Social Networks
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Cascading Behaviour in Networks
Lecture – 90
Modeling Diffusion

So, how do we model this process of diffusion? So, let us design a simple framework for this, probably a kind of game. What kind of game? Let me again give you a scenario.

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This is a sunny Sunday and you wake up early in the morning and you want to decide how you are going to spend the rest of your day. And, you have two options either you go to the library and finish that assignment whose deadline is coming this Wednesday, or you go outside have fun, watch movies, do shopping and enjoy your day.

Obviously we would always want to do the second; obviously, we would always want to do the second sitting in library and reading a book is boring while going out and having fun is so interesting; that might be your option you go out and have fun. But, now let me broaden this picture and bring your friends in this picture. So, now you have many friends; let us say you have some 20 friends. Let me change your mind, you wake up this Sunday and you decide that you are going outside, and you are going to have fun.

But then comes into picture your 20 friends and out of these 20 friends 18 of your friends tell you that they are going to library and finishing that assignment which is coming up this Wednesday and they invite you. And, then here are your 2 friends which are asking you to come with them and go enjoy.

Now, what will you do you? You might think for a moment, you might now want to go to library and finish that assignment. So, how do we weigh our options? How do you weigh your options which choice to make what to do? So, the first factor which we have seen is how much that work interests you. So, in this case let us call it a payoff.

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There is a payoff which working in the library gives you and there is a payoff which going outside and having fun gives you. And, for you, the payoff which you get in the library is a little bit lesser, then the payoff which you get when you go outside and have fun first thing. Second thing as we saw the number of friends is important, what your friends are doing is important. So, how do we capture this notion of friends?

So, let us consider one friend for simplicity, let us say just one friend in the picture. So, you have this friend Zara and both of you have to make a decision, what you both are going to do today. So, one option both Zara and you go to library and study and both of you get some payoff which is associated with studying in the library. Another option both you and Zara go outside and have fun you get another pay off which is actually high because, you enjoy more there.

Remaining two options Zara goes to library and you go outside; probably you do not get any payoff because you do not go along with each other. And, second option the reverse way you sit in library Zara goes and have fun outside, again results in no payoff. So, this tie these two people they get the payoff when they do the same thing and the payoff is equal to the payoff associated with that particular thing. This was about one friend.

So, if there were only if you had only this one friend Zara. So, the ideal situation ideal decision you both should have taken was to go out and have fun, but the situation is not that simple. You have lot of other friends in picture you do not just have Zara.

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So, let us say you have some 20 friends here and out of these 20 friends 18 want to go and study in library and 2 wants to go and have fun outside. Now, how do you weigh your option? So, it is very simple. So, if you look at every tie here you are here and your friend is here and if both of you go to library, both of you get some payoff; let us say A associated with library.

Similarly, here are you and here is the another friend both of you go to the library and you both get a payoff of A and so on for all the friends. And, similarly if you look at the friends this side who are going to go and have fun outside. This is again if you go and have fun you get some payoff here, both of you get a payoff of let us say B which is associated with going outside and enjoying and similarly in this case.
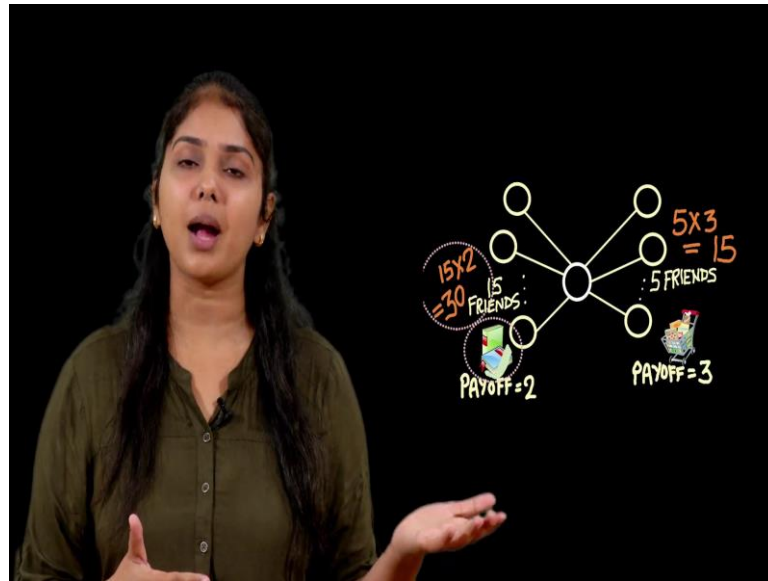
Now, what you will do is you will calculate the total payoff if you go to library and study what is the total payoff you get. And, if you go outside and have fun what is the total payoff you get. So, for the time being let us assume that the payoff associated with library is 2 and the payoff associated with going outside is 3. And, let us say 15 of your friends are ready to sit with you in the library and study while, 5 of your friends want to go outside and have fun.

So, how much payoff do you get this side is 15 into 2, 30 and how much payoff do you get the other side when you go outside and have fun is 3 into 5, 15. So, what do you do? So, you see that you are getting a better payoff when you are sitting in the library and studying with your friends. So, you take that particular path.
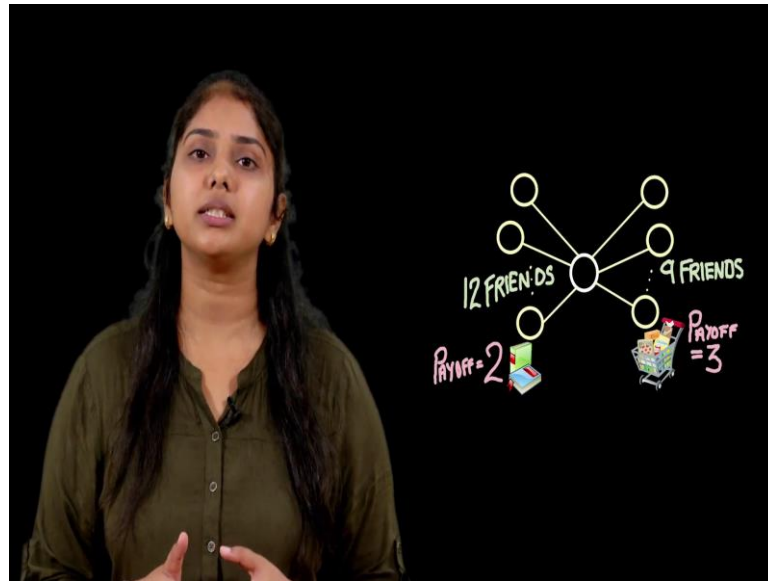
Let me change these parameters and ask you this, ask you a puzzle, ask you an exercise question and the question is: again assume that the payoff associated with sitting in the library and studying is 2 while, the payoff for going outside and enjoying is 3. 12 of your friends want to sit in library and study with you while, 9 of your friends want to go outside and enjoy with you. So, which action do you take in this place?