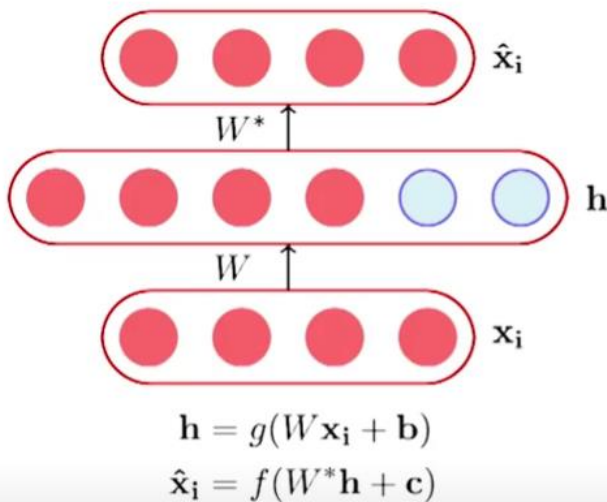




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Overcomplete Autoencoder



- Let us consider the case when $\dim(h) \geq \dim(x_i)$
- In such a case the autoencoder could learn a trivial encoding by simply copying x_i into h and then copying h into \hat{x}_i
- Such an identity encoding is useless in practice as it does not really tell us anything about the important characteristics of the data

An autoencoder where $\dim(h) \geq \dim(x_i)$ is called an over complete autoencoder

So, suppose you are trying to find out whether the person is likely to get a certain disease or not right? So, whether he would have a heart attack or whether he would have a diabetes, would have diabetes and so on. And you are looking at various parameters or various medical parameters of that person and one of them could be height, one of them could be weight and one of them could be BMI. Now, for whatever reason you have not computed the height and weight and you have only looked at the BMI.

So, now, what has happened in your input and all of you know that BMI is actually body mass index which is a function of the height and the weight. So, now, what has happened is that in your original input there was already this compact feature space.

Now if suppose your prediction is that this person has or has a high likelihood of having diabetes at some point in his life. Then you would want to know whether it was the height, or whether it was the weight which was responsible for this. So, in your original input your features are actually entangled and



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you would like to disentangle them. So, you would want to go from this smaller feature space to a larger feature space where some of these entangled features get is disentangled. So, in those cases we reach an over complete auto encoder.

Drawback:

The problem still remains that there is no reason why the machine should actually learn to disentangle these features it could still just simply copy the BMI here and then copy it back here. So, that is why when you are dealing with over complete auto encoders you will have to do something special to prevent this kind of identity encoding.



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