2024-05-22-sample size

Yingxin Xu

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Sample size calculation

linear regression

5 predictors

power = 90%

$\alpha = 0.05$

$R^2 = 0.1$

Load packages

```
pacman::p_load(pwr)
```

We will use function `pwr.f2.test()` for this linear model test

Get parameters:

u is the number of coefficients in this model, we have concentration, cell age, treatment (two levels), cell type (two levels), and media (two levels), five coefficients in total, so $u = 5$.

Now we calculate the effect size $f2$.

In linear model, the effect size

$$f2 = \frac{R^2}{1 - R^2}.$$

In this case, we have $R^2 = 0.1$, so $f2 = \frac{0.1}{1-0.1} = \frac{1}{9}$.

The significant level is 0.05, and the power is 0.90.

So we can perform a linear model test:

```
pwr.f2.test(u = 5, f2 = 0.1/0.9, sig.level = 0.05, power = 0.9)
```

```
##
##      Multiple regression power calculation
##
##               u = 5
##               v = 147.8645
##              f2 = 0.1111111
##       sig.level = 0.05
##           power = 0.9
```

$v = 147.8645$, round up to 148, this is the number of error degrees of freedom, and $v = n - u - 1$.

This implies $n = u + v + 1$, n is the sample size.

So

$$n = 5 + 148 + 1 = 154.$$

The total number of samples we need is 154.