

Lab 8: INFR 4710

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1 Introduction

Welcome to the eighth lab! In this lab we will be learning about triadic closure and network cascades. The lab instructions are set as minimum expectations. You are always encouraged to go beyond the expectations. Challenge yourself, have fun, and learn more!

Remember that when you have finished your lab activities, you need to show your final results to your TA. If you decided to do your lab remotely, you need to upload a PDF file with your procedure and solutions. You can take pictures of your handwritten answers and upload them as a single PDF. The TA will then provide feedback if necessary and record your mark.

2 Setting Up

This lab focuses on a few things you've already learnt in this course. It is recommended that you refresh yourself on Triadic Closure, Network Cascade, and Probability (Lab 7) before this lab if you feel you will need it.

3 Tasks

Answer the following questions:

- Suppose we observe Alice and Bob, who are not friends but have a number of friends in common. Now suppose that for each common friend, there is a 5% chance Alice and Bob will become friends.
 - What is the probability that Alice and Bob will not become friends if they have two friends in common?
 - What is the probability that Alice and Bob will become friends if they have two friends in common? (HINT: This is many non-mutually exclusive events).
 - What is the probability that Alice and Bob will become friends if they have 5 friends in common?
 - What is the probability that Alice and Bob will become friends if they have 10 friends in common?
 - If there is a probability p that two people will become friends for a single common friend, what is the probability that two people with k friends will become friends?
- Suppose there is a new iPhone coming out. Erika and Frank preordered the new iPhone and got it on release. Answer the following questions for the network in Figure 1:

- If more than 50% of a person's friends get the new iPhone then they will as well. Draw how the adoption of the iPhone cascades over time.
- Assume some people will never buy an iPhone no matter how popular it is. Which single person should refuse to buy an iPhone to minimize the cascade over the network? (You can't choose Erika or Frank, they already have the iPhone)
- Now imagine we have the template rule of "if $x\%$ of a person's friends get the new iPhone then they will as well." What is the highest value for x to guarantee everyone in the network to buy an iPhone?
- Now imagine that Ivan is the early adopter instead of Erika and Frank. What is the highest threshold x (i.e., maximum percentage of friends who bought iPhone required for adoption) under which full cascade will happen?

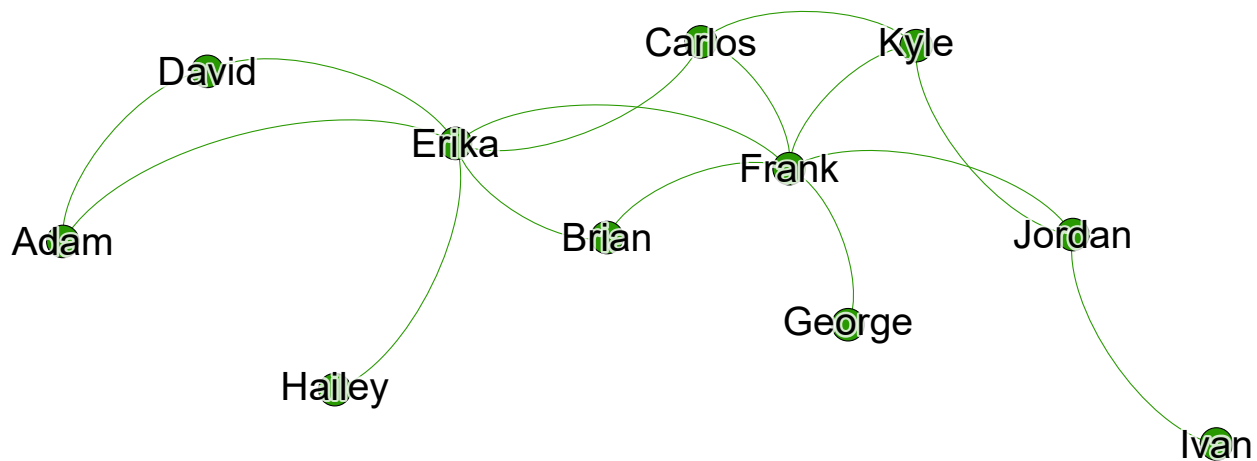


Figure 1: Network of potential iPhone users

Deliverable: Write your answers to questions above with detailed explanations in a document and submit to the Canvas.