Genealogical Relations Between Fitness and Nutrition Communities

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1 Introduction

People who are interested in fitness often explore various diets and nutritional approaches to achieve their health and fitness goals. In this study, we focus on the following fitness and nutrition subreddits:

- **Fitness Communities**: r/Fitness, r/bodybuilding, r/running, r/yoga, r/crossfit, r/weightlifting, r/naturalbodybuilding, r/powerlifting, r/jumprope, r/bodyweightfitness

- **Nutrition Communities**: r/nutrition, r/1200isplenty, r/keto, r/vegan, r/lowcarb, r/Paleo, r/whole30, r/intermittentfasting, r/PlantBasedDiet, r/MealPrepSunday

These fitness and nutrition communities share a common theme: people pursuing a healthier lifestyle. However, they also have unique aspects, leading to intriguing underlying relationships and user migration patterns.

In this study, we aim to analyze the recent community dynamics between fitness and nutrition communities from 2023/01/01 to 2023/04/01. To achieve this, we adopt the computational framework for constructing genealogy graphs between communities, as detailed in the paper "Tracing Community Genealogy: How New Communities Emerge from the Old."

The crux of building a genealogy of communities lies in identifying a set of "parent" communities for each new community. The original paper traces the parents of an emerging community by examining the communities where its early members were active just before joining the new community [1]. For our study, we slightly modify the definition of genealogy to focus on recent activity. To trace the parents of a community, we examine where its members were active shortly before participating in the current community. This modified approach enables us to analyze the genealogy without requiring data from the very beginning, allowing us to concentrate on the recent flow and dynamics among communities.

We have created a genealogy graph (Figure 1) to visualize the relationships. By analyzing genealogies between these communities, we examine the recent flow within the last three months between fitness and nutrition communities, gaining insights into preferences, trends, and connections between different topics within these broader areas.

2 Edge Weight Analysis

In this section, we examine the edge weights in the genealogy graph, representing the flow between different communities. Our goal is to identify the strongest and weakest connections and discuss potential reasons for these relationships.

Figure 1: Genealogy Graph of fitness and nutrition communities on Reddit. A directed edge signifies the presence of members from the source node ("parent" community) in the target node ("child" community). The thickness (or weight) of an edge represents the proportion of these members. Only edges with a weight greater than 0.01 are displayed in the graph. This is an adapted version of the graph generated from the code used in the original paper [1, 2]. The graph created using the original paper's code can be found in Appendix A.1.

2.1 Strongest connections:

- **BodyweightFitness and JumpRope communities**: With an edge weight of 1.0, this robust connection suggests that many members interested in bodyweight exercises also have an interest in jump rope exercises. This correlation is likely because both forms of exercise are convenient and effective, requiring minimal equipment.

- **Nutrition and 1200isplenty communities**: An edge weight of 1.0 indicates a strong connection between these communities. This relationship can be attributed to both communities' focus on healthy eating and calorie counting as methods for managing weight and improving overall health.

- **Nutrition and MealPrepSunday communities**: With an edge weight of 1.0, this strong connection suggests that members interested in nutrition also value meal prepping as a means of maintaining a healthy diet and saving time during the week.

2.2 Weakest connections:

- **Unconnected subreddit pairs**: Any pair of subreddits without a parent-child relationship in the provided data signifies an edge weight of 0. This lack of connection represents the weakest possible relationship, as there is no observable flow between these communities within the studied timeframe.

  An example of such a pair is r/intermittentfasting and r/bodybuilding. The non-connection between these communities can be attributed to the differing nutritional requirements of each community. The intermittent fasting community focuses on consuming food within a specific

timeframe to limit the number of total calories, whereas bodybuilding often requires a higher caloric intake for muscle growth.

3 Community Centrality Analysis

In this section, we analyze the centrality measures of each community in the genealogy graph to identify the most influential or central communities. Centrality measures, such as degree centrality, betweenness centrality, and closeness centrality, help us understand which communities play a crucial role in the flow of information, users, or ideas within the broader fitness and nutrition landscape.

Community	Degree Centrality	Betweenness Centrality	Closeness Centrality
Fitness	5.444	0.468	4.476
Nutrition	3.333	0.706	3.328

Table 1: Aggregated centrality measures for Fitness and Nutrition communities

Based on the centrality measures presented in Table 1, we can draw the following conclusions:

- **Degree Centrality**: The Fitness community has the highest degree centrality, suggesting that it is more connected to other communities in the network.

- **Betweenness Centrality**: The Nutrition community has the highest betweenness centrality, suggesting that it plays a more significant role in connecting other communities in the network.

- **Closeness Centrality**: The Fitness community has the highest closeness centrality, suggesting that it is closer to other communities in the network, making it easier to exchange information, users, or ideas.

Based on the centrality analysis, the Fitness community stands out as the most central community in terms of degree and closeness centrality. This indicates that it has direct relationships with various communities, enabling easier communication and interaction between them. However, the Nutrition community has the highest betweenness centrality, suggesting that it serves as an intermediary or a bridge within the broader fitness and nutrition landscape. It implies that the Nutrition community is a critical point in the network, connecting communities that might not have direct connections otherwise.

4 Temporal Analysis

This section presents an analysis of the connections between the Fitness and Nutrition communities on Reddit, with a focus on the evolution of these relationships over time, assessed on a monthly basis. Data was collected from January 1, 2023, to April 1, 2023, and partitioned into three intervals, each representing one month. Centrality measures, including degree, betweenness, and closeness, were aggregated for each community to identify emerging trends in the network structure (Figure 2). Detailed centrality measures for three intervals can be found in Appendix A.2. The findings are as follows:
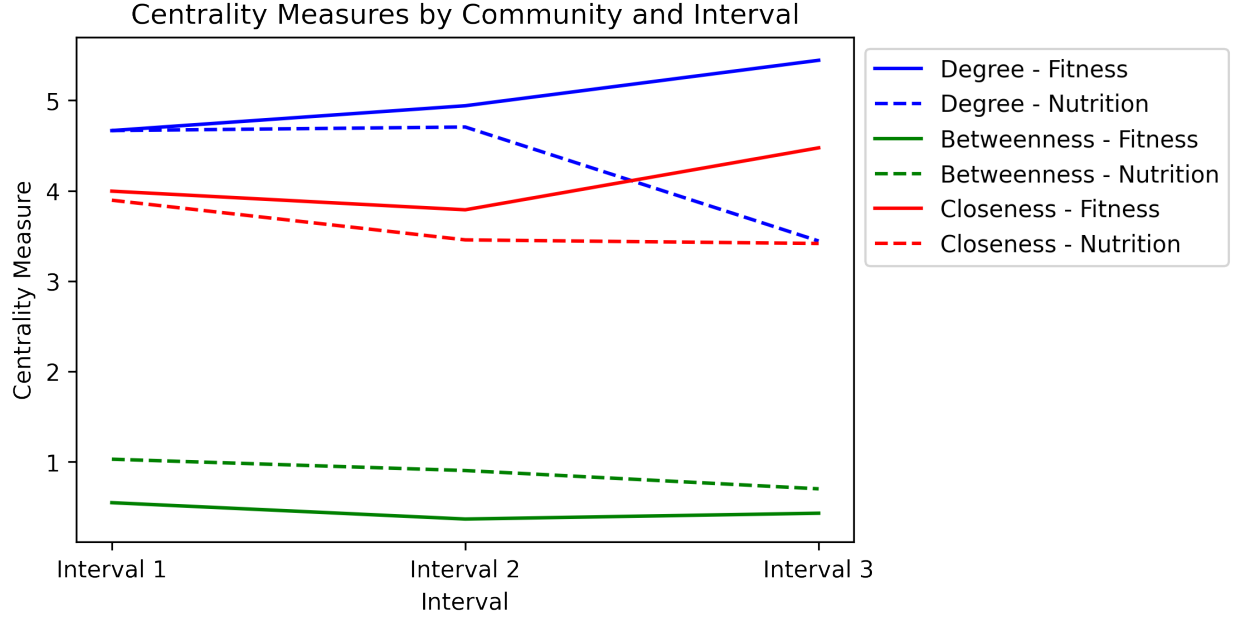
Figure 2: Centrality measures of Fitness and Nutrition communities over three intervals

4.1 Interval 1 (2023/01/01 - 2023/02/01)

- Fitness and Nutrition communities have similar degree centrality, indicating a similar number of connections between the communities.

- Nutrition has a higher betweenness centrality, suggesting that it serves as a bridge between different communities more often than Fitness.

- Fitness has a slightly higher closeness centrality, indicating that it is more central within the network.

4.2 Interval 2 (2023/02/01 - 2023/03/01)

- Fitness has a slightly higher degree centrality than Nutrition.

- Nutrition's betweenness centrality remains higher than Fitness's, continuing to serve as a bridge between different communities.

- Fitness's closeness centrality is higher than Nutrition's, indicating that it is more central within the network.

4.3 Interval 3 (2023/03/01 - 2023/04/01)

- Fitness's degree centrality has increased, while Nutrition's has decreased.

- Fitness's betweenness centrality has increased, and Nutrition's has decreased, though Nutrition still serves as a bridge between different communities.

- Fitness's closeness centrality remains higher than Nutrition's.

Throughout the analysis period, the Fitness community experienced an increase in its network centrality, exhibiting more connections and a more central position. In contrast, the Nutrition community witnessed a decrease in its centrality measures, yet it continues to function as a bridge between various communities. This shift in the network structure suggests that the Fitness community has grown more central and interconnected, while the Nutrition community maintains its role as a connecting link among different communities.

One possible explanation for the observed changes in the dynamics between the Fitness and Nutrition communities could be the influence of seasonal factors. People may be more inclined to focus on their fitness goals during specific times of the year, such as after making New Year's resolutions or when the weather gets warmer. These factors could result in heightened activity and increased connections within the Fitness community.

5   Conclusion

In this study, we investigate the relationships and user migration patterns among various fitness and nutrition communities on Reddit from January 1, 2023, to April 1, 2023. Our aim is to gain insights into the preferences, trends, and connections within these broader areas by analyzing genealogies.

Through community centrality analysis, we discover that over the three-month period, the Fitness community demonstrates the highest degree and closeness centrality, signifying its strong connectivity and central role in the network. In contrast, the Nutrition community exhibits the highest betweenness centrality, highlighting its function as a bridge between different communities. Our temporal analysis reveals changes in the network structure over time, with the Fitness community becoming increasingly central and interconnected, while the Nutrition community consistently served as a connecting link among various groups.

Future research could expand the scope of the study by exploring user migration patterns and their implications over a more extended time frame, which would provide a deeper understanding of the underlying trends and relationships between these fitness and nutrition communities on Reddit.

References

[1] Chenhao Tan. Tracing Community Genealogy: How New Communities Emerge from the Old. In *The International Conference on Web and Social Media (ICWSM 2018)*.

[2] Jason Shuo Zhang, Brian Keegan, Qin Lv, and Chenhao Tan. Understanding the Diverging User Trajectories in Highly-related Online Communities during the COVID-19 Pandemic. In *The International Conference on Web and Social Media (ICWSM 2021)*.

A   Appendix

A.1   Original Genealogy Graph
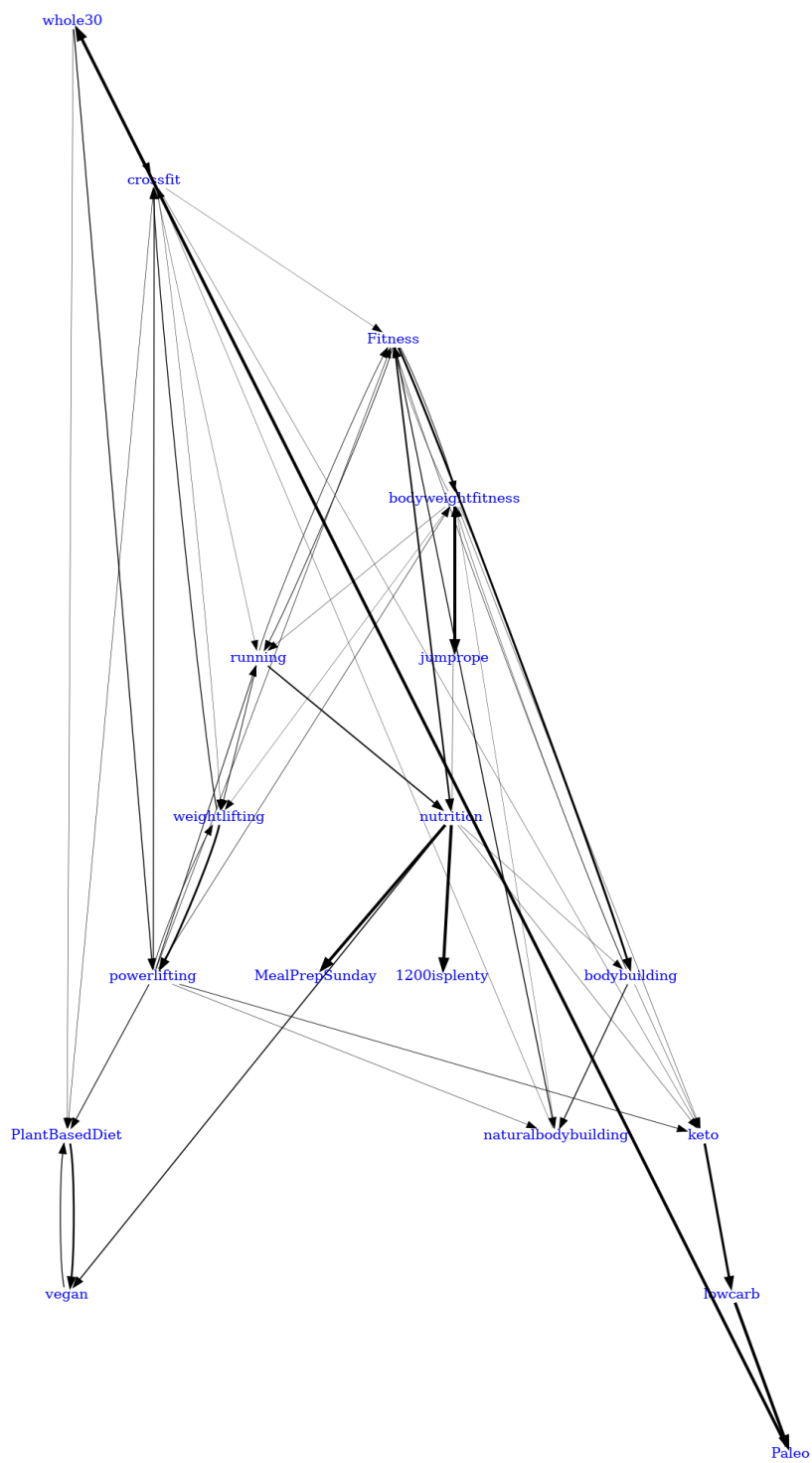
A.2 Detailed Centrality Measures for Three Intervals

Interval	Degree Centrality	Betweenness Centrality	Closeness Centrality
2023/01/01 - 2023/02/01	Fitness: 4.67 Nutrition: 4.67	Fitness: 0.55 Nutrition: 1.03	Fitness: 4.00 Nutrition: 3.90
2023/02/01 - 2023/03/01	Fitness: 4.94 Nutrition: 4.71	Fitness: 0.37 Nutrition: 0.90	Fitness: 3.79 Nutrition: 3.46
2023/03/01 - 2023/04/01	Fitness: 5.44, Nutrition: 3.44	Fitness: 0.43 Nutrition: 0.70	Fitness: 4.48 Nutrition: 3.42