**Social Networks**
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**Lecture – 29**
**Strong and Weak Relationships**
**Triads, clustering coefficient and**
**Neighborhood overlap**

Now we will see some important concepts, I will define them, tell you some results about it and we will slowly go ahead and understand this notion of the strength of weak ties very clearly. Firstly, I would like to define this as structure as you can see.

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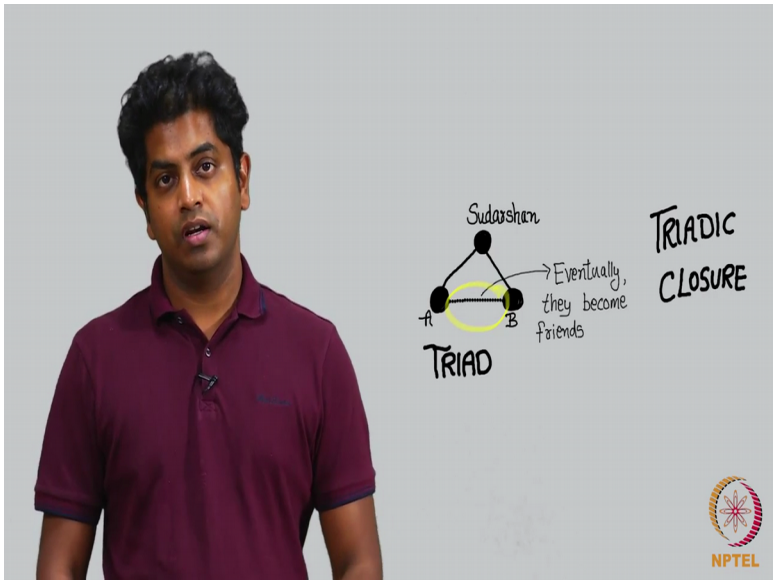


This is called a triad; a triad is simply speaking Sudarshan knows 2 people A and B and this is called a triad and A and B; they do not know each other, what will happen? You have 2 good friends and they do not know each other, eventually you can expect that they become friends with each other, A and B will know each other. This structure is called at triad and the friendship that happens in this triad making it a triangle is called; this phenomena is called the triadic closure.

So, you see there is a triad and it closes and that is called triadic closure let this sink into your mind, this is one very important topic in social networks which will keep re visiting us in the forth coming chapters.

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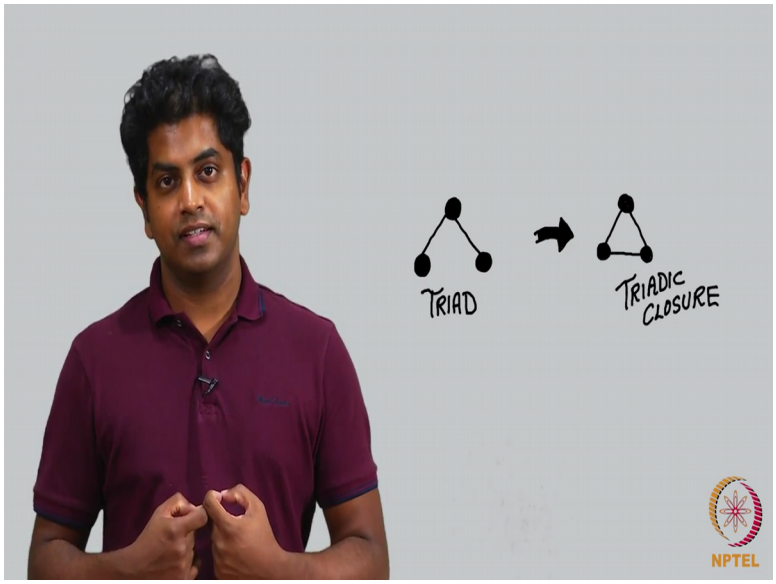


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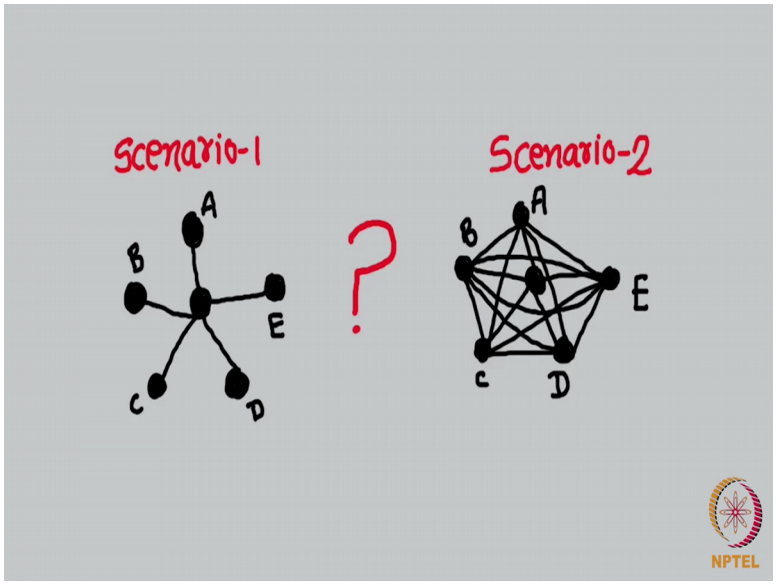


Triad becomes a triangle and that concept is called the triadic closure assume 2 scenario; scenario 1 is I have 5 friends; A, B, C, D and E and none of them know each other; that is scenario 1, scenario 2 I have this 5 friends; A, B, C, D and E and all of them know each other, now scenario 1; I have 5 friends, scenario 2; I have 5 friends, but what kind of which scenario would you favor scenario one or scenario 2.

Obviously scenario 2, you want your friends to know each other. So, that if there is any problem to you all of them can team up and then come and help you, correct, there are

situations where scenario 1 is also very helpful I am reminded of a Bollywood movie; I am unable to recollect the name. So, it is Shah Rukh's movie and he has 3 girlfriends and he ensures that they do not know each other because if they know each other they will come and destroy him given that he is cheating on them by being in a relationship with 3 people simultaneously. So, here is a scenario where the friends not knowing girlfriends not knowing about each other might help any way, jokes apart.

So, it is important that you maintain relationship with your friends in such a way that your friendship circle your friends they know each other let me try mathematically quantifying what I just now said here is me and I have 5 friends A, B, C, D, E and they all are friends with each other this was scenario 2, scenario 1 is none of them are friends with each other they can be something in between these 2 things what do I mean by this.

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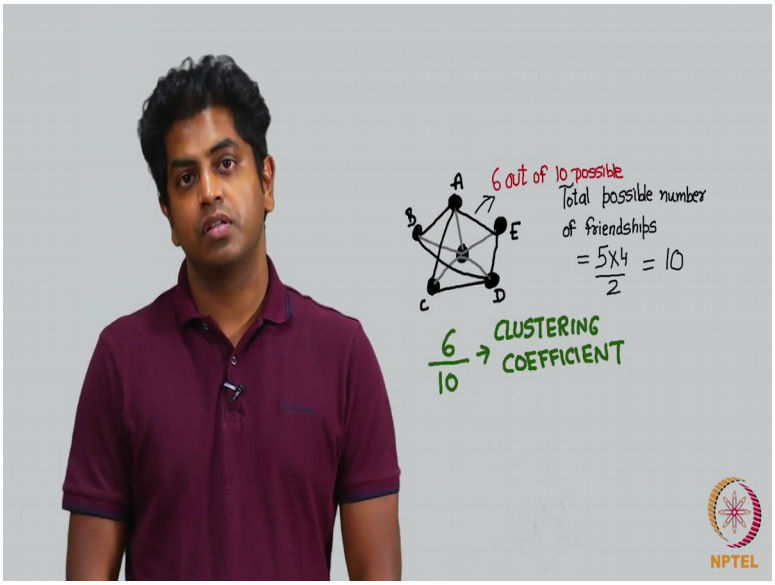


Imagine a scenario where I am friends with 5 people and there are some friendships between them how many possible friendships can happen between 5 people; 5 into 4 by 2 you see that that is very simple, right for 5 into 4 by 2 gives you 10, there are 10 possible friendships.

How many friendships are there in this example there are 6 friendships. So, I would say the strength of my friends these 5 friends depends on the friendships between them. So, this fraction 6 by 10 denotes the strength of my friendship with this 5 people this goes by the name clustering coefficient we will be calling this the clustering coefficient, from

now onwards what does clustering coefficient mean it means in the numerator you put the total number of friendships between your friends and the denominator you put the total possible friendships this fraction if it is one it means all your friends know each other if it is 0 then none of them know each other.

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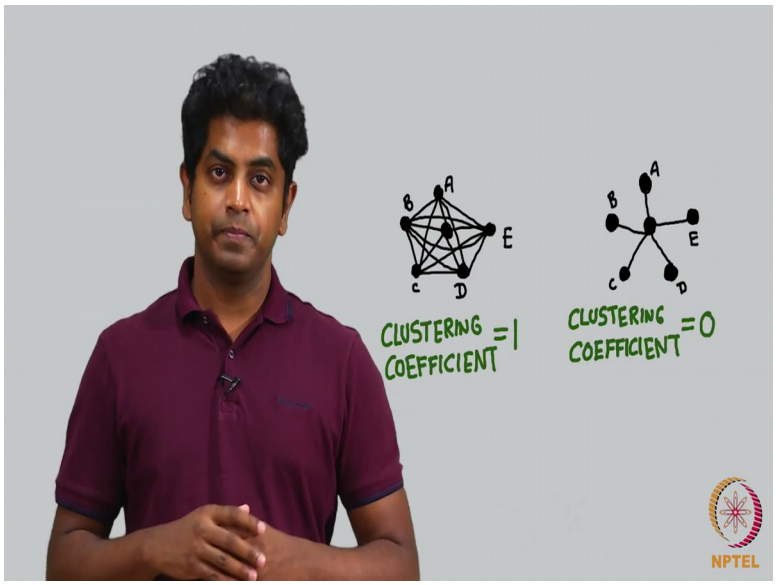


Anything in between tells; how strong are the friendships between your friends? So, clustering coefficient is a very important concept in social networks and I just now defined it what is the use of this.

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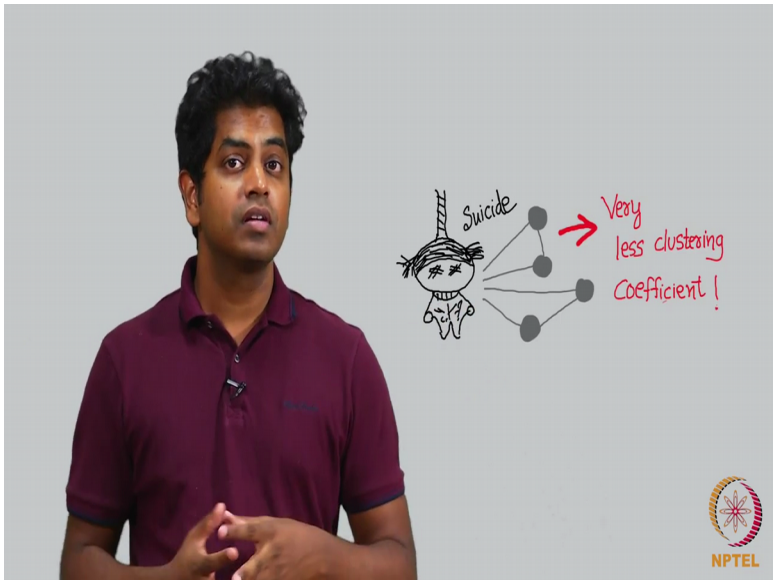

A very eye opening research says in most of the cases where few sides was committed they observed that these people had very less clustering coefficient I mean is it surprising I do not think it is very surprising people who are into depression are the ones not with many friends not that they do not have many friends it is that they have friends, but this friends are from different circles. So, they do not get to meet a bunch of people at the same time.

So, I go and meet this one person and come back another person and then come back another person and then come back I do not go and meet 5 of my friends because 5 of my friends do not know each other. So, clustering coefficient it is observed is less in people who have attempted suicide. So, this way I think clustering coefficient can be used to say many things about a person, but let us just use this definition in the forthcoming units I just introduce this as a concept that is close to triadic closure I explain what is triadic closure and I explained quick implication of what it is triadic closure which is clustering coefficient.

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So, let me define what is a neighborhood overlap it sounds slightly complicated let me use the right analogy to ensure that the definition is well understood by all of us.

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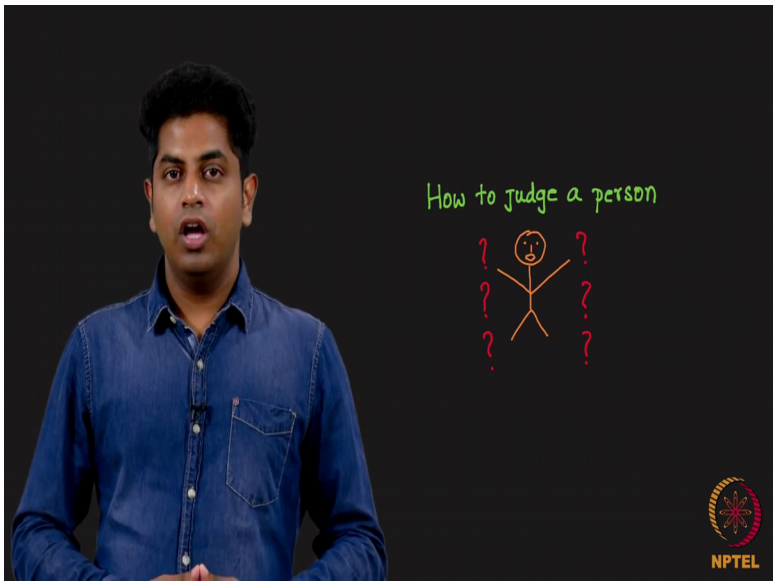


If I were to judge a person philosophically speaking is it based on how much he earns, let me give a definition of judging a person look at a look at B if A earns more than B.

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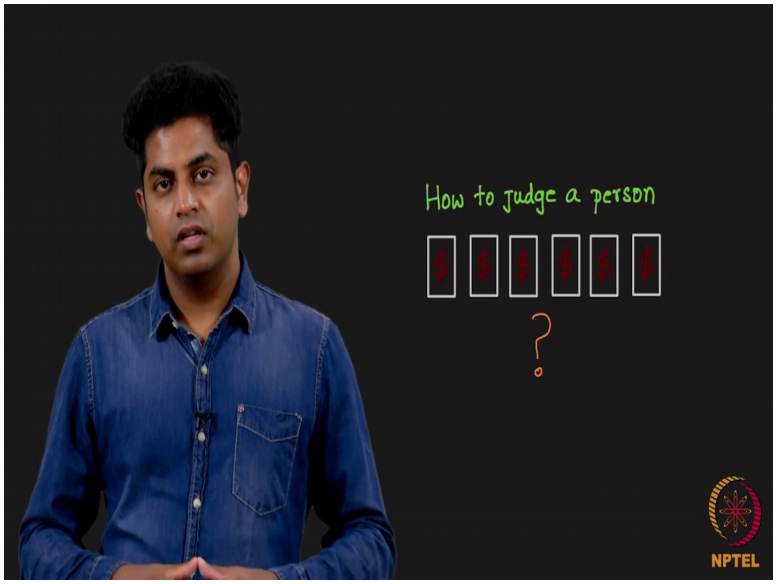

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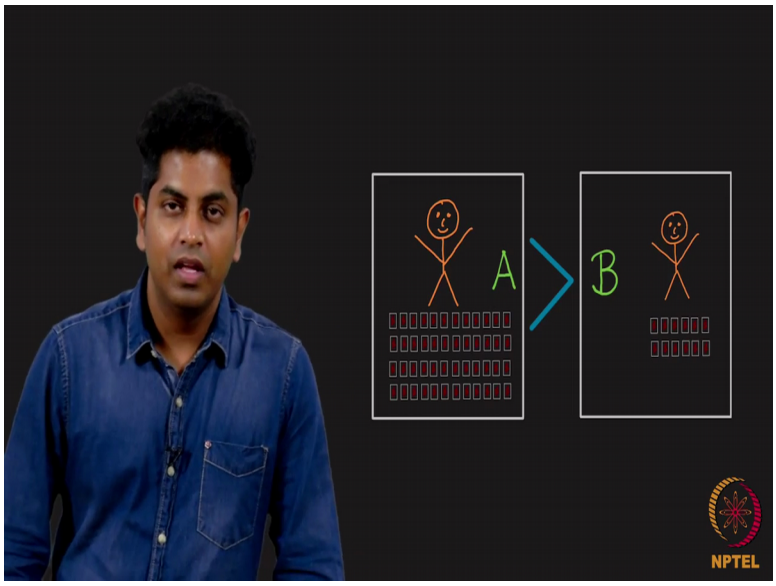


Then you say A is richer than B, let me try redefining this look at this definition that one can get I will not judge a person's richness by looking at his bank balance.

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I will instead look at the following I will see how much he earns put that in the denominator and in the numerator I will put how exactly he spends the money where exactly he spends the money.

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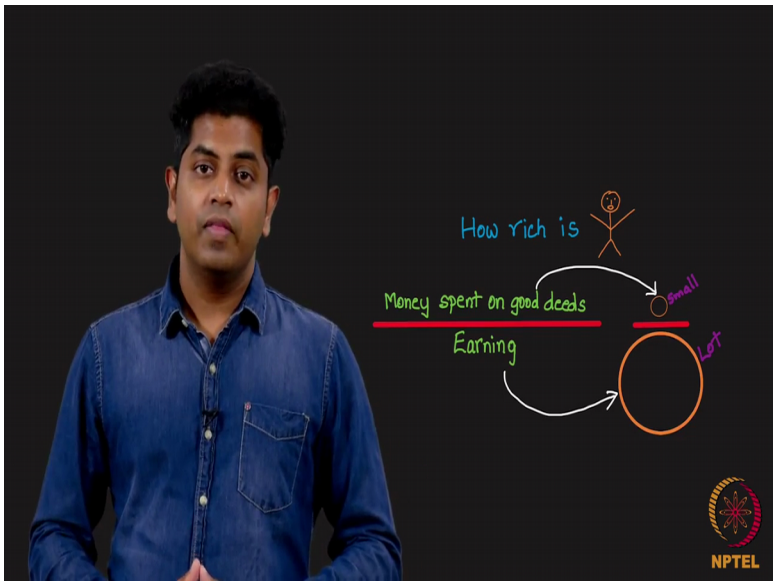


If he spending a good chunk of his money for let say a noble cause then I will call that person the richest. Now, I am re defining what is rich by rich I mean the proportion of how well the money is spent divided by how much you earn why do I use this fraction that is because you earn a lot you spend a small chunk worthy way I do not call you rich whatever you earn you spend a good chunk of it forever the cause then I call you rich.

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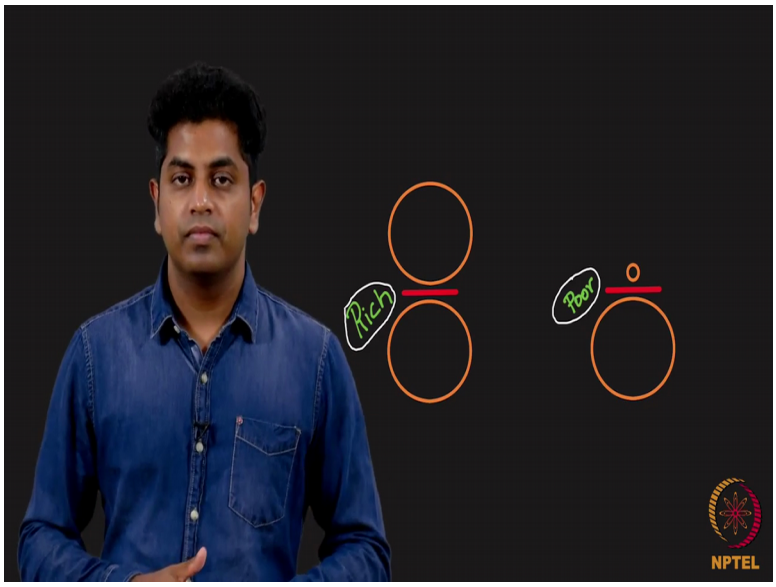


If this fraction is close to one you are very rich if this fraction is close to 0 you are not very rich. So, I am redefining richness with the help of this fraction.

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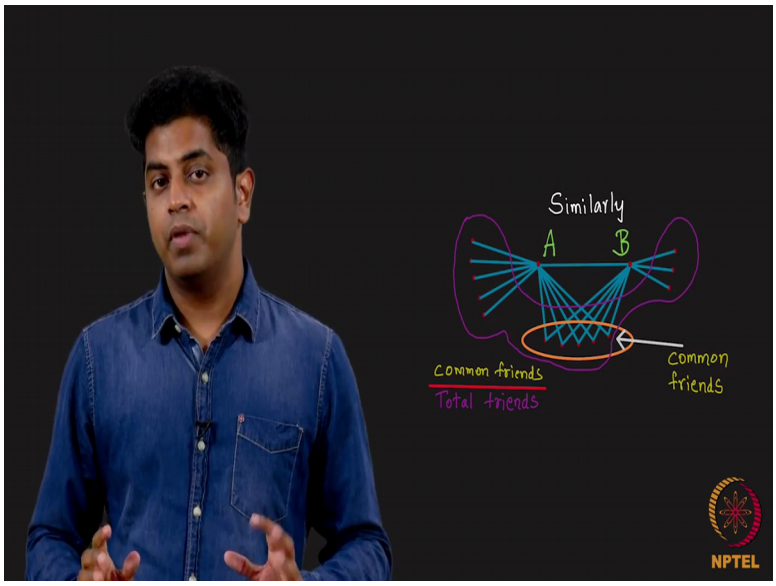


Similarly, the strength of a friendship let say between A and B can be defined the following way you can simply see how many common friends do A and B have and designate that as the strength of their friendship or you can put this in the numerator and in the denominator you can put the sum total of friendships of A and B; I repeat.

You look at what fraction of the friends of A and B are common friends what fraction of the friends of A and B are common friends. So, this is called the neighborhood overlap.

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What is the neighborhood overlap of the friendship between A and B it is in the numerator total number of common friends and the denominator all possible friends. So, mathematically speaking it is the number of elements in a intersection B divided by A union B by A intersection of B, I mean friends of a intersection friends of B divided by friends of A union friends of B this is called neighborhood overlap it is close to 1; means neighborhood overlap is maximum it is close to 0 means neighborhood overlap is very very less.