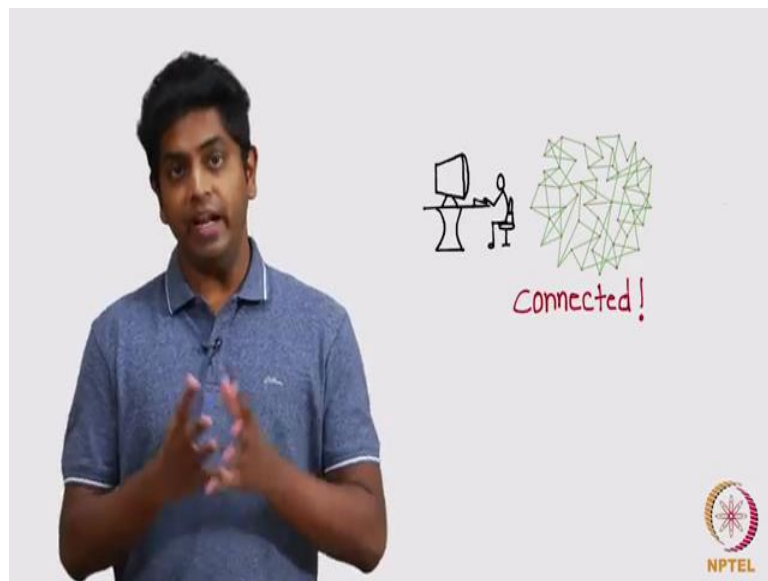**Social Networks**
Prof. S. R. S. Iyengar
Department of Computer Science
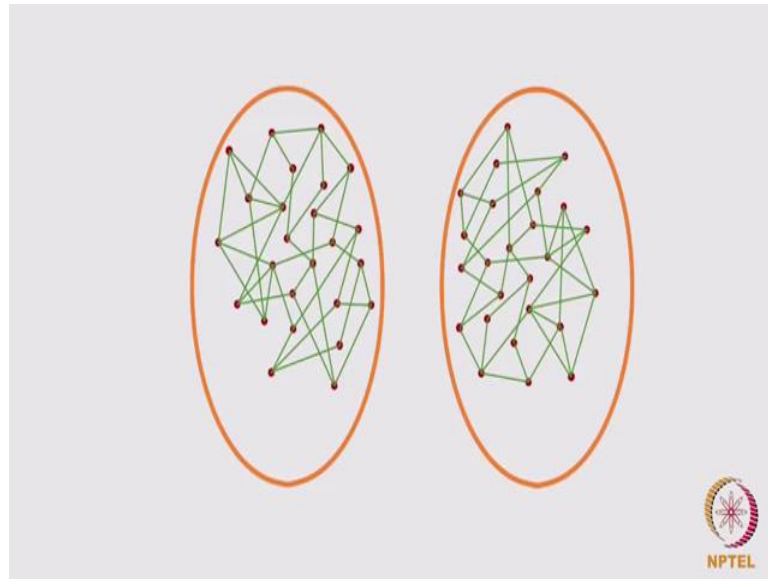**Indian Institute of Technology, Ropar**

Lecture - 02
Introduction to Social Networks
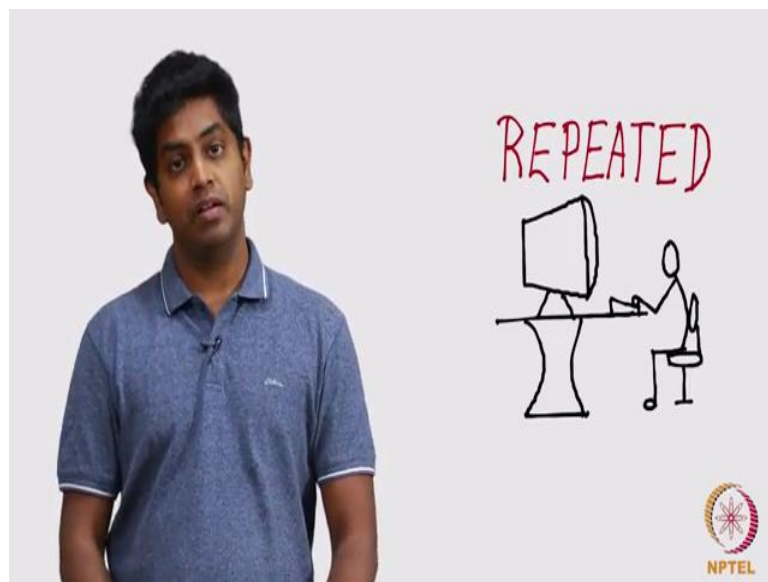**Answer to the puzzle**

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Fine, I am back. So, I did this piece of programming, what did I do? I took 50 dots, for each dot I randomly chose 3 people.
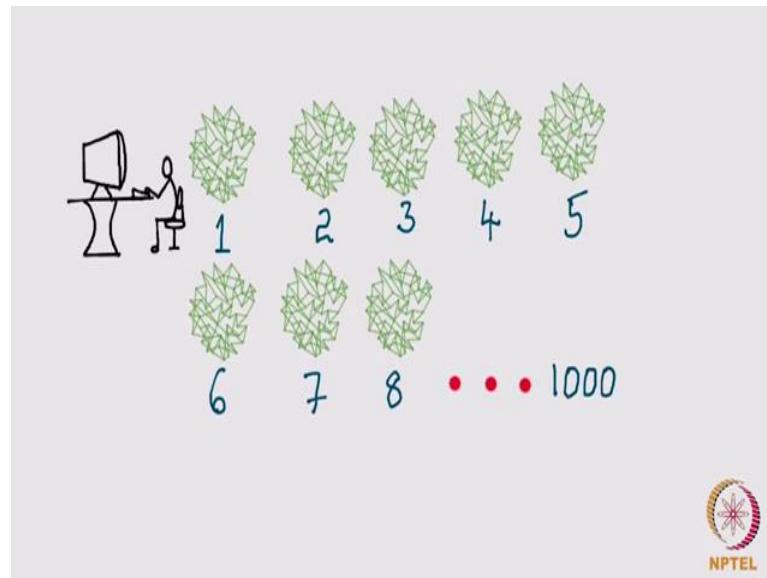
Whatever I told you just a while back I did I choose 3 people uniformly at random per person and made them friends. I did this for everyone and I saw the resultant network, it was connected by that I mean I did not see 2 components like this.

I did not see this at all, I only saw this. So, what did I do? I repeated my experiment, what do I mean by repeating the experiment?

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Anyway I take a person and make 3 friends uniformly at random for every person, it turned out to be connected for the first time, I repeated this experiment for the second time, I saw it was connected, third time, connected, fourth connected, fifth, sixth, seventh, eighth, I repeated this a 1000 times my program always said it was connected.

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Now, there are 2 possibilities possibility one is something is wrong with my programming I probably I am a bad programmer there is a error in the code bug in the code or there is something happening here. So, I am sure you people are confident with

the instructor that he knows how to write a piece of code. So, probably it is not the first one it is indeed the second one what is happening here let us recollect the question.

If you take a network of let say 50 people with each person having just a few friends the network turns out to be connected unbelievable whys is this true think for a minute.
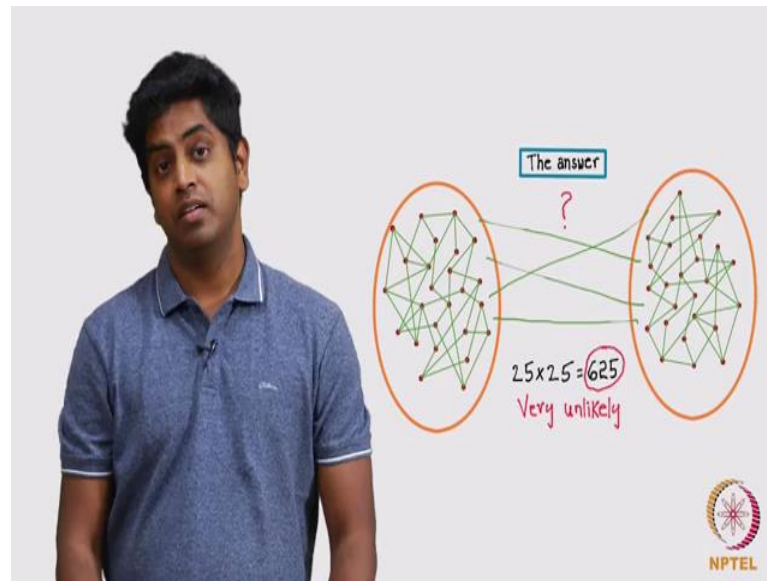
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Well I can tell you the answer, the answer is pretty simple let us get back to this 25; 25 example.

The graph can have this kind of 2 partitions a class with 50 people can have such two partitions or maybe even three partitions or four partitions and so on.

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I think that is impossible why because 2 partitions if it exists 25, 25, 20, 30, whatever two partitions do you see what are the possible friendships between these 2 partitions 25, this side each one has the possibility of making 25 different friends and he chose not to fine maybe he does not like these 25 people.

Another person from this group had 25 possible friendships to make he chose not to so on, so on and so on. So, what do you observe there were roughly 25 into 25 possible friendships here that did not happen how likely is this.
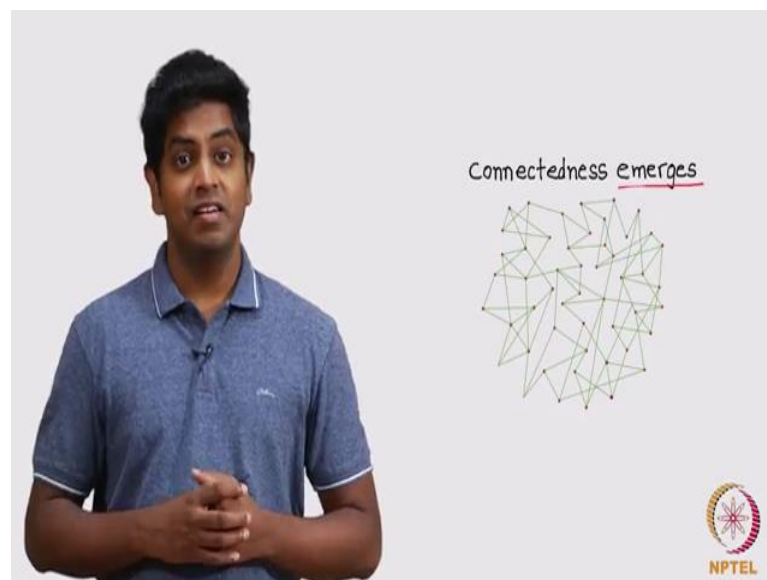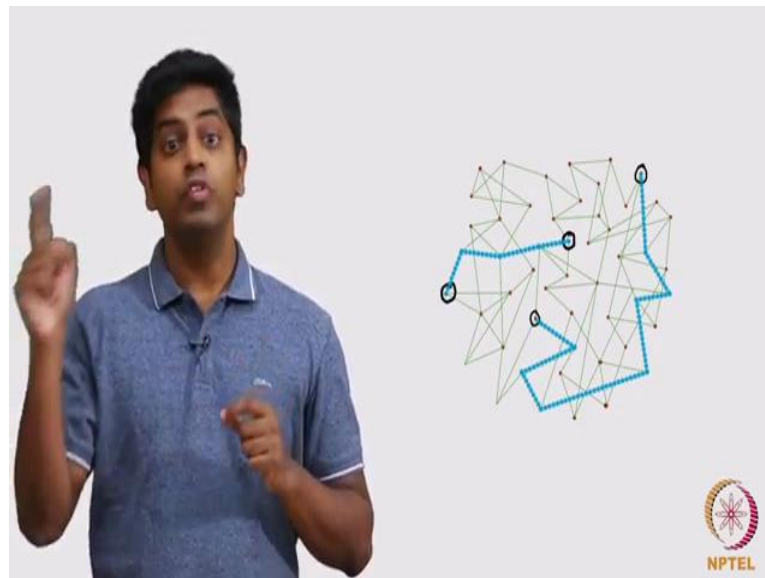
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Intuitively very unlikely by that I mean even if one person on this side had friends, let us say a friend on that side over the graph would not look like this it would look like this with one connection, it would not have 2 clusters, 2 clusters would become one cluster out of 625 possible friendships even if one friendship got executed it will not have led to this bifurcation which means we all now we have developed this intuition that bifurcation is improbable.

Although possible with a very small probability I do not worry if you do not know about probability you just need to have this intuition that there are 625 possibilities out of which even one possibility did not get executed that is a very improbable event correct.
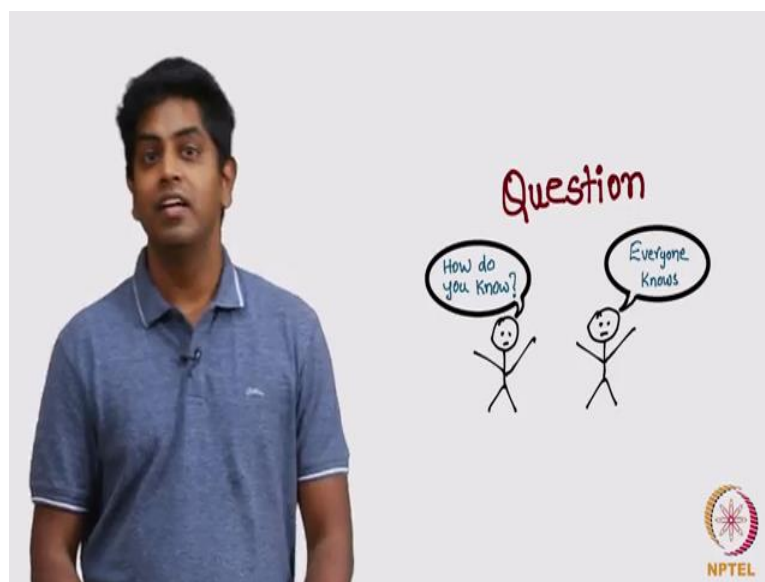
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And that is the reason why in a classroom with 50 people there emerges what is called connectedness by that we mean any 2 people have a path between them which means let us get back to the question that we asked.

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Remember the clip, 2 friends talking to each other and they were wondering how come everyone knows this a piece of juicy gossip that is because even with a fact that the class is only one week old, they are just into the college still with each person having 2 to 3 friends, the graph becomes connected and a piece of gossip. Such as this that that are

friends are discussing can spread like wild fire and if it starts from one node it can reach to all nodes simply because it is connected and not disconnected.