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

The Small World Effect
Lecture - 145
The Reason

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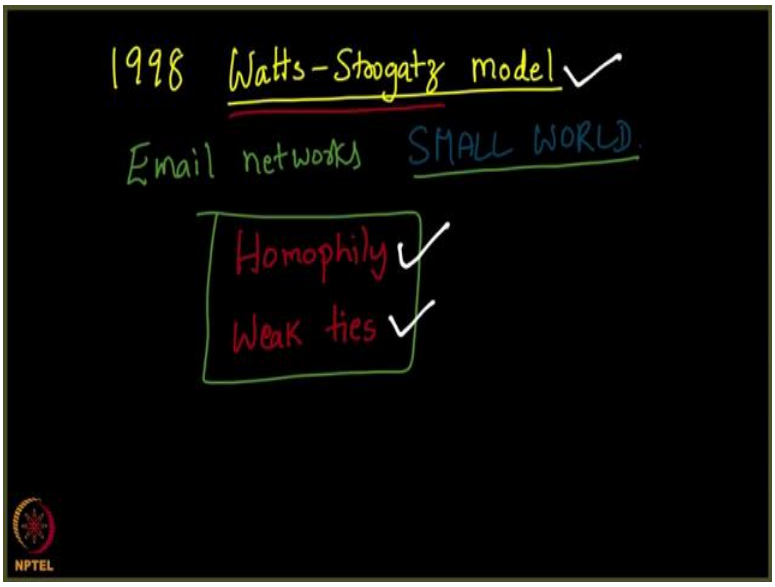

In the year 1998, this experiment was redone, and it saw a fresh look by a couple of scientists by name Watts and Strogatz. It is in fact, popularly called the Watts Strogatz model which will be seeing very soon. So, they reconducted this experiment on email networks, email networks and observed the small world phenomena on email networks as well, they observed the small world phenomena. It was not way to surprising for them and they went ahead and proposed that their possible reason why this is happening is because of two concepts which we indeed saw already which is homophily and the concept of weak ties.

The first nice explanation was indeed given by Watts and Strogatz they said the reason why the small world is being observed is mainly because of two concepts; homophily and weak ties. Let us dwell deep into their explanations, what exactly was the reasoning that.

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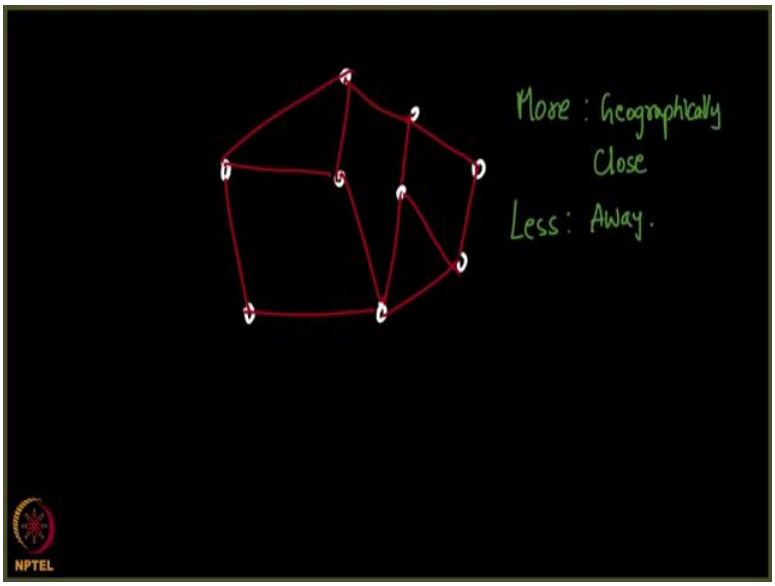

They supplied they said in a given network of course there are many nodes, there are several edges connecting them, correct. So, they proposed that these edges are actually sort of grid like structures right, the grid like structures.

Then this is like our locality in your place. So, you live in a locality and these are the friendships that you have made; obviously, you would have made more friends, more friends who are geographically close to you, more who are geographically close geographically close right and less people who are geographically away from you correct. So, instead of seeing it as a graph, let us modulate as a grid. So, what do I mean by that?

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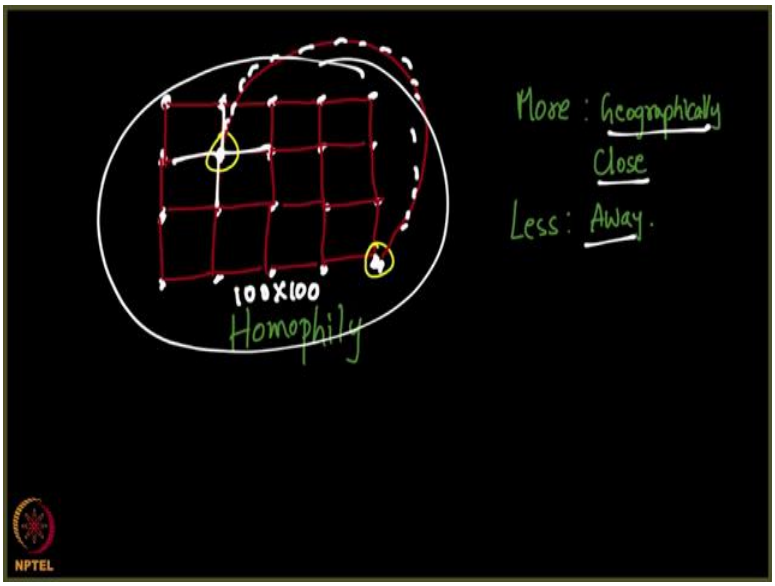

Let me just write down that this is my locality. These are let us say the houses or my the way this could be a school or college, an office or whatever, so, all I am trying to say is let us have a very simplistic model of representing people as white dots and their friendships as edges and each person has some friends in his neighbourhood ok. He makes friends in his neighbourhood because of homophily right. People who stay together in the same locality probably share some characteristics and they become friends with their immediate neighbours right. So, now, such a thing probably happens because of homophily as we saw.

But then, but then a person who is here might make friends with a person who is here. So, this person might make friends with a person here. So, let me draw a red line here right.

So, imagine this was a huge let us say 100 cross 100 grid 100 cross 100 grid and some two extremal points are becoming friends like this. This is very much possible right, you might no friends only in your locality, but you do know some friends away from you as well right.

So, Watts and Strogatz proposed that it is because of the homophily and weak ties that in a grid like this while most of your friends are your neighbours on the grid you tend to some of us tend to make friends with far away people as well and this is what is leading to the small world phenomena as observed by us and what is that let me explain.

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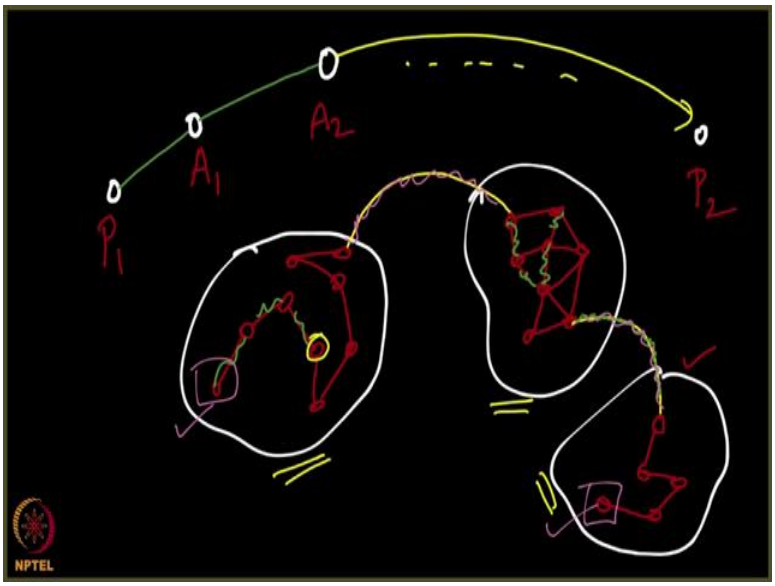

So, when a person is asked to deliver a letter to another person, P_1 is asked to deliver letter to another person P_2, P_1 will indeed give that letter to his someone of his neighbours, but then he does not give it to any random neighbour. He gives it to that neighbour he thinks is close to the destination right. He gives it to that neighbour who is close to the destination possibly right and this keeps happening right. But then 1 might know someone who is not his neighbour but is someone who is staying far away from him who might be very close to P_2 alright.

So, this is what happens. So, when let us say this is one region this is another region this is another region. When you are trying to send a piece of information or let us say a letter or whatever you call it through your people whom you are close to you probably will stay in this shell, you probably will stay in this city. But some people do have links to outside the city and they will pass on the letter to people outside the city and again once it goes outside the city it probably will stay there because of homophily.

But then some one person might know someone from this world rather this country or this continent and the letter will indeed reach this particular place which initially was not the case as you saw. We were just roaming around here and then we came here and then we roamed around here a little and then we saw that there was a path to the next country and we entered here and then slowly it reaches the desired destination ok, from the

source it reaches the desired destination. Mainly, because of two things as I told you which is homophily and the notion of weak ties.

By weak ties I mean the at edges such as this we have studied already right. It has these two things that lead to let me write that down once again.

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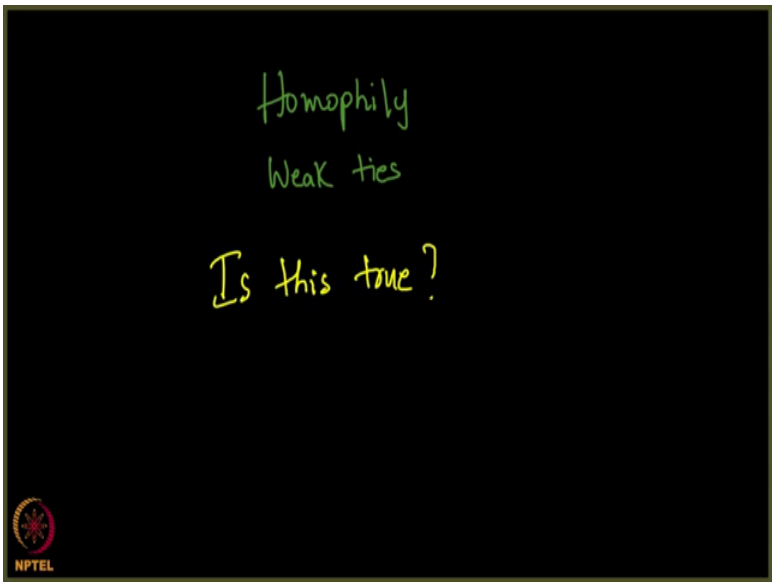

Homophily and it is not just homophily that leads to small world phenomena, homophily coupled with weak ties that result in such a phenomenon from occurring.

Now, anybody can hypothesis something like this. How do we know this is true, is this true, is this true? By let us been observed in many networks that this is indeed true that several networks have what is called these clusters like this right and nodes exhibit a homophily, they make friends with many people who are like them, but then there are friends who are outside the territory as well.

So, let me illustrate it well.

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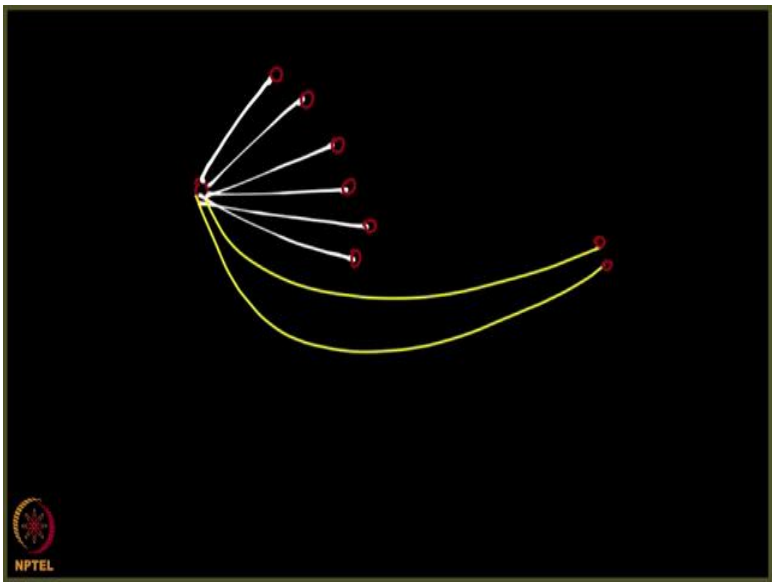

This is you, you will have many friends who are like you inside your territory, but a few of them will be outside the territory right, outside the territory. Some of them will be, most of them will be inside the territory. By territory I mean your zone homophily and a couple of them will be outside your territory. It is this couple of them couple of those friends that each one of us have would results in the small world phenomena right that makes the world really closely connected.