Social Networks
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Cascading Behavior in Networks
Lecture – 92
Impact of Communities on Diffusion

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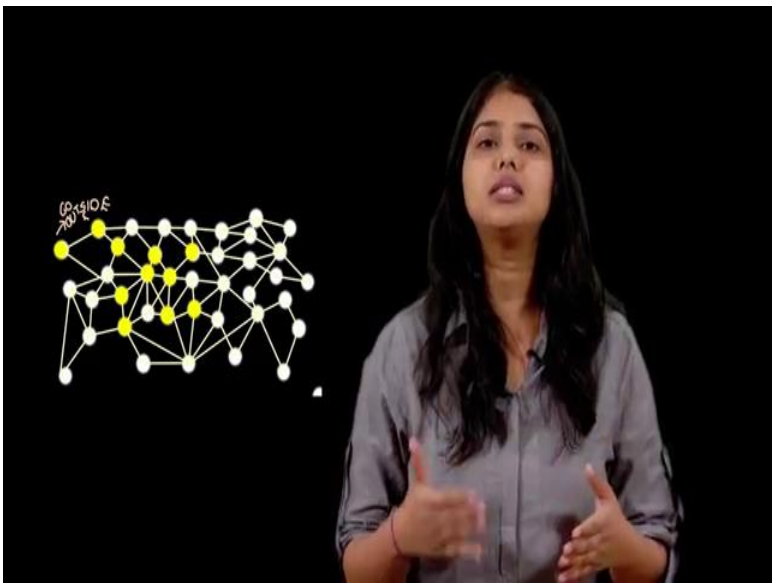

If we looked at this example where there was this class of 40 people. And initially everybody in the class has decided that they are going to sit in the library and complete that assignment which is pending on Wednesday, but then there were these 2 people who decided to do the assignment a little bit later and go outside and enjoy.

And then we looked at since the payoff with going outside and enjoying is higher, slowly, slowly people in this class they start flipping and more and more people decide to go outside and enjoy. And then we ask these 3 questions, where will be this stability? So, when this network is changing, changing in this sense the decisions of the people are changing. So, initially everybody wanted to sit in library and study, then these 2 people want to go outside, then maybe some 4 people want to go outside and so on.

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So, what happened at the end? What is the convergence whether at the end everybody has decided to go outside and enjoy or these two people has kind of looked at other people and they also decide to sit in library and study; that is at the end everybody sits in the library and study. But there was a third interesting possible outcome we have looked at and it was the class gets divided in 2 parties.

So, 1 party who wants to sit in the library and study and other party goes outside and enjoy. In which scenario can this third case happen that, the class gets split in 2 parties and 1 party sit in library and other party go outside. So, here I would like to take you back to a chapter on weak ties which was in week 3 and compare what is happening there. So, in the chapter on weak ties, we studied about communities.

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So, assume that this class has 2 really strong communities; community 1 and community 2. And this was in community 1, that these 2 people decided that they are going to go outside and enjoy. Slowly, slowly people in this community start changing their decision and slowly and slowly this entire community wants to go outside, but we still have this another community, let us say C2, where everybody is still wants to be in library and study. And then there is this weak tie between these 2 communities.

So, in this community C2 currently everybody is going to library and study. So, how will people here start changing? So, these weak tie if we look at this person here, let us say Ram. So, Ram is the one of the endpoint of weak tie and somehow if Ram gets convinced to go outside then maybe people in this community also start flipping and change their decision, but you see changing Ram's decision is difficult because, Ram is here and most of the Ram's friends they have already decided to sit in library and study and there is only this one tie where this person is going outside and enjoying.

So, you see this community has kind of trapped these phenomena of going outside inside itself and the decision does not easily gets passed to this another community. So, there are these 2 communities, 1 is going outside and enjoying and another sits in the library and study. So, till now we have looked at this example where there were 2 actions; each person can take going to library or going outside. And the same phenomena repeat itself and it is about something else. So, let us say it is about the adoption of 2 software. There

is this college, let us say where everybody is using an operating system, say Windows and then and all together new operating system very nice operating system with new features come in the market. And then a few people adopt it and then people start flipping and changing to this new software.

So, this is the diffusion phenomena which happens in almost all the cases, but do you see a problem here? The problem here when any new technology diffuses on a network the actual problem is with getting started, so in the beginning when the entire population is using windows, it is risky for somebody for 1 person in this population to adopt this new operating system and start working with it. That is since it is risky, so people they resist adopting a new technology or a new innovation. So, let me give you one example. So, the example is very fictitious.

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Let us say a scientist from NASA comes to your school and he has a big-time machine with himself and he invites anyone of you. He says that I invite one of you to come sit in my time machine and maybe go back in your life change something about it or do something or this might give you a very fruitful result, but I ask you will you be daring enough, will you take that risk of going inside and then sitting in his time machine? No, probably no, nobody will come forward.

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But now, imagine a world a highly technical world like we see in Hollywood movies Matrix every now and then there is time machine. People sit in this time machine go back change their future and happily enjoy their life. So, there it will not be very difficult for you to adopt this new innovation. So, the there is only the starting trouble for any product or any innovation to come in the market. We only need a few people to adopt it in the beginning and then rest of the diffusion is kind of easy, people look at each other and start following as we discussed and this innovation spreads in the network.

So, how do we overcome this starting trouble? So, one way of overcoming this starting trouble is to increase the payoff associated with your product. So, as payoff increases, people see that if they adopt it they are going to get a lot of advantage. So, probably initially people will be likely to adopt it more, but that might always not be possible. So, the second very nice option is to use the key people in the network.

So, instead of trying to advertise your product or your innovation to every single person in the population, you carefully choose a few key people and infect them with your idea or your innovation. What am I saying? I am saying that let us say you want a new bike that a new bike in the market probably which all of your friends are having and you want to look cool in your college and you want that new bike.

Should you really go and convince your sibling, or you should you go and convince your mother? Actually no, whom should you be convincing, you should be convincing the

head of your family, your father and once if you convince your father, it does not actually matter whether your mother or your sibling is in your favor or not they look at your father and they will adopt what he is saying.

So, similarly in a network if you want to advertise your product or your technology choose those key people. So, that is why this is the reason why we see a photograph of Shahrukh Khan on the Chavan Prash, Chavan Prash box or the photo of Amitabh Bachchan on the Navratna [FL] and stuff like that.

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So, this particular thing is popularly known as viral marketing.

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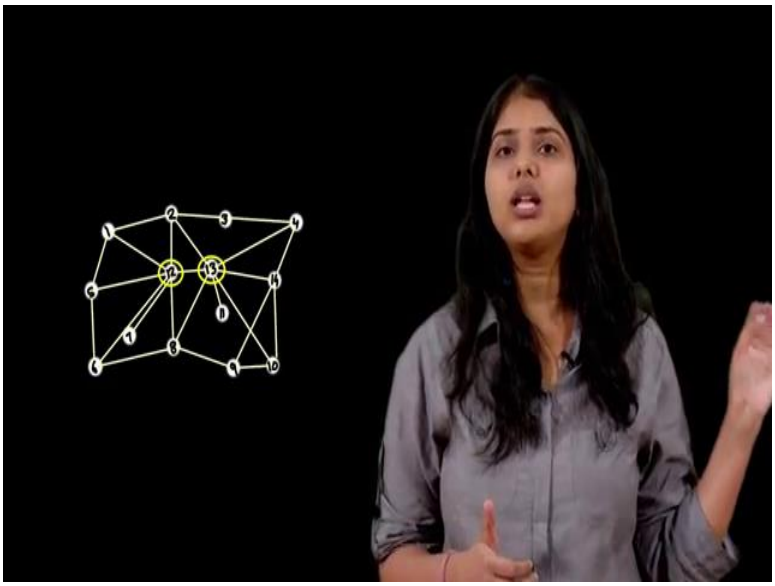

So, given a network and given the people in this network, identify this bunch of key people, if you which if you convince your product gets spread really very, very fast. So, if you see in this example, we have many nodes many nodes, but if somehow here you convince node 12 and node 13 to adopt your idea. Probably everybody will soon start adopting it because, these 2 nodes are very well connected to rest of the network. We just looked at the importance of key people in a network.

So, we looked at if we convince these key people in the network, it is beneficial to us in the way that my product or my innovation gets a way to quickly spread on this network. And, we can use this very same strategy in our previous example which we were discussing.

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So, we have looked at here were 2 communities and, in this community,, community C1 2 students they had decided that they are going to go outside and have fun. And slowly, slowly this entire community decides to go outside, but this community remains unaffected by the decision here. Because, there are not enough number of links here to transfer the decision and probably this weak tie is not working here because, it is a single link. And the person at the other side of this weak tie has more number of friends, who are studying in the library and not going outside.

So, what we can do in this case if we want the people of this second community also to go outside and have fun. So, we looked at some key people in this community and convince them to go outside and probably we will be able to attain our objective.

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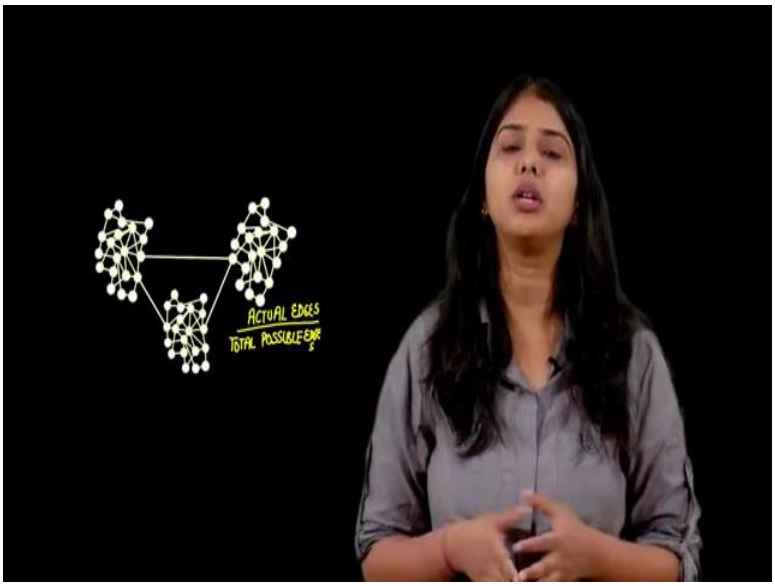

Here I would like to ask you a very interesting question. Do you think that when this big social network is divided into many, many communities and something is spreading on this network some product, some idea, some information is spreading on this network does the density of a community, so here we have a community do the density of this community has anything to do with? Whether this idea will spread on this community or not? What is the density of a community you will be wondering?

So, density of community is mainly tells you how well connected this community is. Mathematically speaking it is the ratio of the number of edges which exist in this community divided by total possible number of edges in this community.

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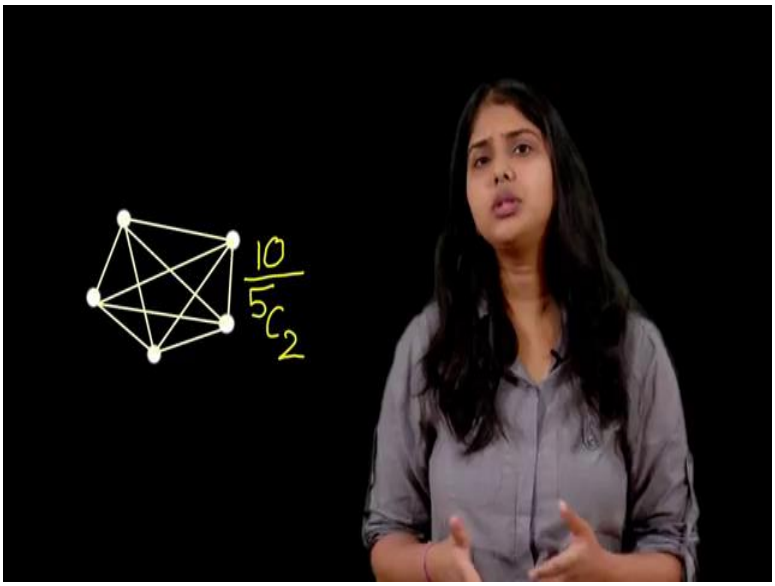

For example, let us say there is a bunch of 5 people and they are forming a community. If they have 10 links among them, so their density the density of this community will be 10 divided by 5 choose 2. So, that is a density. So, do you think the density of a community has something to do with? Whether this information will spread in this community or not? So, I will again make this question a little bit clearer.

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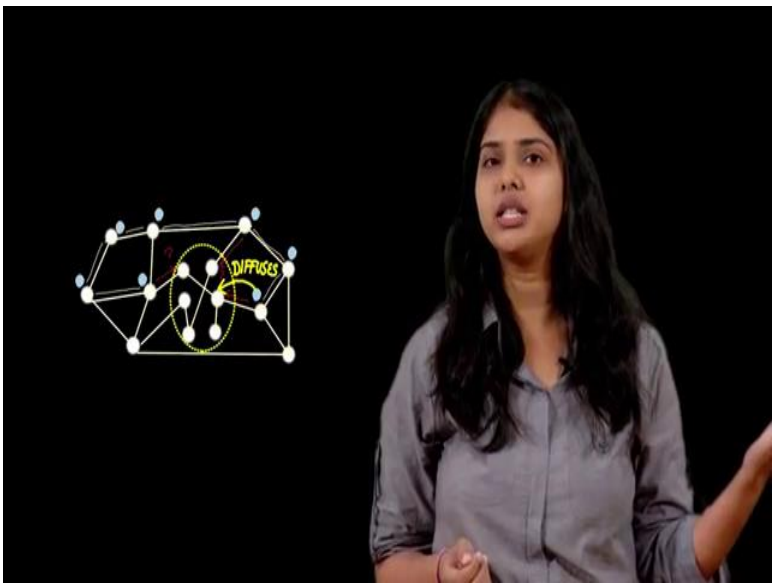

Here is this community and it is having some density and here is this entire network some information is spreading on this entire network and he is trying to enter into this

community. So, does the density of this community has something to do here? Whether this information will be able to come inside and infect these people or it has nothing to do with this?

So, to help you answer this question, I tell you I will not tell you I will revise a small story most of you would be knowing. So, there was this king who was about to die and he had a big kingdom which needs to be looked after when he dies. And he had these 3 sons who always used to fight each other, and he wanted to teach them a lesson. So, when he was trying, he was on the deathbed, he asked his sons to come with a bundle of sticks, wood sticks.

And then they come with a bundle of wood sticks and he gave one wood stick to each of them and asks them to break it. The first person tries breaking the wood stick it easily gets broken, second wood stick easily gets broken third one also, but then he gives them all the wood sticks together as a bundle and asks them to break it. But then it does not get broken. So, there is an important lesson that there is power in unity. What it has to do with our question?

So, do you see here that this community here, if the people here kind of do not like each other or not many people are friends with each other, then if somebody will say something from outside, probably they will believe. And. they probably they will adopt this idea, but if they are good friends with each other it will be very difficult to convince them, it is very intuitive as well.

So, here are these bunch of 5 people who are really, really close friends and then they have decided to sit in library and do their assignment; no matter how hard you convince them to come outside with you and enjoy they probably will not come, but if their friendship was not that strong 1 or 2 of them would come outside with you. So, do you see here the role of the density of a community in diffusion? Higher the density the difficult it is for an idea to be injected in this community.