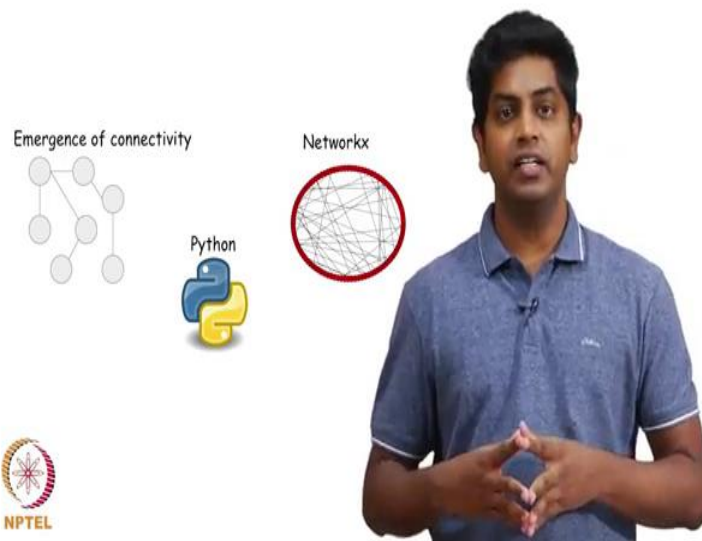


**Social Networks**  
**Prof. S. R. S. Iyengar**  
**Department of Computer Science**  
**Indian Institute of Technology, Ropar**

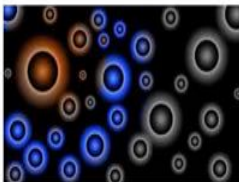

**Lecture – 07**  
**Introduction to Social Networks**  
**Social Networks: The Challenge**

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We saw very nice emergent property on social networks and I thought you how to use python on network x, now let shift our gas and try looking at something that is very non trivial about social networks.

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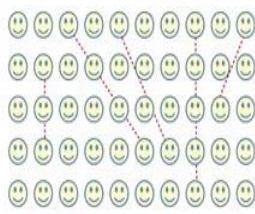
Number of Atoms in the Universe ?  $> 2^{200}$

$4 \times 10^{79} - 4 \times 10^{81}$



What is a non trivial about social networks? Let me ask a very seemingly unrelated question here; what you think is the atoms in the universe? So, very big number, it is roughly 2 to the 200 plus more than that 2 to the 200 plus is the number of atoms in the universe, so much to be precise. So, what? Observe: look at the example that we just now saw in one of our previous lectures.



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Total possible number of friendships

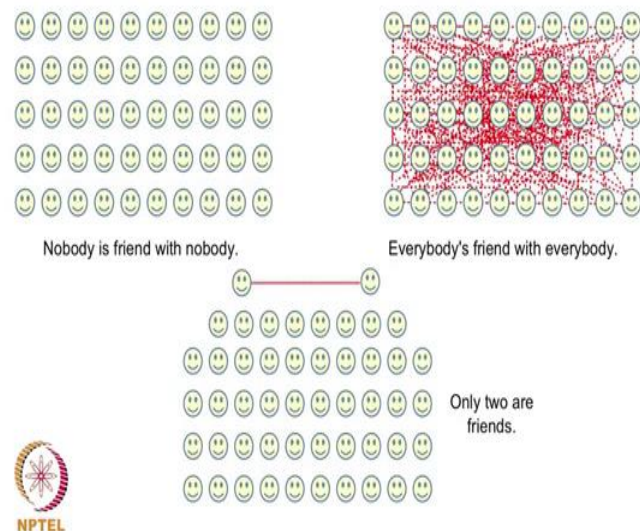
?

How do friendships happen here?



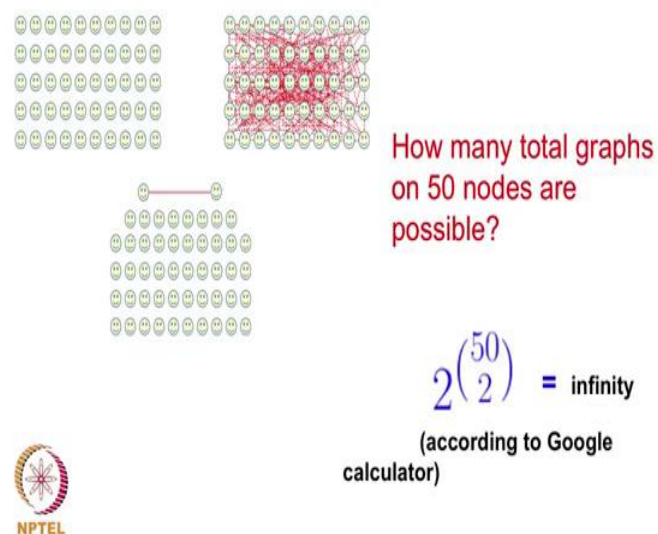
A classroom with 50 people correct and we questioned about friendships there. Now let me ask you this question, what are the total possible friendships that are possible on this graph on just 50 people?

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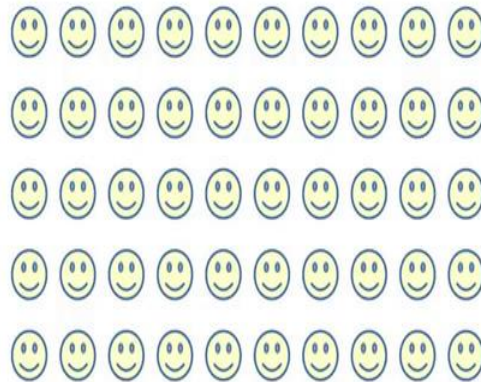
By that I mean look at this, this is one possible friendship where nobody is friends with each other, the other possibilities is all of them are friends with each other, other possibilities there are only these 2 friends rest are not friends so on and so on and so forth.

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If I go on enumerating all possible graphs on 50 nodes, how many will I get? How do I even answer this question? I leave it as an exercise. I will quickly answer it here. The answer is 2 to the power of 50 and that is a very big number and the number is so much, this is the total possible graphs on 50 nodes; just 50 nodes.

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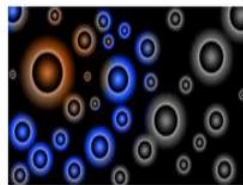


If you take 50 people in this classroom, all of you sitting here 50 people let us say.

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$$2^{\binom{50}{2}}$$

**Much much much more than**



Number of Atoms in the Universe ?

$$> 2^{200}$$



What are all possible graphs that I can think of on the 50 people, the total number of graphs on 50 people is much much more not just more, but a lot lot lot more than the atoms in the universe.

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And that is what makes analyzing social networks very very difficult, the inherent complexity in it is way too much for even a super computer to handle and this is what makes it interesting that despite the fact that there is so much of complexity, we tend to observe some very nice properties.

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I am going to start enumerating this very nice questions and properties that this entire course is going to cover. Let us start with a first such a property rather what I will do right now is I will start off telling you a couple of nice; may not be couple may be 4 to 5 such nice ideas which I will be covering in the course. In fact, the course will have several nice ideas, but the main ideas I am going to tell you right now on what will be covered in the course.