Social Networks
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Link Analysis (Continued)
Lecture - 105
PageRank Revisited – An example

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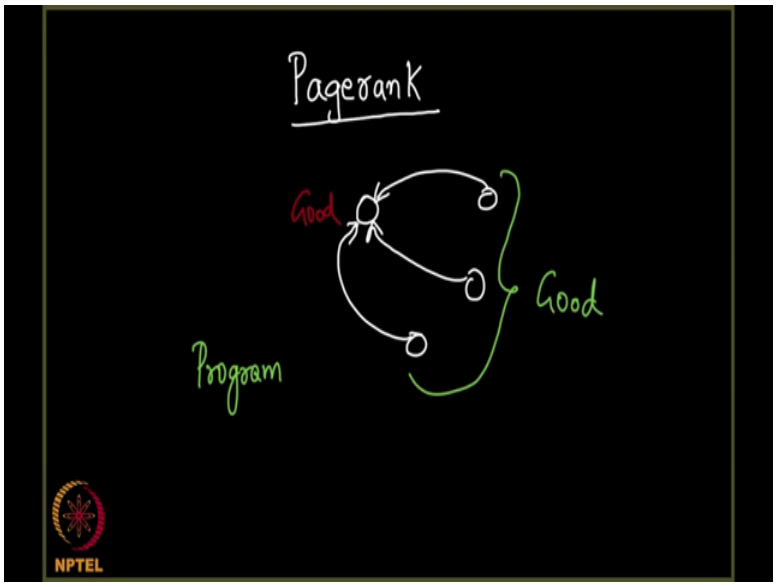

We have been discussing about pagerank all this while we will see it in a brand new light. If you can recollect I told you what exactly pagerank does, it is all about what you are is decided by who your friends are. If good people point to you it means that you are good. So, you are good if all these people who are pointing it to you are good.

Now, that is a very vague way to put it, can we quantify it nicely? We saw of program a whole lot of programming we programming screen casts you saw where we exactly show you how pagerank is computed. And why exactly its done that way is what will be our focus right now in our discussion for this lecture and the forthcoming lectures ok.

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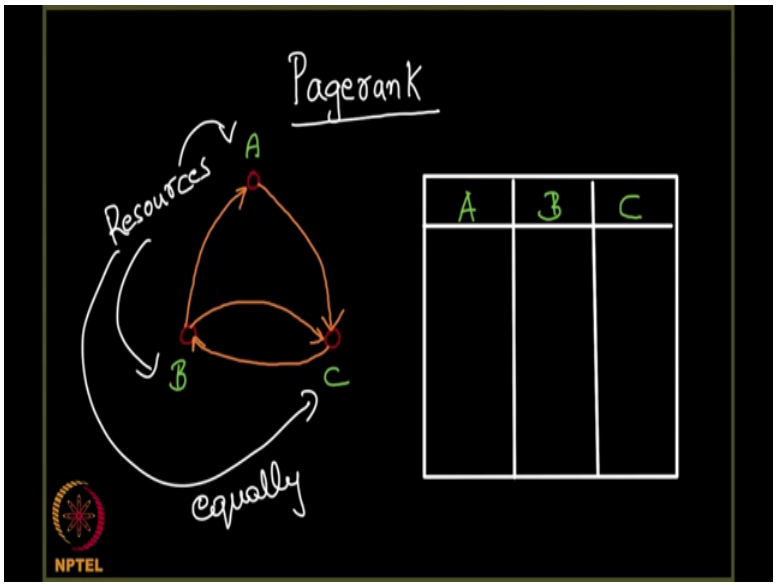

So, let us start with a nice example, let me try writing a graph for you all a very simple three node graph. So, here is the graph here are three nodes let me name it A, B and C we put edges from B does a edge from B to C and there is an edge from C to B and there is one edge from B to A and one from A to C.

So, what do you observe? You observe that there is this edge only one edge comes from A to C while this one edge coming from C to B, but there are 2 edges going from B right one to A and one to C correct ok.

So now, let me do the following let me write down table and make a note of what is happening here I need three columns let me write that down; one for A, one for B and one for C ok. So, here we are. So, I am going to write the values of A and B and C and what we are going to do with it I am going to start with some value for A, B and C let me write that down a here B here and C here. Let us start with the value of a being so, assume we had resources; we had resources allocated to A, B and C equally, what do I mean by that?

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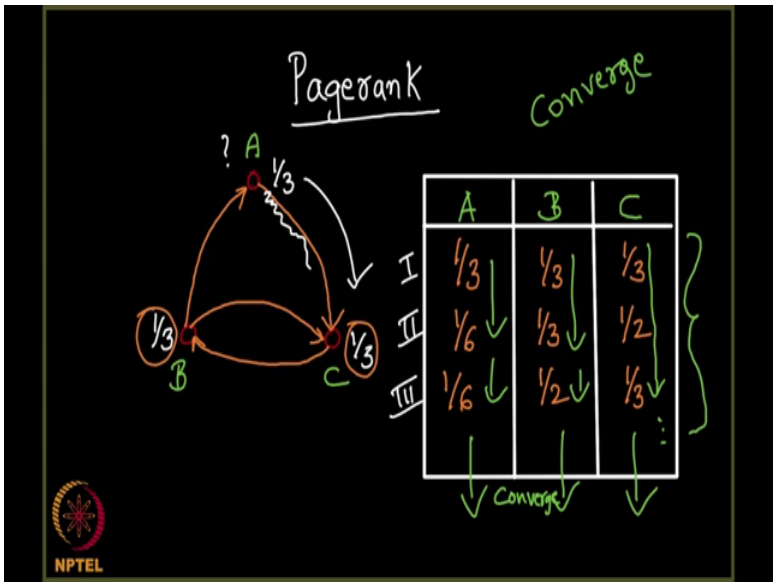

By that I mean I take A, B and C and I give one-third my resource to A and one-third of all the resources to C and the remaining one-third to B, which means I start with one-thirds to A one-thirds to B and one-thirds to C. What happens next? If you remember the programming screencast all that we did there was we took these values A is 1 by 3, B is 1 by 3, C is 1 by 3 and we told them and we observed and we told you all that A is going to give 1 by 3 to C correct ok. So, which means the new value of C, the new value of C is going to come from A correct. So, C will be 1 over 3 exactly the value that it had before all right ok.

So, what would be the value of B let us see, what is going to be the value of B? B takes the value from C as you can observe, which means B will be whatever C was 1 by 3 right. Let me write that down 1 by 3 and what we A, B? A what we A B? A is taking whatever B had, but B has two edges going which means it will divide its 1 by 3 equally to A and C, giving A half of 1 by 3 which is 1 by 6 and C gets half of 1 by 3 which is 1 by 6 once again.

So, let us see what happens to A; A gets 1 by 6 let me write that down 1 by 6, but then again as you can see B gives 1 by 6 to C correct. So, what should I do? I should increments C here by 1 by 6. So, this is the second nitration value. So, let me write this down what is 1 by 3 plus 1 by 6 here this is nothing else, but 1 by 2 correct a simple calculation tells me its 1 by 2, let me write it down 1 divided by 2 well this was my first

iteration this was my second iteration, let me go ahead and do the third iteration just for clarity sake.

So, once again what is what will be the value of let us say C? C gets all that A had ok, A this value was 1 by 6. So, C gets whatever A had. So, C becomes 1 by 6 correct. So, please note this value 1 by 3, 1 by 3 and 1 by 3 is what we started from correct and that need not necessarily continue to be the values, the values change. You saw we start with 1 by 3, 1 by 3, 1 by 3 and it became 1 by 6 1 by 3 and 1 by 2 and now we are computing the third iteration right ok.

So, let us see what happens in the third iteration um. So, let me remove all the annotations that I did and let me compute the third iteration. So, what is the third iteration? It is very clear that we wrote C as 1 by 6 because C takes the value of whatever was the value of A so, it became 1 by 6 correct. Now, what would be the value of B? B simply takes whatever was the value of C. What is the value of C? The value of C was 1 by 2.

So, which means my B will be 1 by 2 right let me write that down 1 by 2 perfect so far so good. So, what is the value of A? Now here is a small problem as you know A takes half of B right, which means B was 1 by 3 and A takes half of this as you can see A takes half of what B was? B was 1 by 3 as you can see. So, A becomes 1 over 6 which is 1 by 2 of B, 1 over 6 correct perfect.

Now, now as you can observe B also gives 1 by 2 of its existing value to C which means B was 1 by 3 and half of that is 1 by 6 and C gets 1 by 6 more correct plus 1 by 6. What happens to this? This becomes 2 by 6 correct which is 1 by 3. So, let me replace this by 1 divided by 3 and it goes on like this.

So, my question for you all is the following, if this process keeps continuing like this where will it reach? So, let me remove all these things. So, my question is this. If this keeps continuing like this goes on like this where will it reach, will it at all will it converge will this process, converge? So, what do I mean by that? By that I mean we will just go on like this randomly 1 by 3 becoming 1 by 6 and then 1 by 6 1 by 3 becoming 1 by 3 and 1 by 2, 1 by 3 becoming 1 by 2 and then 1 by 3 and so on. What will happen, will it ever converge or will it keep continuing with its random values? So, let us try verifying what exactly happens in our next lecture.