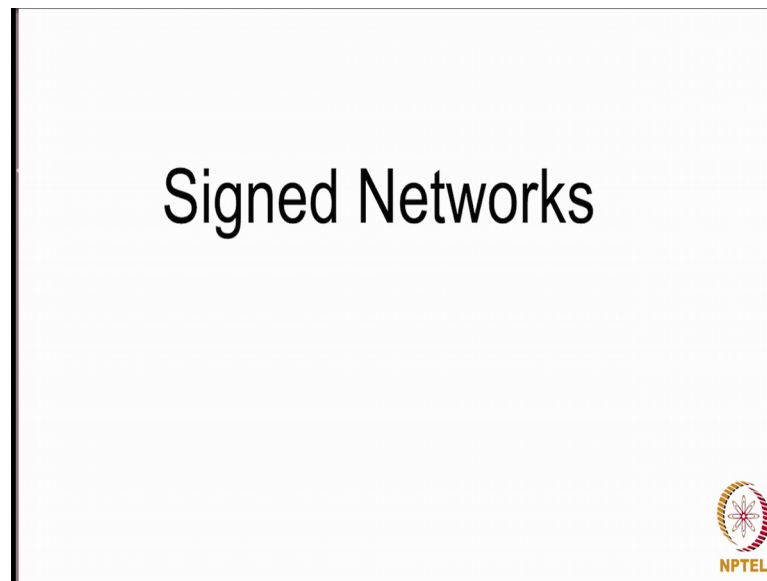**Social Networks**
Prof. S. R. S. Iyengar
Department of Computer Science
Indian Institute of Technology, Ropar

Lecture – 68
Homophily (Continued) & Positive and Negative Relationships
**Introduction to Positive and Negative Edges**

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Hi everyone, in this video sequence we are going to implement signed networks where the edges have either positive or negative weights attached to them. And if the nodes represent individuals then the positive way the positive edges indicate friendships amongst these individuals and the negative edges indicate animosity amongst these individuals. In such networks there exist some sort of triangular structures which when analysed lead to interesting observations, in this video sequence we are going to analyse those structures which are basically different combinations of positive and negative weights across the edges of the triangles present in the network.

So, I assume you have been already introduced to these networks in the previous videos, I will just be briefly discussing the possible structures that are prevalent in the networks and then we will go ahead to implementation.
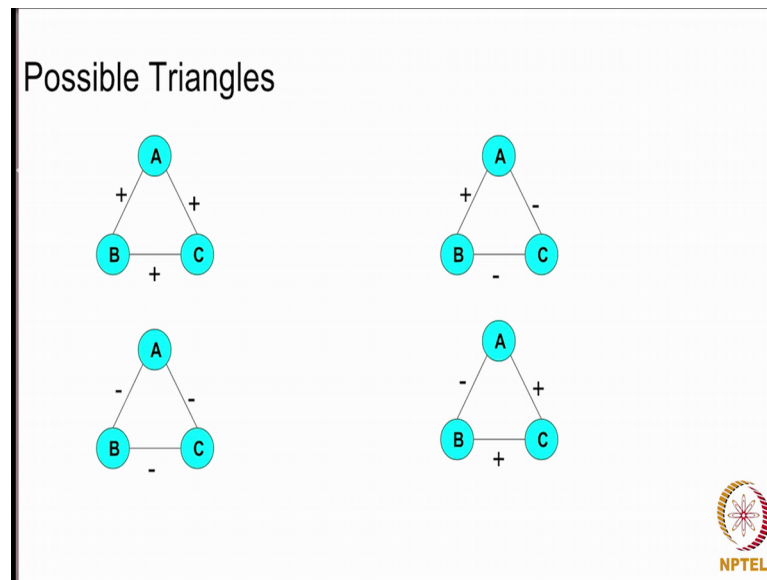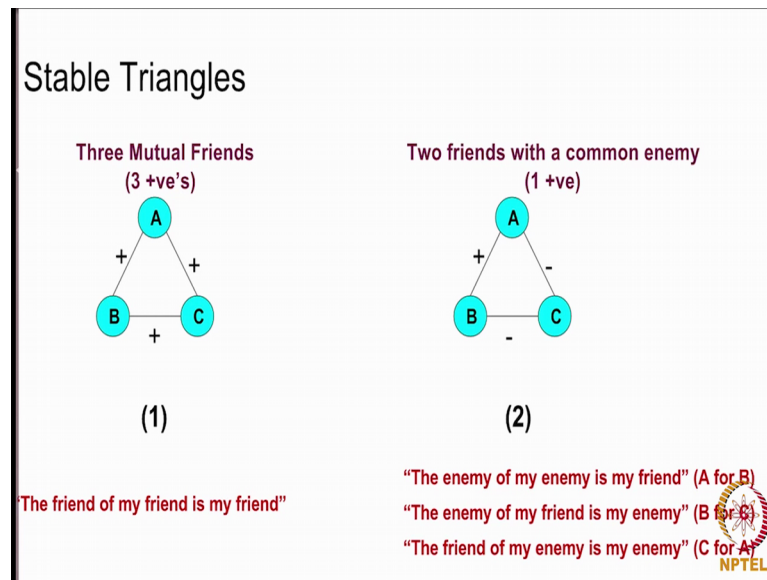
These are the possible combinations of positive and a negative ways across the triangles present in the networks. Now some of these triangles are called stable and some of these are called unstable. Now what do we mean by unstable triangles or unstable combinations? These are the combinations that do not stay in the network for a long time simply because they are inconsistent with respect to the relationships among amongst the nodes and they tend to move towards a stable state.

Now, we are going to see which of these are stable combinations or stable triangles and which are unstable triangles. Please note that they could be different permutations of these signs across the triangles you anything to note here is that there are three positive signs here and there is one positive sign here there are 2 positive signs here and there is no positive sign here.

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So, this is these are the different combinations of course, the different permutations can exist. So, let us look at these stable triangles first. So, a triangle having all positive edges is one of the stable triangles. So, there are three mutual friends they cannot be a better situation done this, so, every bodies every body's friend.

This kind of structures seems to follow this popular social belief that the friend of my friend is my friend the next social sorry next stable triangle is this one where you have one positive edge and 2 negative edges. So, this basically shows that there are 2 friends who have who have one common enemy, right. So, the triangle will have one positive edge, but it indicates that 2 friends have one common enemy this is also one of this stable triangles this triangle seems to follow a number of interesting social believes. For example, if you look at node A with respect to be the node a seems to follow the enemy of my enemy is my friend when it comes to node B with respect to C its seems to follow this belief that the enemy of my friend is my enemy as you can see here and if when it comes to node C with respect to A it seems to follow this belief that the friend of my enemy is enemy.

So, it is pretty interesting to see that all the nodes seem to be satisfied with the kinds of relationships they have they have with their neighbours in the triangle. So, that is how it another stable triangle. So, you can remember that triangle which has either one positive edge or three positive edges are stable triangles let us now check the unstable triangles.

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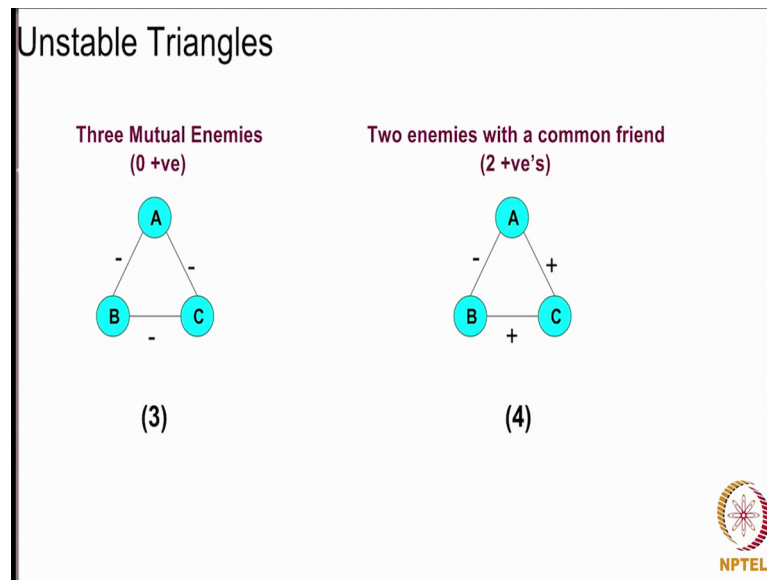
So, the first one as you can see is the triangle which has all negative edges. So, this is one of the unstable triangles because all the nodes are enemies of each other and this; this kind of situation cannot stay for a long time given the belief that enemy of my enemy is my friend. So, this seems to actually play a role here which leads to some of the nodes befriending other nodes and hence changing the configuration and hence moving towards stable state.

So, this is the one where there is 0 positive edge let us look at the second unstable triangle now here as you can see there are 2 positive edges and there is one negative edge. So, this basically means that there are 2 enemies which is A and B here there are 2 enemies and they have one common friend. So, this is again another unstable situation which does not tend to stay for a long time because 2 enemies would not like to have one common friend. So, this again leads to another state which is table hence changing changes the configuration of the network. So, you can remember that the; and that a triangle which has either 0 positive edge or 2 positive edges is an unstable triangle right. So, you can remember it that way now what we are going to do is we are going to look at each of these unstable triangles and we are going to see which stable states can these triangles move towards.
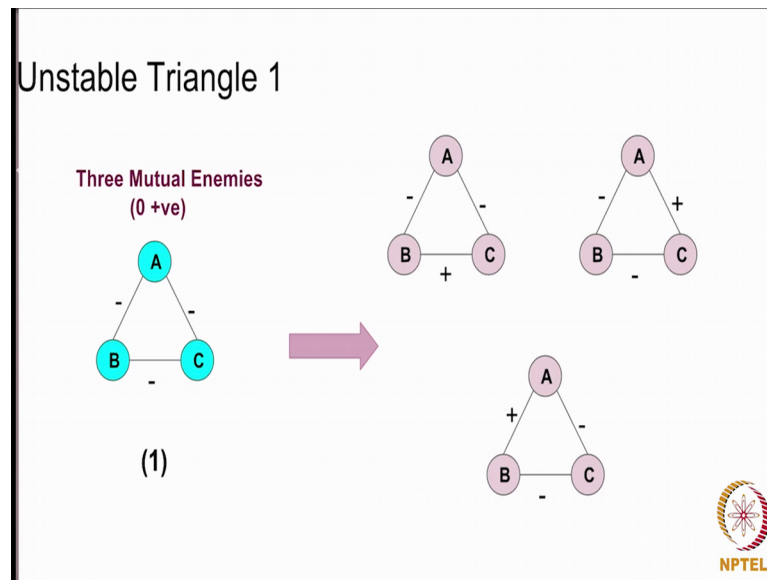
So, we are taking the first unstable triangle here where there are three mutual enemies as I said the beliefs that enemy of my enemy's enemy is my friend seems to play a role here in the network. So, when there are three negative edges which means that some of these nodes ten to make a make friends make friendship friendships with each other. So, it may happen that B and C become friends of each other because there enemy there because they will then have A common enemy which is A or it may happened that these three negative signs leads to a and C becoming positive because they will have B as a common enemy or it may happen that A to B becomes positive because they will have a common enemy C.

So, whenever we have a triangle which has all negative edges that are 0 positive edges it can move to any one of these there stable states where there is one positive edge each. So, let us talk about the next unstable triangle which has one negative edge and 2 positive edges.

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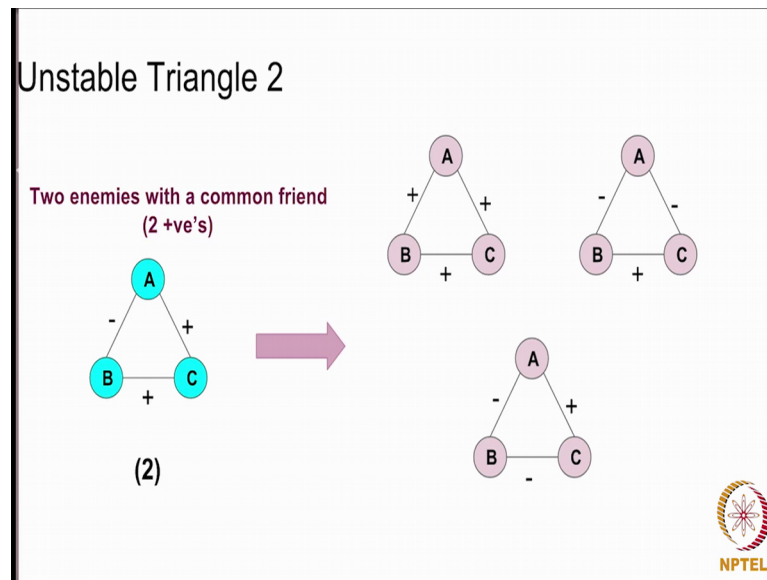
So, here there are 2 enemies who have one common friend which is see now there are they can we they can we three things which can happen in this scenario first thing is since C is a common friend to A and B C might help A and B also to become a friend right. So, A and B, A to B, h can be come positive like this. So, this is one thing that can happen second thing that can happened here is A has a friend C who is friends with an enemy of A. So, that may lead to animosity between A and C. So, this is what can happen in this case third thing that can happen is since B is friends with C who is friends with an enemy of B which is A.

So, that can lead to animosity between B and C as well. So, it can lead to this kind of situation. So, as you can see on the right hand side the three configurations one of them has three positive edges which is a; which is a stable one that that you have already know and 2 of the configurations have one positive edge which is again a stable relation. So, all these three are stable relationships. So, the relationship on the on the left hand side leads to these three configurations in the implementation we are going to start with a few configurations and we will see how they move towards stable states in the next video we are going to see the steps that you are going to follow for the implementation.