Social Networks
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Lecture – 30
Strong and Weak Relationships
Structure of weak ties, bridges, and local bridges

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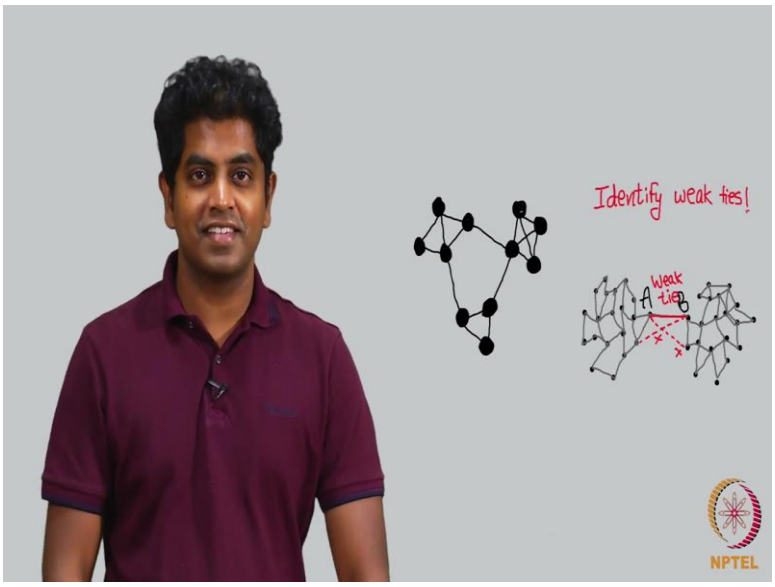

Now, assume I give you a graph g, a graph is basically a bunch of vertices and some edges, I show you the such a graph here and I ask you; can you tell me what are the weak ties here? How can you tell me? How do you know what is the intensity of friendship here? You obviously, cannot tell me, or can you? Look at the underline graph; the graph that is shown here, remember this graph is we discussed about this graph, you do not have to remember, I will help you recollect it. There are 25 nodes this side and 25 nodes that side and is only one friendship from someone this side to someone that side.

First, there are 625 possible friendships between these 2 clusters because they are 25 this side, 25 that side. Total possible is 625 out of which I am saying this only one friendship happening here, alright, fine, let us assume the graph is like this do you sense that this particular edge here this red colored edge is actually a weak tie is it not that obvious because this person is in some other island all together and in this island this person

knows a lot of people that this person does not know mainly I am saying B knows a whole lot of people that a does not know and A and B are friends with each other.

Now, A and B by definition would you think it should be a weak tie now we can tell me how do you know it is a weak tie maybe they are good friends now that is slightly not possible probably not possible for a simple reason that if they were good friends let say A and B were good friends then B has a lot of friends there and a you should also be friends with them because of triadic closure correct given the triadic closure is not happening itself is an indication of the fact that A and B are weak they form of weak tie their friendship is not in this now remember what I said a while back.

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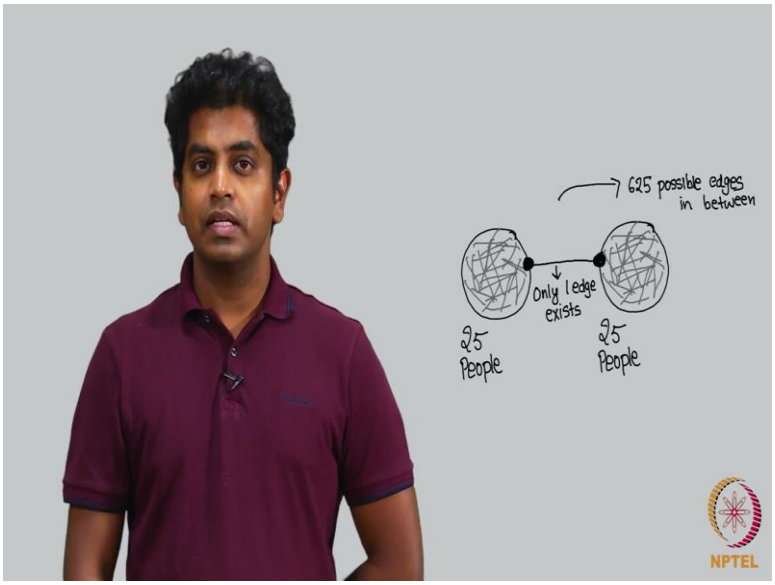

I said there are 625 possible friendships as well one friendship happening this is rare such a structure may not even exist in real life.

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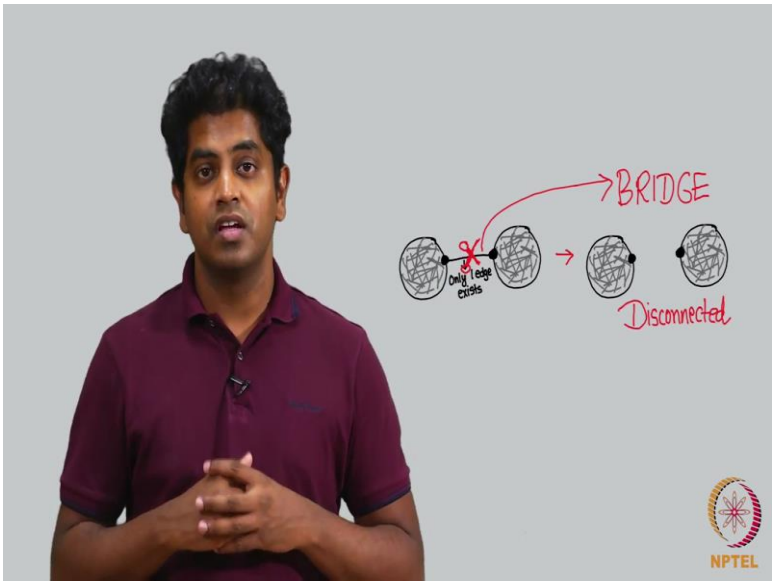

So, this such a edge is called a bridge the definition of a bridge is basically this you remove that edge the graph becomes disconnected that is a definition now this does not definition does not seem to be of any help, because we may not see such structures if we see such structures then we know it is a weak tie we may not see such structures.

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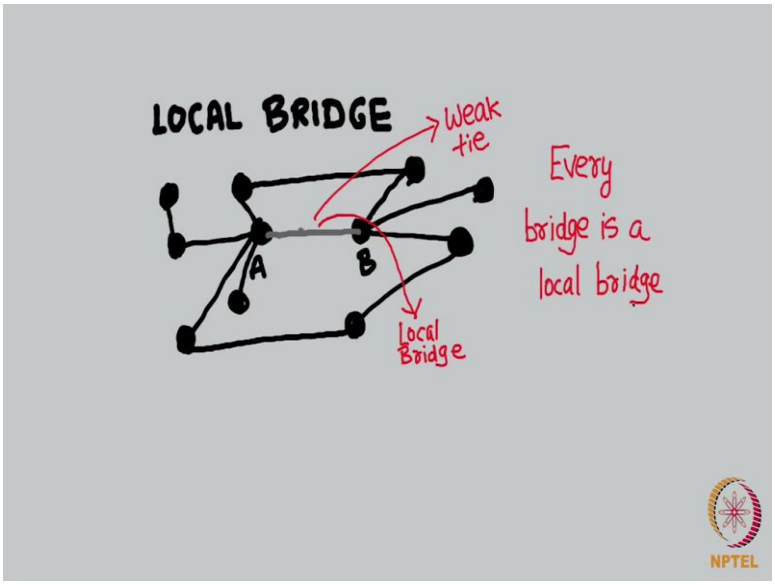

So, I am going to relax this definition slightly and I am going to define what is called a weak bridge it is called the local bridge, but it is intuitive a mind to call it a weak bridge.

So, what is a local bridge? Local bridge is bread an edge without any triad on the either sides of the vertices.

A and B is called a local bridge if there is no triad on that not even a single triad now do you see every bridge is a local bridge by definition because a bridge means what A and B do not have any common friends nor is there a path from A to B apart from the A B edge, correct. So, A B is a local bridge if there is no triad on it as you can see from the figure here in this example A B is not a bridge, but is a local bridge because there is no triad on it correct now such local bridges are also can also be considered as a weak tie why think about it here again a is friends with B A B is a local bridge none of B's friends a knows why if a well to know A B's friend that would sort of result in a triad on A and B you see.

So, none of B's friends A knows none of A's friend B knows sounds like a weak tie you see. So, Granovetter actually observed that these local bridges are what forms is what one means by a weak tie it forms a weak tie and a weak tie is mostly is a local bridge they both do not have a common friend. So, this is the definition of local bridge and this is where Granovetter argued that such weak ties is what resulted in a being friends with someone who connects him to a different island all together from where very good opportunity can knock his door through B, I am going to explain a very nice way in which we can analyze the local bridges that we just now discussed.

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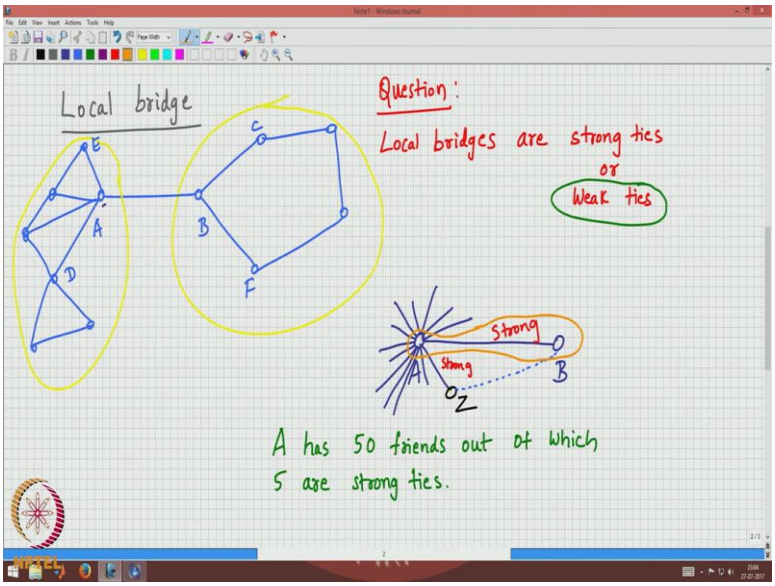

So, what is the local bridge a local bridge between two people is that edge that relationship where let say A and B, A and B are friends you call this friendship as local bridge if there are no common friends right for example, as you can see A and B are friends and A is the left side, B is in the right side and there are lot of friendships for B lot of friendships for A, but A and B do not have a common friend, A and E; they have common friends A and D have common friends, but A and B do not have common friends this is called a local bridge here goes my question let me write that down the question if you are going to ask an answer right now is the following.

What can one say about this local bridges are they strong ties or weak ties we saw strong ties we saw weak ties we discussed about the strength of weak ties right we saw local bridges now I am asking this question are local bridges are there strong ties or weak ties by this I mean A and B are friends and this A and B do they enjoy very close friendship or is it friendship very weak something in me tells me that it is indeed weak tie why let us try looking at it mathematically. Let us discuss logically why one can actually show whether it say a weak tie what I am trying to say let say as a real world analogy or I am saying is if I were it to have of friend in let say Indonesia will have be very good friends with this person. Firstly, it is the proximity.

We may not meet each other very regularly, but that aside if you where it have a friends with some on in Indonesia will that friendship be very strong looks like no is the answer there could be exceptions, but mostly no when you have friendship across 2 different clusters the way have showed here as you can see this is a cluster this is another cluster right between these 2 clusters is there is a friendship that is mostly a weak friendship how why what makes me say this let us look at it mathematically. Now, assume this a let me just write a here once again A and B and there is friendship here a has a lot of friends let say forget this case I am looking at another situation you has a lot of friends and you see some of A's friends let say A has; assume A has a has 50 friends; out of which 5 are strong friendships strong ties.

What do I mean by this a we all have friendships some of them are close some of them are not so close, A has 50 friends and let say 5 of them are very close.

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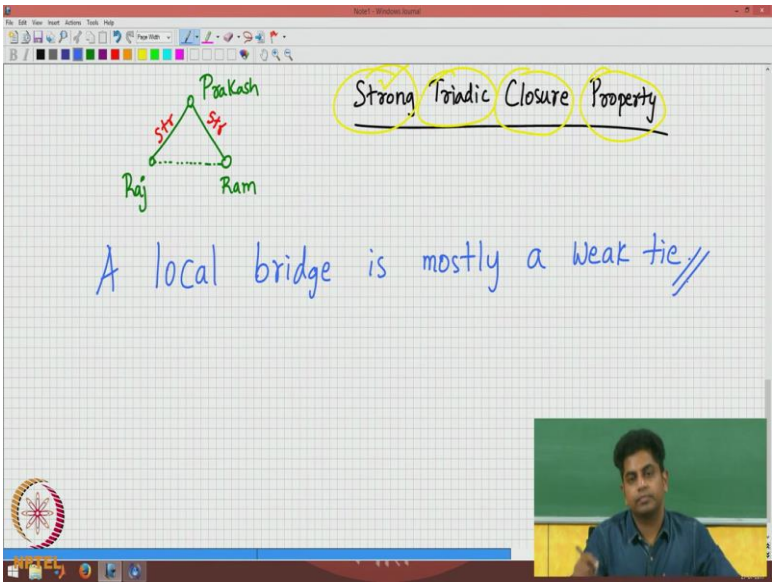

Now, let us look at this in detail if you see what I just say I said if a has 2 very close friendships really close friendships assume A; let me. In fact, give them some name for clarity sake assume there is a person called Prakash, here and then raj and then Ram, Prakash is friends with Raj, Prakash is friends with Ram and they very good friends, their tie is really strong what can you say about the friendship between Raj and Ram? What can you say about it? Do you think that is also strong? That we cannot say, but for sure they should be friendship between Raj and Ram.

Why imagine you are really close to 2 people very close in the past ten years you are close to these 2 people is there a possibility that these 2 people do not know each other every possibility that you would have made these 2 people meet each other I am not saying any 2 friends of mine now each other I am only saying if there are 2 really best friends of mine from a long time strong friendships they both will at least know each other they may not be a strong tie not necessarily they could be not necessarily, but definitely there is a tie between these 2 people, right, this property which is very straight forward intuitively goes by the name strong it is not of self explanatory strong triadic closure property.

What do you mean by this? We just mean when this a triad and they are strong, they are closed that is what I mean here by a strong that is what I mean by strong triadic strong it is a triad and the friendships as strong and that will lead to the triad getting closed always

it is a property that is very easy for us to sort of visualize. Now, when this happens what do you mean by this happens is this always happens you see, but all I am saying is if we assume that this property is through in the network whenever you have 2 strong friendships there is a friendship between these 2 people. So, Raj and Ram become friends if Prakash is strongly in friendship with Raj and Ram.

Let us get back to your previous slide as you can see, A has 50 friends out of which 5 were strong ties then let us say a and this person let say this person Z A and Z are very close friends my claim was local bridges are weak ties assume A and B was indeed strong tie and A is friends with 5 people with strong ties. So, A and Z is let us say strong see what happens A is friends with B, A is friends with Z both are strong friendships. So, what does the triadic closure property is say let us go and then see the triadic closure property says that wherever you have 2 close friends they are basically friends with each other. So, what happens here you observe that Z and B will be friends because a triadic closure property does resulting in A and B does resulting in A and B not being a local bridge why what is a definition of a local bridge there are no common friends, but here. So, see or seeing a common friend between A and B which is Z, correct.

So, what have we just infer lets paraphrase A and B if you assume were local bridge was a local bridge then a naturally has a lot of friends and some of them are strong ties assume a has at least one strong tie namely Z and A and B is a local bridge my claim is this local bridge cannot be a strong tie if it becomes a string tie then there should be link between Z and B by the strong triad a closure property which is self explanatory and intuitive correct which while lets the fact that A B is a local bridge logically speaking local bridge is mostly weak tie. So, let me write that down. So, our conclusion is that local bridge is always rather mostly weak tie.