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Explanation for dnorm(), pnorm(), qnorm()?

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Sofia Freitas Signature Track · 7 days ago

Hi,

although this course is over I still have a question and maybe someone is still here and could help me.

In week 4 we learnt about simulation and generating random numbers, and I understand the rnorm(), rpois() functions and so on for different kinds of distributions.
But I struggle with understanding the "d", "q" and "p" functions, like dnorm() and so on. I tried to use the help function, but I don't really understand the discription.

Could anyone explain how to work with those functions or knows a good source for further information? I have some statistical background from school, but probably need to refresh my knowledge a bit.

Thanks in advance and greetings,
Sofia

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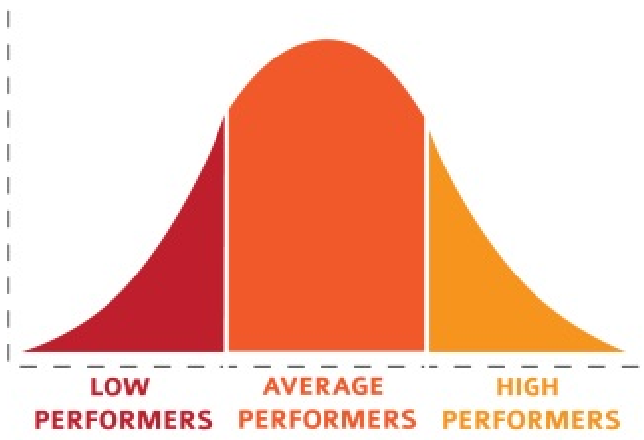
So there are a variety of common random variable types that follow well-defined distributions. The most familiar of these is probably the normal distribution with its bell-shaped curve:



This graph is a *probability density function*, which we might call $f(x)$, which describes the relative probabilities of a random variable X taking on the value x for different values of x along the domain.

In the bell curve, for example, we see that it's less likely to be at either tail of the curve than to be somewhere in the middle. So that's **d**

Then there's the *cumulative distribution function* $F(x) = P(X \leq x)$, or "the probability that X falls at the point x or earlier". For example, when $F(x) = 0.5$, that point x is the point such that there's a 50% probability of a random variable of that distribution having a value below the point, and 50% probability of being above it. This is also called the "median". So that's **p**.

The "quantile function" is the inverse of the cumulative distribution function. Following the example above, let's consider the median point x_α where $F(x_\alpha) = 0.5$. This point is called the 50th percentile, or 0.5th quantile; it describes "how much" of the distribution comes before, vs after the point. In other words, $Q(0.5) = x_\alpha$, so it is the inverse of the distribution function. That's **q**.

And then **r** is just random generation of *n* values following that kind of distribution. So *rnorm(50)* generates 50 random numbers following a standard normal distribution.

So for example:

```
> dnorm(0)
[1] 0.39... ## height of the probability density function at x = 0
> dnorm(1000)
[1] 0       ## note that this is about 0 now, since we're at the high tail of the pdf
> pnorm(0)
[1] 0.5     ## this is the middle point of the pdf of a standard normal
> pnorm(5, mean=5)
[1] 0.5    ## probability of result < x is always 50% if x = mean in a normal dist.
> qnorm(0.5, mean=5)
[1] 5      ## similarly, the 0.5th quantile is always at the mean in a normal dist.
>  rnorm(5)
# just 5 random numbers now, generated according to a standard normal dist.
[1] -0.8948829  0.9019026  1.0045750  0.3127317  0.3931312
> rnorm(5, mean=5)
# we can also generate random numbers about a different mean...
[1] 4.559693 4.296752 4.447514 6.332901 5.383676
> rnorm(5, mean=5, sd=100)
# or with different spread (sd = standard deviation)
[1] -163.51749 -187.71287   21.58642  -45.32585   25.50433
```

Poisson, binomial, etc are simply other types of random variables, each with their own particular density and distribution functions.

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ly · 7 days ago

This might be a great (and free!) resource for statistics at varying levels:

https://www.openintro.org/stat/index.php?stat_book=os

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