Problem Set 7

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github link: https://github.com/gretagoldberg/phys-ua210.git

1 Question One

For this question I implemented Brent's method to compute the minimum of a function. I then compared this to scipy's implementation of the function which did absolutely horrendously in finding the minimum.

```
My implementation gives: 0.30000000004656613
The scipy implementation returns: -1757.08380848355
```

2 Question Two

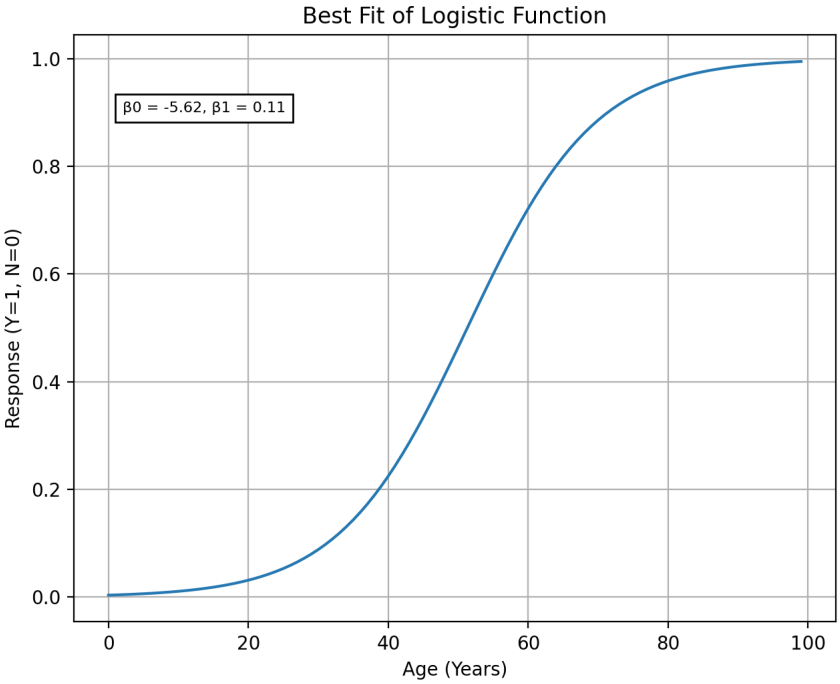
For this question we found the optimal parameters β_0 and β_1 for the logisitic function. We find the log likelihood based on the function

$$l\left(\beta_0, \ldots, \beta_p\right) = \sum_{i=1}^{n} Y_i \log \frac{p_i}{1-p_i} + \log\left(1-p_i\right)$$

We can then use scipy optimize minimize to minimize the negative log likelihood. We then can find the maximum likelihood values and formal errors and covariance matrix of beta values.

```
Optimal parameters and error:
        p:  [-5.62023245  0.10956339]
        dp:  [0.00037025 0.00359722]
Covariance matrix of optimal parameters:
        C:  [[1.37084195e-07 3.67084019e-09]
 [3.67084019e-09 1.29399736e-05]]
```

We can then see the logistic model with the beta values. This data makes sense because it is in reference two VHS tapes. Therefore, fewer young people will recognize this saying, which the model shows.


Best Fit of Logistic Function
β0 = -5.62, β1 = 0.11
Response (Y=1, N=0)
Age (Years)
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
100