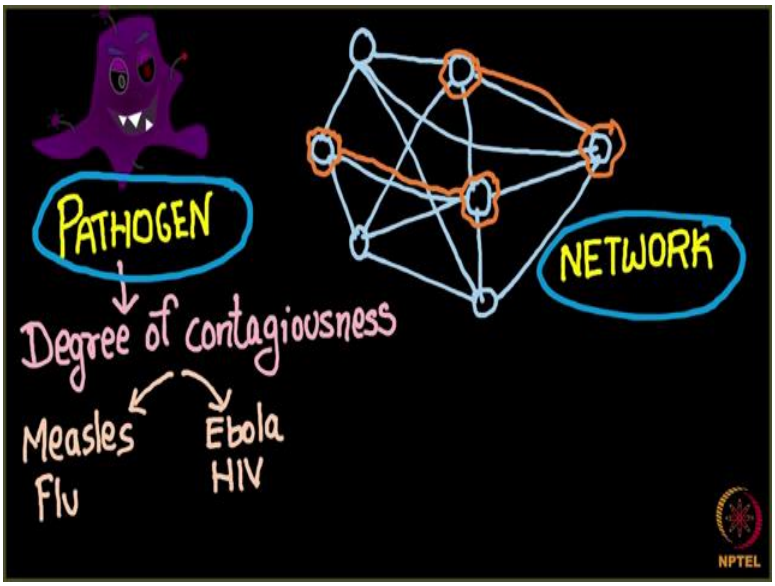
Social Networks
Prof. S. R. S. Iyengar
Department of Computer Science
Indian Institute of Technology, Ropar

Rich Get Richer Phenomenon – 2
Lecture - 129
Introduction to epidemics (continued...)

So, now, before starting with the question or before looking into how an epidemic spread lets us look at 2 things, 2 important things. So, I would like you to ask this question from yourself which 2 factors do you think are the most important which 2 factors are required when we want to model a disease spreading on a network? Assume there is this classroom and there are some people, some students in this classroom and one of the student catches a flu there and this flu is spreading through the network. So, which 2 things will you require if you want to model the spreading of this flu? And here goes the answer.

(Refer Slide Time: 00:50)



So, the first one is the pathogen itself about the flu itself. So, what is spreading on this network is important. For example, it is degree of contagiousness matter, how contagious this flu is. Taking an analogy with these spreading of an idea as we have seen, something like a piece of code spreads less quickly as compared to a juicy piece of gossip.

Similarly, in the case of diseases, there are certain diseases which is spread more quickly as compared to other diseases. If you talk about diseases like measles and flu, they spread quite quickly as compared to the diseases like Ebola and HIV.

So, first of all what is important is the pathogen. We need to know how contagious this pathogen is and the second which is the obvious for a network scientist of course, is the network, yes we need the network on which this pathogen is spreading. Does the network really matter? Yes it matters. So, if you look at the network which is shown to in this figure, you can see that there are quite a bless number of edges in this network.

The network is less dense rather we call that this network is (Refer Time: 02:06) So, you put any disease over there it will slowly move to this network; rather it can die away quickly, but if your network is say something like this and I put a lot of edges there between these people, so you put any disease on this network and this disease will quickly spread on this network because, your network is dense.

So, yes one thing is the density of the network or let us say the sparsity of the network it affects how your contagion is going to spread on the network rather, there is one thing very interesting to note here is do you see that this pathogen has something to do with the network? So, let us say I want to model these spreading of flu and I can be having a network like this and the network is going to be quite dense and actually network is dense for the spreading of something like a flu because, even if you come in because flu spreads even if you coming close proximity with someone, so even if you just stand and talk to a person for 5 minutes you can catch flu right.

And even people do not need to come in close contact together, let us say that you have worked on a piece of code on your keyboard and then you go away and then your sister comes and she also works on the same keyboard, even this thing can make a flu to spread. So, this common flu, common cold flu, common cold virus, it can spread even through keyboard.

So, the network is going to be very dense in the case of such a contagion, if the contagion is a flu, but let us say I do not want to model the spreading of a flu, I want to model spreading of let us say HIV. So, in the modeling of a HIV will the same contact network work? And the answer is no, in the case of HIV since it is spreads with the help

of sexual contact, there will be quiet less number of edges which will be which will be counted in this contact network.

So, the network in the case of HIV is going to be very sparse. So, whether your network is dense or your network is spars also depends upon what kind of a pathogen we are talking about. If this is the pathogen like flu, then the network is going to be quite dense and if the pathogen is something like let us say HIV then this network is going to be very sparse.

So, here while your blue I just repeat your contact network for the spreading of flu orange edges or the orange nodes here, this is the contact network for the spreading of HIV which is quite sparse. So, these are the two things which are most required for modeling the spreading of a disease; the first one is the pathogen how contagious it is and second one is obviously, the network structure, so will be using just both of these 2 things to model the spread of diseases on our social networks.