



Student's t Distribution

The following sections provide an overview of Student's t distribution.

Background of Student's t Distribution

The t distribution is a family of curves depending on a single parameter ν (the degrees of freedom). As ν goes to infinity, the t distribution converges to the standard normal distribution.

W. S. Gossett (1908) discovered the distribution through his work at the Guinness brewery. At that time, Guinness did not allow its staff to publish, so Gossett used the pseudonym Student.

If \bar{x} and s are the mean and standard deviation of an independent random sample of size n from a normal distribution with mean μ and $\sigma^2 = n$, then

$$t(\nu) = \frac{\bar{x} - \mu}{s}$$

$$\nu = n - 1$$

Definition of Student's t Distribution

Student's t pdf is

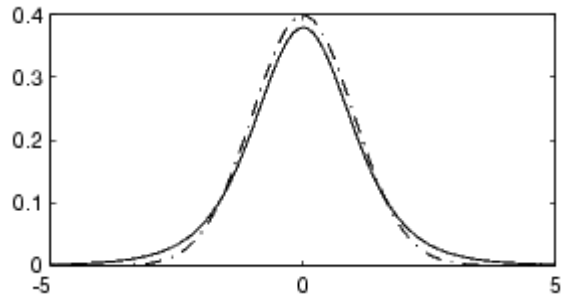
$$y = f(x|\nu) = \frac{\Gamma\left(\frac{\nu+1}{2}\right)}{\Gamma\left(\frac{\nu}{2}\right)} \frac{1}{\sqrt{\nu\pi}} \frac{1}{\left(1 + \frac{x^2}{\nu}\right)^{\frac{\nu+1}{2}}}$$

where $\Gamma(\cdot)$ is the Gamma function.

Example and Plot of Student's t Distribution

The plot compares the t distribution with $\nu = 5$ (solid line) to the shorter tailed, standard normal distribution (dashed line).

```
x = -5:0.1:5;  
y = tpdf(x,5);  
z = normpdf(x,0,1);  
plot(x,y,'-',x,z,'-.')
```



← Rayleigh Distribution

Noncentral t Distribution →