

MATH 265
Write-up 3
Due (on) 22 November 2023

Consider our imaginary friend group below, and a super hectic game of phone tag. Each of our friends has the numbers of others in the group and has an equal chance of calling someone whose number they have. There is also a chance (albeit small!) that our friends could use their assistants to randomly call *anyone* else in the friend group without interrupting the game. Your job is to explore the dynamics of influence in this digital ecosystem to determine who would *most likely* be *it* in this game of phone tag if the game began with someone at random in the group and the game continued on for a long, unspecified period of time.

Here is how the celebrities are connected:

- Taylor Swift can call: Ed Sheeran, Selena Gomez, Ariana Grande, Justin Bieber;
- Ed Sheeran can call: Taylor Swift, Justin Bieber, Beyoncé, Selena Gomez;
- Selena Gomez can call: Taylor Swift, Ariana Grande, Kim Kardashian, Kylie Jenner;
- Ariana Grande can call: Selena Gomez, Beyoncé, Justin Bieber, Dwayne Johnson, Kim Kardashian;
- Justin Bieber can call: Ed Sheeran, Ariana Grande, Kim Kardashian, Taylor Swift;
- Beyoncé can call: Kim Kardashian, Jay-Z;
- Jay-Z can call: Beyoncé;
- Kim Kardashian can call: Beyoncé, Taylor Swift, Justin Bieber, Kylie Jenner;
- Dwayne (The Rock) Johnson can call: Beyoncé, Ariana Grande, Kevin Hart;
- Kevin Hart can call: Dwayne Johnson, Ellen DeGeneres;
- Ellen DeGeneres can call: Kevin Hart, Oprah Winfrey;
- Oprah Winfrey can call: Ellen DeGeneres, Jay-Z, Michelle Obama;
- Michelle Obama can call: Oprah Winfrey, Beyoncé;
- Kylie Jenner can call: Kim Kardashian, Kendall Jenner, Selena Gomez;
- Kendall Jenner can call: Kylie Jenner, LeBron James;
- LeBron James can call: Kendall Jenner, Taylor Swift, Beyoncé.

(Please use your creativity to come up with a scenario where the celebrities would need to play phone tag in this friend group.)

For this assignment:

1. Set up a graph to *visually* describe the relationships between the celebrities. This can be done in a myriad of ways (i.e., a matrix, a diagram, etc.), but should be able to be interpreted by anyone reading your work.
2. Apply ideas from PageRank/Google matrices to rank how likely each figure is to be *it* in this context. Vary the p value (from our notes) to see how this affects the rankings.

3. Any systems you need to solve any systems should be solved *computationally*, and include your code in your submission.
4. Explain other items which could be considered (but do not implement them!) to get a more holistic idea of this system's behavior.

For write-ups, in general:

1. The write-up should have sections for: problem statement, description of mathematics, coding, results, and a discussion/conclusion.
2. The write-up should be typed in Latex using the template on Blackboard.
3. The write-up should be written in a way that a student (having taken Calculus II) could understand what is being done. Your writing should also be able to 'stand alone'; that is, your target audience should *not* just be someone familiar with the topics we've gone over in class.
4. You should aim to have your writing flow well. Your work doesn't need to be a page-turner or anything super exciting, but a reader shouldn't struggle to finish reading it.