Re: Independent random variables versus non correlated variables

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Will:
>I have a question which I guess revolves around the meaning of
> independence of random variables. The definition I am aware of is in
> the context of discrete rvs X and Y where for all possible values of
> x and y, p(x,y)=p(x)p(y).
> So this means that in terms of independence of events, for each
> possible combination of events generated by X and Y those events are
> independent.
>
> Now, in Statistics we talk about variables being independent, which
> means among other things that they are not correlated. I can't see
> this relates to the above "for each possible combination of events
> generated by X and Y those events are independent".
> Can anyone give me some insight into this?

Each measurement/experiment/instance 'i' can be seen as having or being characterized by two attributes/random variables/random quantities X_i and Y_i. Now, there are many different "events" here: if the range of X_i is {x1,x2,x3...}, and the range of Y_i is {y1,y2,y3,...}, a possible event is any combination of x_j and y_k. For example, if the range of your X is {sick,healthy} and the range of your Y is {white−tongue, red−tongue}, an event will be a healthy patient with a white tongue.

For each combination of two values x_j and y_k, you can assess the dependence/independence through querying P(x_j,y_k) ?= P(x_j)P(y_k).

The important difference is that in probability theory P is given, but in statistics, P must be inferred or estimated from data. Therefore, any statement about the dependence and independence of two variables depends on the model you choose for P. In the above case with discrete variables, you could employ a Multinomial model. Furthermore, you have to assess the dependence/independence for all combinations of the variables' values.

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