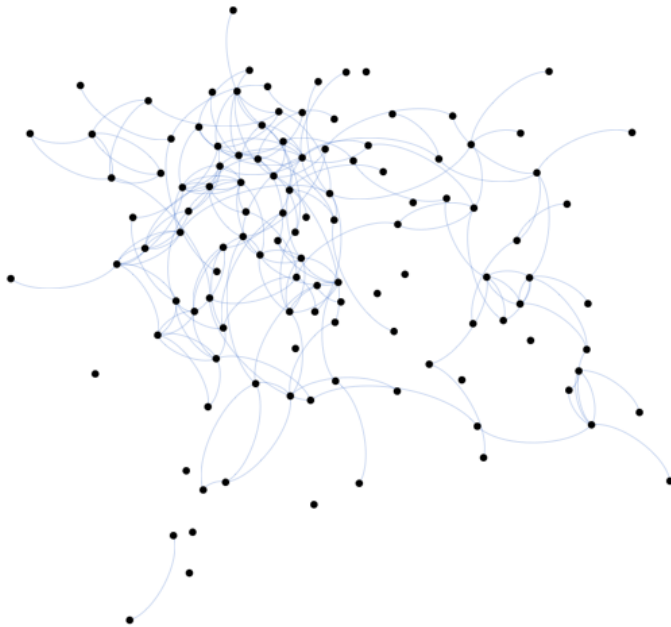


Figure 23: Hobbies and Interests

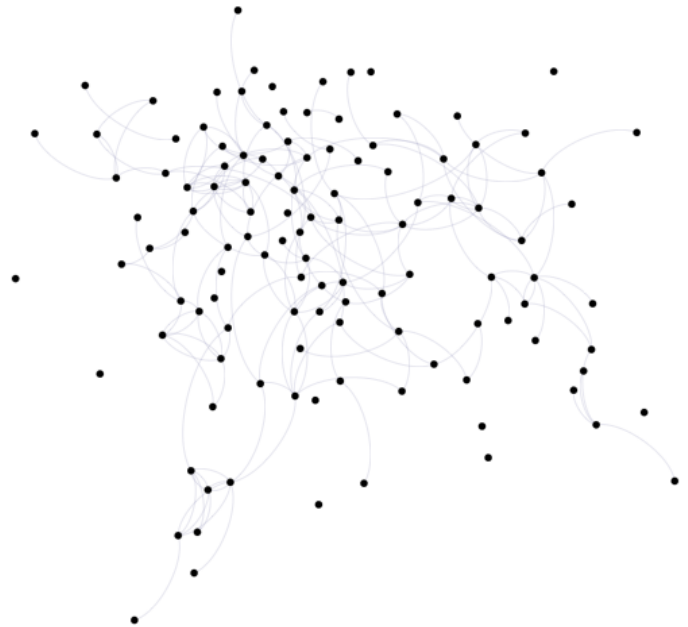


Figure 24: Shared Experience

Reason x Multilayer Interactions

Also, certain types of connections seem to be more likely to happen together. For example, food sharing, physical distance and study buddies seem to have similar patterns, which means they are identified by the same people together at the same time.

Take Aways

- (1) You are less lonely than you think! More than 90% of the class were identified by at least one person given that 59% of people filled the survey. Less friendship is forged in the second year, but you are not out of luck!
- (2) However, if you do want to make a deliberate effort:
 - Hobbies and Interests; Shared Experience
 - Try different ways of socializing, e.g. 1:1 tea time, café study buddy, invite your neighbors for dinner.

Potential Future Work

- Quantitative Metrics
- Longitudinal Study
 - So please support us by filling in surveys in the future!!
 - Class 2019 can still fill out the survey
 - Class 2020 is welcome to join!
- Interactive Webpage for Individual Exploration