WEEK 1

Lecture 1 and 2 Notes :- Introduction to Networks

Title: Connectedness in Random Networks

Introduction:

Experiment: Choose 3 people uniformly at random per person and make them friends.

Repeated experiment 1000 times and observed that resulting network was always connected.

Why does this happen?

Example with a class of 50 people: It is improbable for the graph to have 2 partitions.

Even if one friendship got executed out of 625 possible friendships, it would not lead to bifurcation.

Therefore, the class becomes connected, and any 2 people have a path between them.

Implications:

Even with a small number of friends per person, a piece of gossip can spread quickly in a connected network.

This phenomenon is not limited to classroom networks but can be seen in various random networks.

Conclusion:

Random networks tend to be connected due to the improbability of bifurcation.

This connectedness has implications for the spread of information and behavior in various networks.

Lecture 7 Notes :- Introduction to social networks

- Analyzing social networks is very difficult due to the large number of possible graphs even with a small number of nodes.
- The total possible graphs on just 50 nodes is 2 to the power of 50, which is much larger than the number of atoms in the universe.
- Despite the complexity of social networks, they exhibit some interesting properties.
- The course covers several such properties, including:
- Emergent properties of social networks
- Small world phenomenon
- Power laws and scale-free networks
- Network motifs
- Community detection
- Network dynamics and evolution

- Influence and contagion in social networks

Lecture 8 Notes :- Pagerank Algorithm Introduction

The question of who is the most important person in a friendship network is a complex one. It is not just based on the number of links one has, but there is something more to it. This question yielded a 450 billion dollar industry, and it is the same question that Google asked about web pages - which is the most important web page among a bunch of web pages that are linked to each other. This question led to the development of a concept that solved one of the most important problems in computer science - how to rank nodes in a network. The concept might appear to be very obvious, but it took a team of two people to bring it to the limelight and use it to its full potential.

Lecture 9 Notes :- Analyzing huge networks

The second problem in network analysis is searching in a network with a large number of nodes, such as one billion nodes. This is a complex problem, but there is a simple and straightforward solution. It is possible to search a network of n nodes with only roughly log n number of steps. This is because of the small world phenomena, which is a nice property of such networks. In 20 transactions, one can find any node in a network of one billion nodes.

if you have n number of nodes you can search with only roughly log n number of steps to be precise actually its log square n, but the point is in log number of transactions you can achieve searching, I am sure you know what one means by logarithm, if n is the number log of n is the number of digits in n.So, if the number of nodes in a network is n let us say 1 billion, the effort involved in searching in this big network is the number of digits in one billion single digit number or let say maximum 10, 15 or even 20, in 20 transactions you can find any node in the network.

Lecture 10 Notes :- Link Prediction

Predictions on networks work really well. For instance, by looking at someone's friendship network, one can predict who could possibly be their next friend. The speaker cites the example of Facebook's friend suggestion algorithm, which uses a sophisticated algorithm to suggest prospective friends based on common connections.