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Project 1

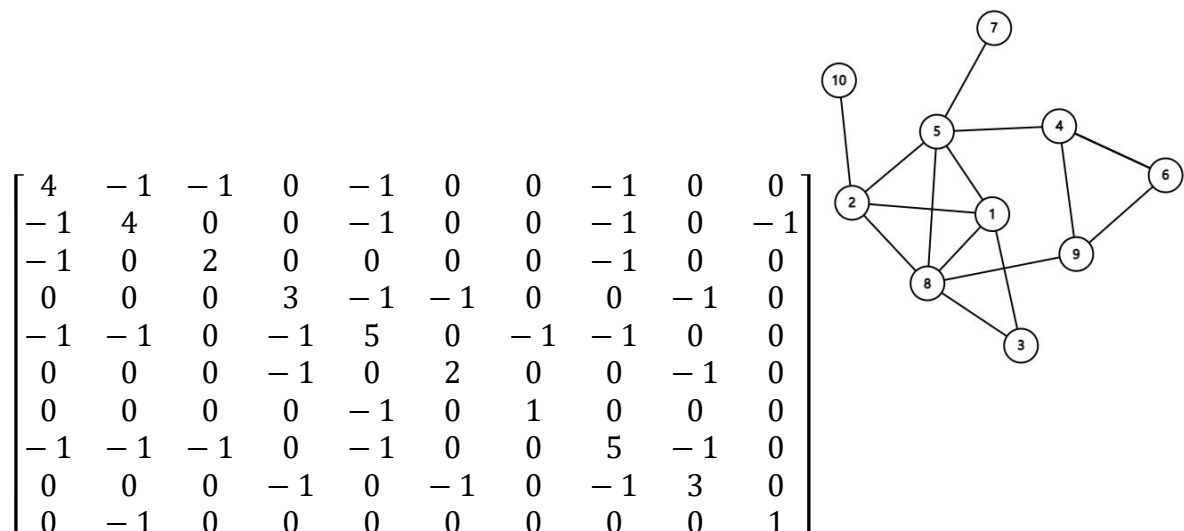Video Game Category Network

Introduction

    For this project, I would study the network formed by ten most recent video games I have played. More specifically I would like to connect them through similar genres or game elements and observe existing trends in my choices of digital entertainment.

Network Description and Laplacian Matrix

    The data used in the project came from user generated tags for video games on Steam, a major digital distribution platform. Below is a list of the ten videos games I have played in the past 12 months. Due to the large amount of text, tags are not included here, but they can be viewed on the corresponding Steam store pages.

1. *Peggle*/**2.** *Zuma*/**3.** *Draw & Guess*/**4.** *Half-Life*/**5.** *INFRA*/**6.** *Half-Life 2*/**7.** *The Forest*/**8.** *Bejeweled 2*/**9.** *Dynasty Warriors 7*/**10.** *Darkest Dungeon*

    Certain Tags are considered irrelevant to this study since they do not reflect the games' content to me. For example, "multiplayer" and "single player" tags are too broad as they apply to almost all games. Furthermore, only the first five tags shown on Steam store are considered since a huge number of less representative tags exist due to the user-generated nature of these tags. By connecting two games that share a tag, we can get the following network and Laplacian matrix:

$$
\begin{bmatrix}
4 & -1 & -1 & 0 & -1 & 0 & 0 & -1 & 0 & 0 \\
-1 & 4 & 0 & 0 & -1 & 0 & 0 & -1 & 0 & -1 \\
-1 & 0 & 2 & 0 & 0 & 0 & 0 & -1 & 0 & 0 \\
0 & 0 & 0 & 3 & -1 & -1 & 0 & 0 & -1 & 0 \\
-1 & -1 & 0 & -1 & 5 & 0 & -1 & -1 & 0 & 0 \\
0 & 0 & 0 & -1 & 0 & 2 & 0 & 0 & -1 & 0 \\
0 & 0 & 0 & 0 & -1 & 0 & 1 & 0 & 0 & 0 \\
-1 & -1 & -1 & 0 & -1 & 0 & 0 & 5 & -1 & 0 \\
0 & 0 & 0 & -1 & 0 & -1 & 0 & -1 & 3 & 0 \\
0 & -1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1
\end{bmatrix}
$$

Nodes 10 and 7 are not connected with the rest through the first 5 tags, however, they are through the 11th and 6th tags (strategy and adventure), respectively.

Fiedler Vector, Value, and Set Computation

After connecting nodes 10 and 7, the network becomes connected, which makes the multiplicity of eigenvalue 0 equal to 1, and there exist the positive Fiedler value, which is approximately equal to 0.623 according to the online Julia calculator (https://www.tutorialspoint.com/execute_julia_online.php). The corresponding Fiedler vector written as a row is [0.119209, 0.239245, 0.109776, -0.353189, 0.0215934, -0.51088, 0.057325, 0.0319172, -0.350131, 0.635135]. Therefore nodes 4, 6, and 9 are in the Fiedler set, corresponding to the games *Half-Life*, *Half-Life 2* and *Dynasty Warriors 7.*

Analysis and Discussion

The Fiedler set's elements are not surprising given that the three games all belong to the action genre while the other games with corresponding positive values in the Fiedler vector are relative slow-paced. The *Half-Life* games being in the same cluster is expected for they are in the same series. This separation can be seen on the graph: the cluster of nodes 4, 6, 7 is relatively less well-connected to the rest of the graph as it is the only part without overlapping   edges beside nodes 10 and 7, which are not originally connected in the network. The two groups of games represent two major genres I am interested in. While all three games in the Fiedler set have the "action" tag, four out of seven games outside the set have the "puzzle" tag and another two share the "strategy" tag – there is a balance between reacting and thinking in my choice of games.

Sources

The following sources are used in this project:

1. Steam store pages for the games mentioned(https://store.steampowered.com)
2. CSacademy graph editor for the construction of the network's graph(https://csacademy.com/app/graph_editor)