Identity Management - I

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Hi. I'm Saurabh Srivastava. I am a PhD. scholar at IIT, Kanpur. This is a two-part lecture on identity management. Our next lecture will be on location management. The objective of these two lectures is to provide you an idea of how people interact with systems and how systems identify and locate us. Okay.

Motivation

- How do we recognize people when we communicate?
  - Physical Appearance

When we see people, we may recognize them

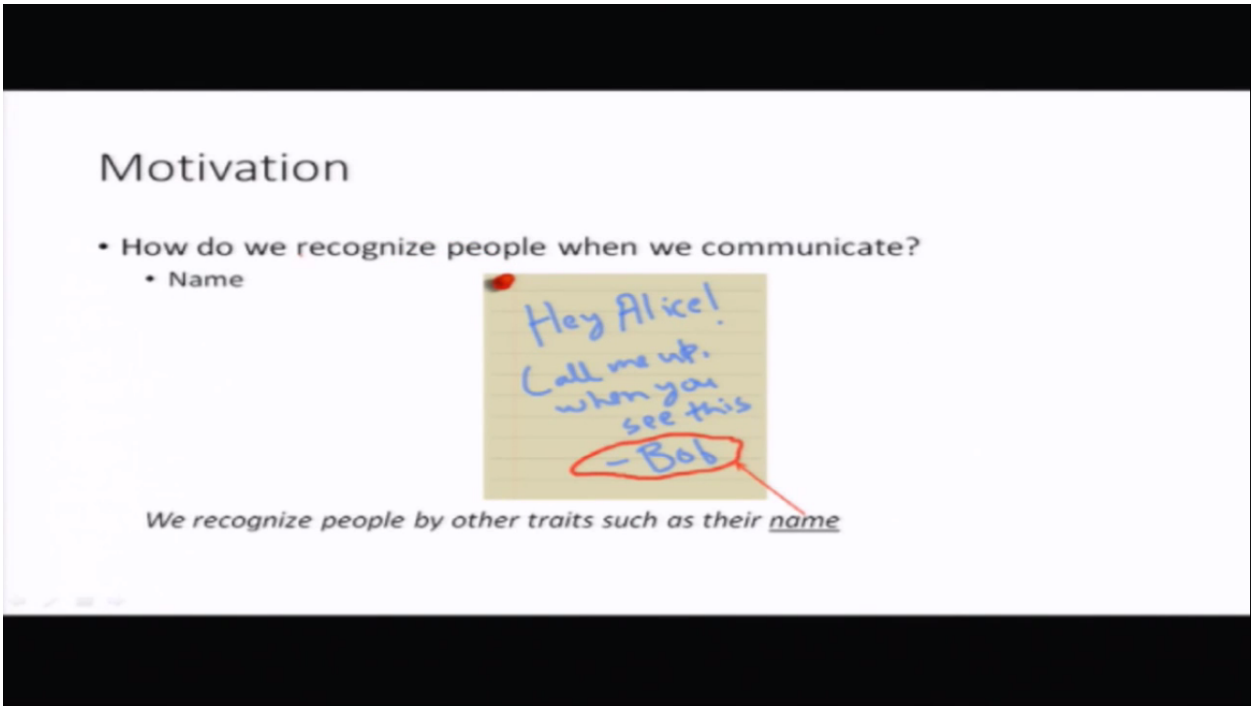
So let's start. We start this lecture with some analogies. In our day-to-day life we interact with a number of human beings and well we are somehow able to identify them. So we'll start with the analogies between human beings and then we will go on and continue with how systems try to identify entities. Okay.

Motivation

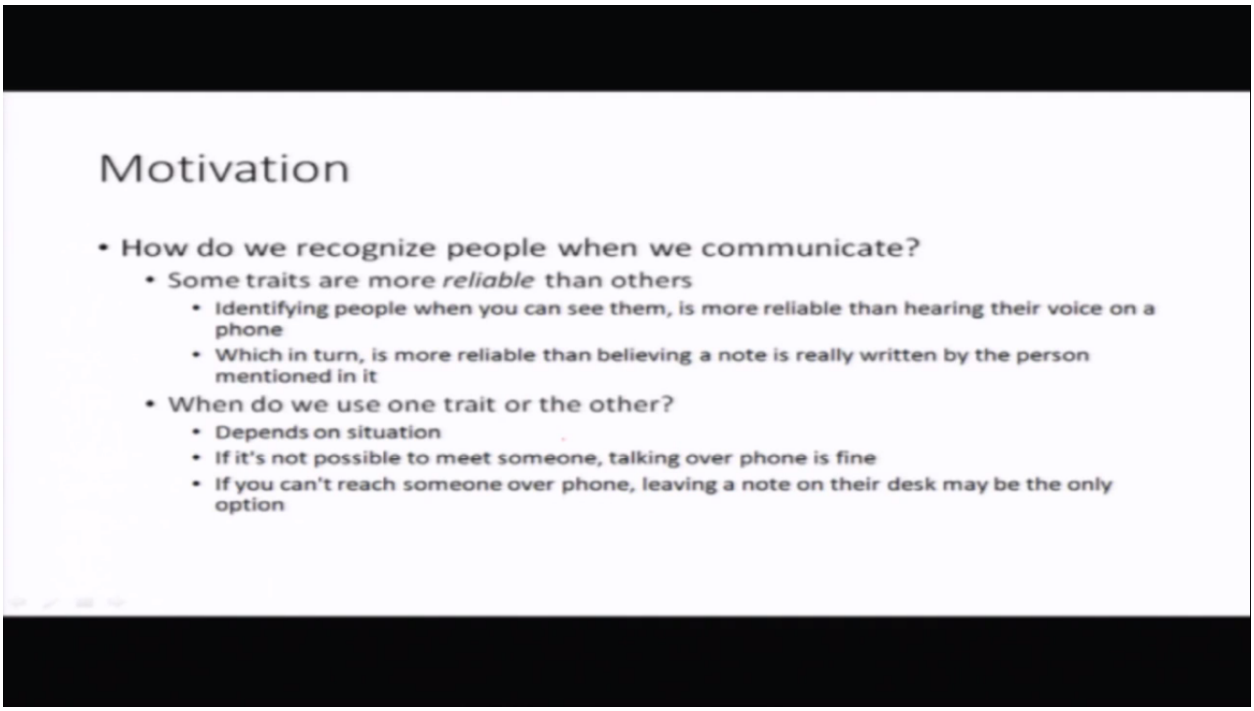
- How do we recognize people when we communicate?
  - Voice

When we hear people, we may recognize them

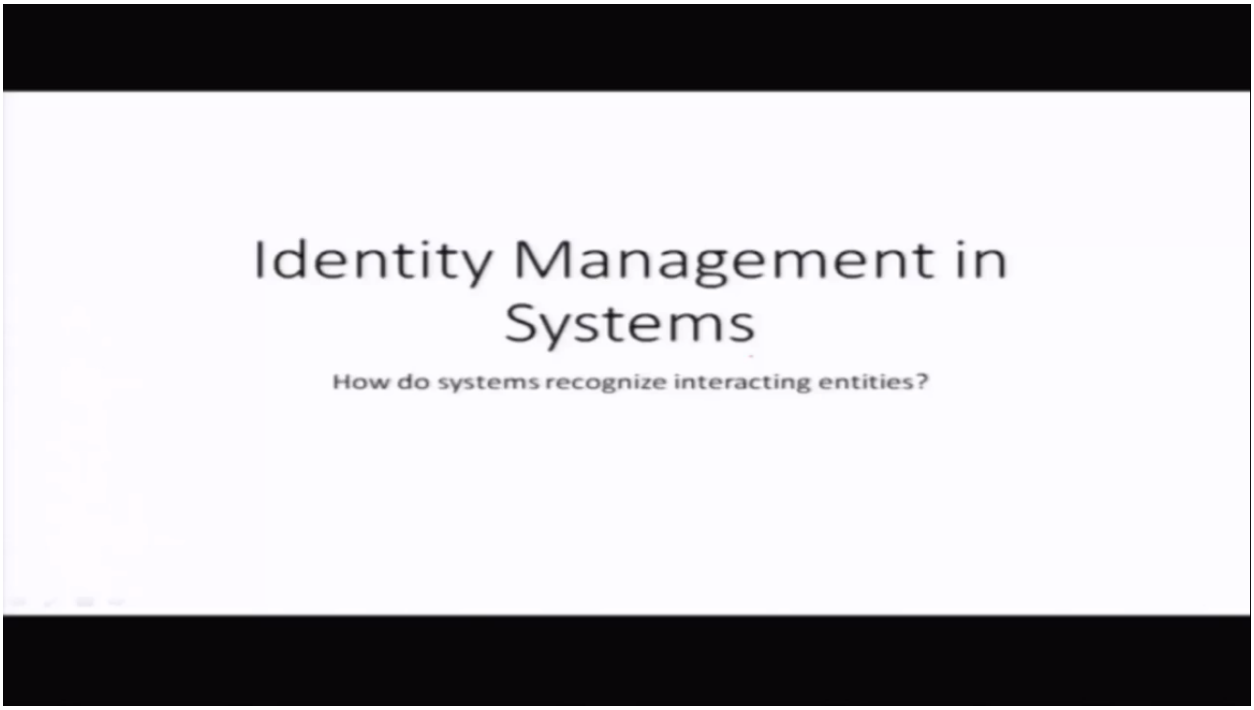
So when we see people, when we meet each other face to face we are able to recognize them right. So basically we use the physical appearance of human being to recognize them right. So it could be the face. It could be their height. It could be anything that we can see.



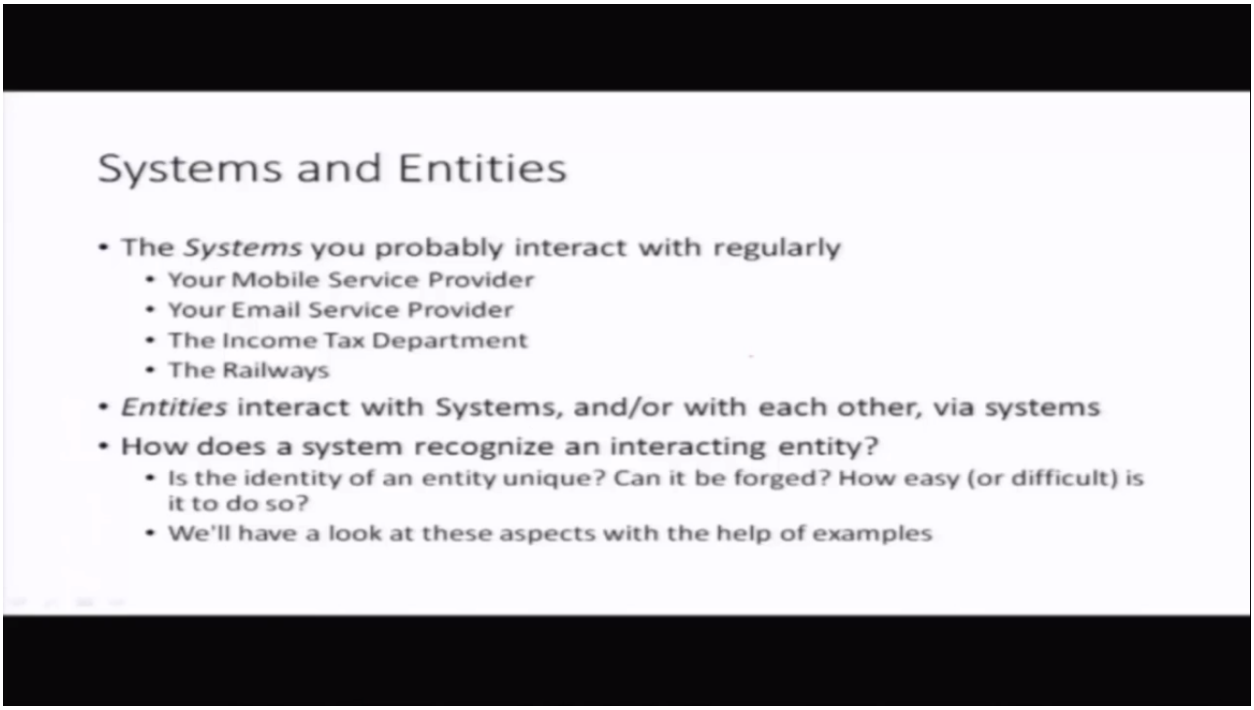
Sometimes we are not able to see people right. We are probably calling them over a phone or or something like that. So our voice actually is also a characteristic of how people can recognize us right. So we make all our friends and they'll be able to listen to our voice and they'll be able to recognize us.



Now other than voice in physical appearances there are some other traits that we have too. For example our name right. So suppose I went to see a friend and I couldn't find her in her office I can probably just leave a note right with my name out there. So my friend would be able to recognize me just by the trait of my name right.



So basically we recognize people with the help of some traits and some traits are more reliable than the other traits. For example if we can see people that is much more reliable then actually hearing them over a phone right. And if probably calling them over a phone is not possible then just leaving a note may actually be good enough. Now which trait we use depends on well situation right. So we may be able to see people. We may be able to listen to them but sometimes you know just leaving a note probably is fine. So this is what we are going to see now in this lecture that how human beings interact with systems and systems, till now we were just talking about two human beings. So one human being is trying to identify the other one. In this lecture we will see how systems will interact with entities and they identify human beings.



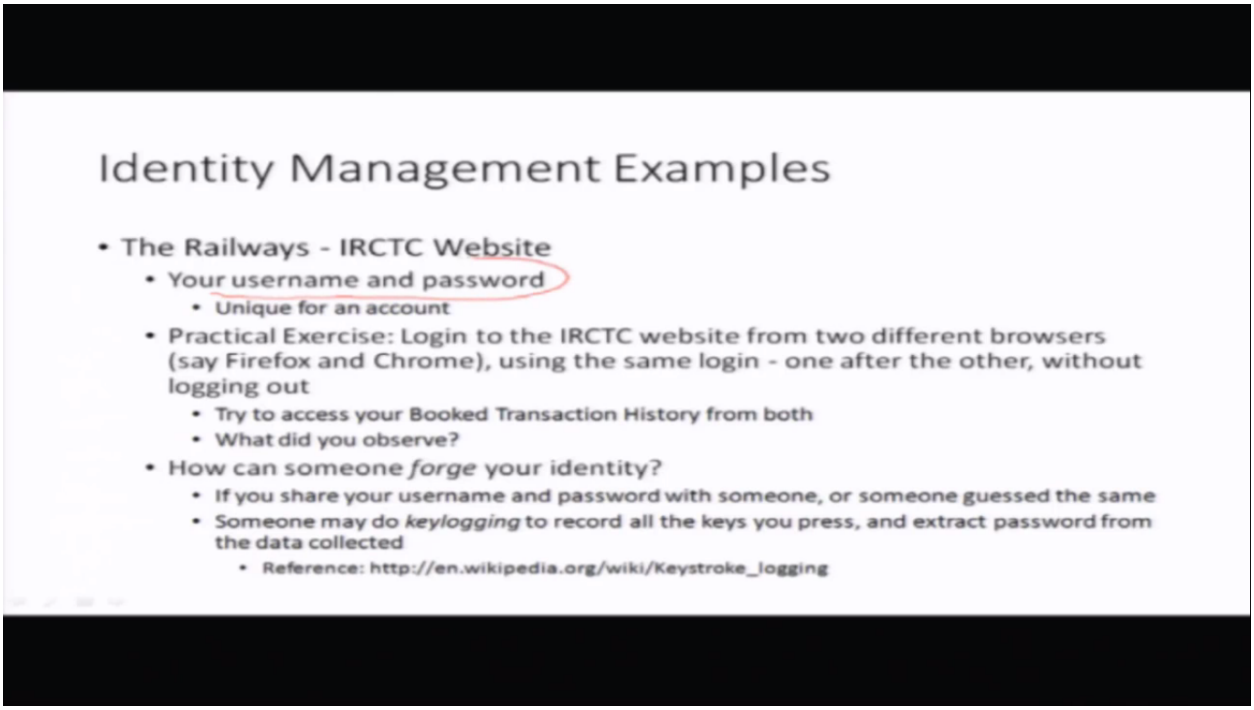
Okay first before going ahead we should actually try to define what a system is and what entities are okay. so let's take some examples. Your mobile service provider that's actually a system right because we interact with our mobile service provider on a daily basis. We probably make dozens of calls a day and then you know these calls get connected by some telephone exchange or something. So the mobile service provider is actually a system here. Then we also send emails on a daily basis probably. So the email service provider is a system as well. Okay and the income tax department. Well the income tax department is a system too. We interact with them by their website. We probably go to their offices and you know they have their own way of interacting with human beings. So the income tax department is system as well. Okay the last example is of Railways. We all booked tickets via IRCTC's website and we probably go to their counters everywhere and try to book our tickets there. So the railways themselves are also a system right.

So these are the systems that we are trying to understand okay. so we are trying to understand computers. We are trying to understand systems which may not be machines. They could be you know a set of people or an organization. So these are the systems that we'll be talking about. And

what are entities then? So entities are the ones which actually interact with the system. They could be human beings. They could be devices. They could be anything but basically in this whole lecture we will be talking about entities which are mostly human beings right. So we are not going to go in any other direction. That will be pretty much restricted to human beings okay.

Now that we know what a system is, we know what an entity is; so how does the system's recognize entities? Well one thing about an entity is that it needs to have an identity right. So what is an identity? We'll have a look in more detail in what identities are but basically the thing about an identity should be that it should be unique right. It is because of this that you are able to recognize somebody. So for example if you are seeing their face, if their face is not unique you won't be able to recognize them right.

So we have a look at what entities are, whether they can be forged or not, how easy or difficult it is to forge these entities and all that stuff and we'll have a look at some examples of how systems identify entities right.



Okay so we'll start with some identity management examples. We'll actually have two examples with us. The one is of course the mobile service provider we just talked about. So exactly how does your mobile service provider identify you or for that matter your sim card or whatever it is? Well your mobile number and your sim number are two identities of you or say your sim card by which your mobile service provider can identify you okay. So basically these are unique within a domain typically within a country. There's another aspect of your communication with the mobile service provider that can be used as your identity. It is the IMEI number of your mobile device. So IMEI number is basically a unique identifier that is provided to each and every

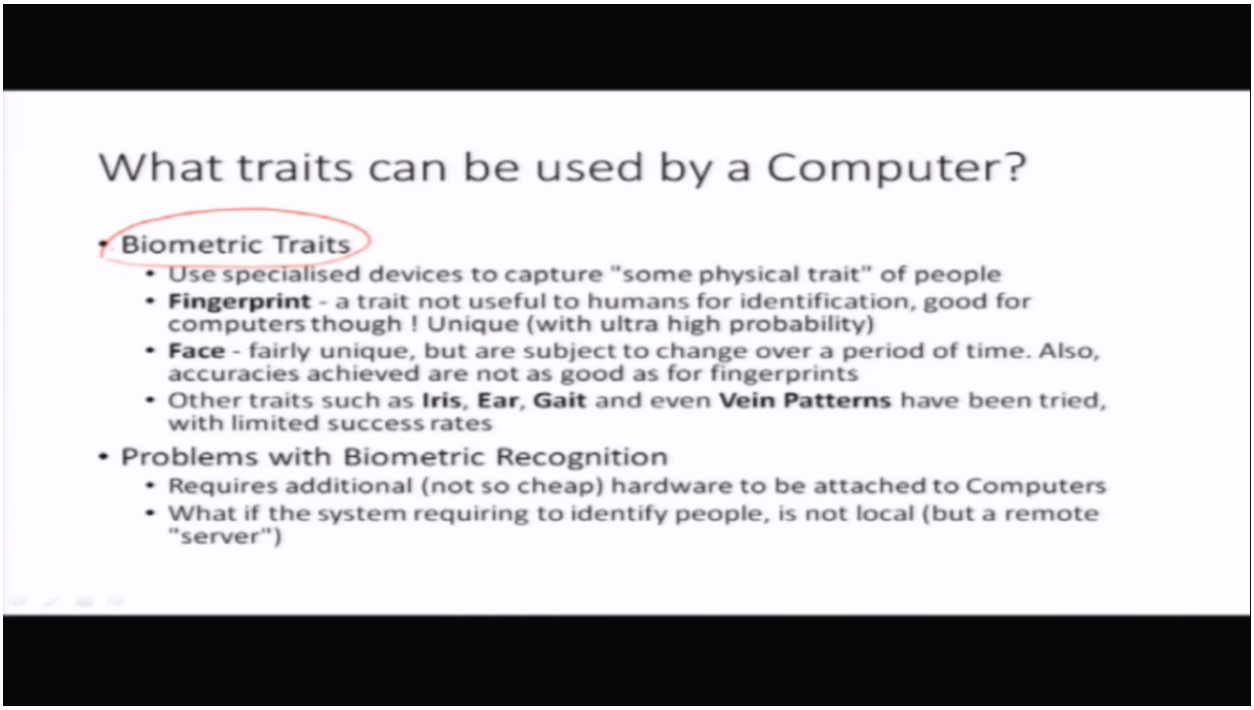
mobile device globally and these can actually be used by your mobile service provider to track which particular SIM card is being used by which particular mobile device right. So in this way even your IMEI number could also act like a unique identity. Okay. now come to forging the identity. So what can somebody do? You know how can somebody hijack your identity on say the system of mobile services and all that. So one way is to clone your phone so on CDMA networks in order to clone a device and access to its embedded file system is required okay. we are not going to go in details of what embedded file systems are. Let's just assume that anyone who wants to hack your phone would probably need an access to the internals of your phone so that's not an easy task to get. The other ways get a SIM card with the same mobile and/or SIM card number okay.

So well how can that be done on? GSM networks placing an extra hardware in the mobile device that you are using can actually do it okay. Again we are not going to go in the details of how it can be done but well there are ways to do it. You can actually go and have a look at this reference. It's actually a Wikipedia link. You can go and have a look at it you will probably you know get some more understanding of how hacking can be done.

Okay we see one more example this is of IRCTC our favorite example. So how does IRCTC identify people okay. well simple you must have a username and a password on IRCTC without which you cannot login and book any tickets. So here's actually a practical exercise for you there that will be a part of the homework as well. So what you're supposed to do is log into the IRCTC website from two different web browsers and use the same username and password and then you can actually identify certain aspects of the system okay. you will probably be surprised with some of the observations that you'll make. We will get back to this in the homework. Okay coming back to forging the identity. So how can somebody actually forge your identity on the

IRCTC website? Well username and password. So if somebody knows you username and password he or she can log in as you and your identity is gone.

So understanding how this can be done is a bit difficult and it is going to be a bit more technical aspect but there is a term called keylogging so somebody can actually record all the keys that you type on the keyboard and with the help of that they can actually know your username and password. Again we are not going to go in any details of that. There is another reference here keystroke_logging you can go and have a look at it.



Okay. So these were some examples of how systems and entities interact with each other and how entities are identified by systems. We will now go a little bit detail in computers and human beings. So basically we now have systems which are computers and we now have entities which are people.

So what identification traits do we have as human beings? Well face is one. Voice is one. Height, gait. So gait is actually how we walk, there is an analysis of you know what are the amount of distance we are covering in each of our steps and how are our legs moving all that stuff is called gait other than that of course face, voice, and height we all know about. We will actually look at one more quality of these gaits. Face is fairly unique right I mean there is a very low chance that you'll actually find someone with exactly the same face as you. Voice well it is not that unique but yeah still fairly unique so your friends can probably identify your voice but it is not that common okay. it could be someone else's voice as well which is you know might be similar to yours. Height well that is too common for practical purposes you know for someone if maybe

someone in your own peer group will have the same height as you. So it is not really that uncommon.

So these are some physical traits that human beings have. Other than that we have another trait called name right. We all have names. We can be identified by our names. They're not really unique because we all know that you can always find a person with the same name as ours. So name two is not that unique. So there are other traits of us which are legally verified identities. Pan card is an example. So the income tax department issues you unique number it. Is called PAN, Permanent Account Number then the Election Commission issues you a voter ID card so that voter ID card is unique identity as well and then there is a driving license okay.

So these are some traits that human beings have and human beings can actually be identified using these traits. We will actually go a little bit more in detail about biometric traits. So we talked about face and we talked about voice. So these traits are actually termed under the category of biometric traits. So let us just assume that a computer wants to use these traits of ours okay. so if the computer wants to identify us with the help of our face or you know our voice or anything like that. So what exactly is a computer required for that okay.

So basically we need to capture this information somehow okay and in order to capture this we need some devices. We need some sensors. Those sensors can capture these traits of ours; our face, our voice or something else. Fingerprint. Fingerprint is actually a trait which is not many people even know about the fact that fingerprints are you know something that can probably be used for identification it's because we as human beings we never used fingerprints for identifying each other but for computers it's a very nice trait okay because it is fairly unique. It is you know almost impossible to find a person who's got the same fingerprint as you. So fingerprint is one trait which the computers can use and we already talked about face. There are other traits like iris. Iris is actually you know eyeball in your eye and that can be used as a trait too. There are vein patterns you know. So every human being is supposedly have a different vein pattern. So that can be used as well but out of all these traits it's only fingerprint which probably makes a little bit of sense for the computers to use.

Now there are some problems with biometric recognition okay. for example it requires additional hardware to be attached to the computer. Now that hardware is not cheap okay. So it actually requires you to buy some kind of sensors which can sense your fingerprint or it requires you to buy some kind of high resolution cameras which can capture your face or your iris. That's not cheap okay. and what if the system that is trying to identify you is not local okay. so maybe you are trying to identify yourself to a server, a server which is sitting maybe thousands of miles away from you. So what would happen in that case? You know you the sensor will be attached to the local computer but the system is somewhere else. There are a lot of problems using these traits right. Okay we stop here.

In this part we had a look at the personal traits of human beings and in the next part we'll have a look at the system generated identities right. Okay. Bye.