Estimating statistical model parametes with maximum likelihood in R

As was covered in lecture there is a general recipe for estimating statistical model parameters in `Python`.

1. load data
2. write a custome likelihood function
3. estimate parameter values by minimizing the negative log likelihood

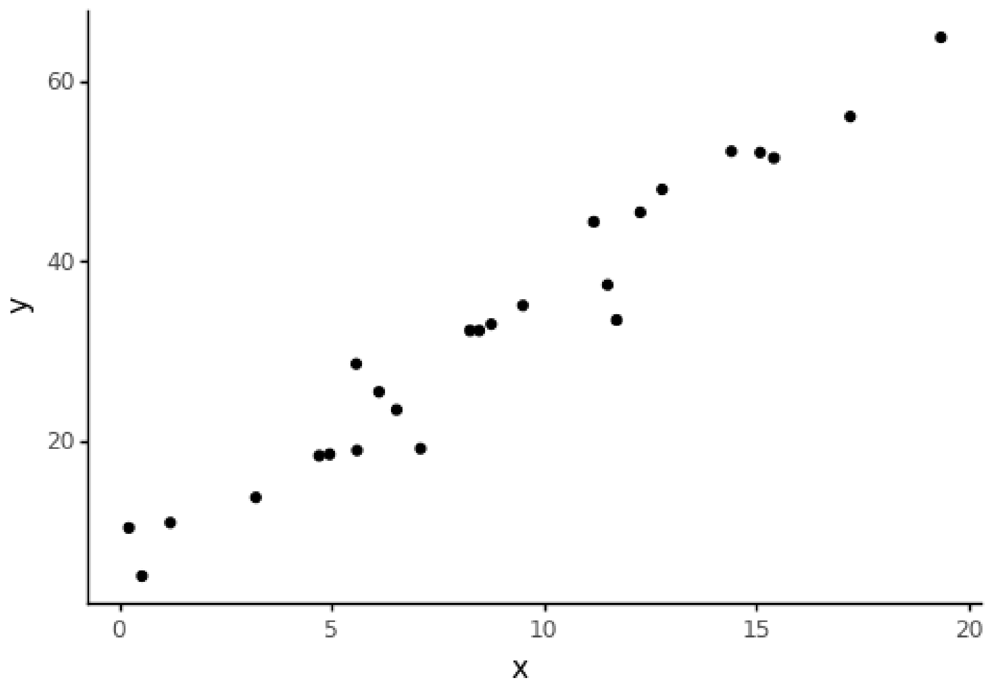
The code required to accomplish these steps on a simulated data set are below.

```
In [1]: ### Import packages
        import numpy
        import pandas
        from scipy.optimize import minimize
        from scipy.stats import norm
        from plotnine import *

        ### Simulating data
        # creating a uniformly distributed set of values for an independent variable x
        # and values for a variable y that is linearly dependent on x
        N=25
        x=numpy.random.uniform(0,20,size=N)
        y=3*x+5

        # add some "noise" to y and put the variables in a dataframe
        y=y+numpy.random.randn(N)*3
        df=pandas.DataFrame({'x':x,'y':y})

        # plot our observations
        ggplot(df,aes(x='x',y='y'))+geom_point()+theme_classic()
```



```
Out[1]: <ggplot: (297143721)>
```

```
In [2]: ### Custom likelihood function
        def nllike(p,obs):
            B0=p[0]
            B1=p[1]
            sigma=p[2]

            expected=B0+B1*obs.x
            nll=-1*norm(expected,sigma).logpdf(obs.y).sum()
            return nll

        ### estimate parameters by minimizing the negative log likelihood
        initialGuess=numpy.array([1,1,1])
        fit=minimize(nllike,initialGuess,method="Nelder-Mead",options={'disp': True},args=df)

        # fit is a variable that contains an OptimizeResult object
        # attribute 'x' is a list of the most likely parameter values
        print(fit.x)
```

```
Optimization terminated successfully.
         Current function value: 65.715476
         Iterations: 133
         Function evaluations: 231
[ 5.47260034  3.04434477  3.35240437]
```