Timeline

Data

* <https://www.kaggle.com/kumarajarshi/life-expectancy-who/version/1>
* Life Expectancy ~ Schooling
* Life Expectancy ~ BMI
* [Life Expectancy ~ GDP] OR [Life Expectancy ~ Percentage Expenditure (on healthcare)] (they are similar plots)

Approach

* ~~Visualize the data (scatterplot) (Riley)~~
* ~~Determine two or more models/functions for each plot (Errybody)~~
* ~~Set up coefficient matrix for each model (Riley)~~
  + ~~Create functions for~~
    - ~~linear~~
    - ~~quadratic~~
    - ~~log model~~
    - ~~Output matrix A and vector b~~
* ~~Apply the algorithms~~
  + ~~SVD (Gianni)~~
  + ~~Pseudoinverse (Homework #3) (Riley)~~
    - ~~Write code~~
    - ~~Resolve issue with Log model~~
  + ~~QR Decomposition~~
    - ~~Gram-Schmidt (Sharon)~~
      * ~~Write function~~
      * ~~Apply algorithm to all models~~
      * ~~Resolve issue with Log model~~
    - ~~Modified Gram-Schmidt (Riley)~~
      * ~~Write function~~
      * ~~Apply algorithm to all models~~
      * ~~Resolve issue with Log model~~
    - ~~Householder Triangularization (Orthogonal Triangularization) (Serena)~~
      * ~~Resolve issue with output~~
    - Givens Rotations (Address why we aren’t using this)
* ~~Show which model best fits data~~
  + ~~Determine metrics for measuring best fit~~
    - ~~||b - Ax||~~
    - ~~||b-Ax||^2 ?~~
    - [~~https://www.mathworks.com/help/matlab/ref/qr.html~~](https://www.mathworks.com/help/matlab/ref/qr.html)
      * ~~Equation for solving X~~
* ~~???Look at condition numbers???~~
  + Solidify understanding of how condition number comes into play
  + ~~Address the question about adding noise~~

Things to Do:

* ~~Make data usable~~
* ~~Write code/find code to implement each algorithm~~
* ~~Apply each algorithm~~
* Measure fit of each model
* Make sure everyone understands the code
* Make sure everyone understands the math
* Anticipate questions
* Create presentation
* Practice presentation
* Finish code
  + Finish explanation
  + Finish presentation

| Sun | Mon | Tue | Wed | Thur | Fri | Sat |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | 11/19 | 11/20 |
| 11/21   * Data is ready to go * Plot the data | 11/22   * Confirm algorithms & approach + K(A) | 11/23 | 11/24 | 11/25 | 11/26 | 11/27 |
| 11/28 | 11/29   * Ensure code works | 11/30 | 12/1   * Confirm explanations * Determine which model fits the best * Make presentation | 12/2 | 12/3  **MUST FINISH PRESENTATION**   * Anticipate and practice questions | 12/4 |
| 12/5 | 12/6 | 12/7 | 12/8 | 12/9 | 12/10 | 12/1 |
|  |  |  |  |  |  |  |

**Useful Links:**

Function Fitting

QR Decomposition

https://blogs.mathworks.com/cleve/2016/07/25/compare-gram-schmidt-and-householder-orthogonalization-algorithms/

Householder Matlab code: <https://www.cs.cornell.edu/~bindel/class/cs6210-f09/lec18.pdf>

<https://www.physicsforums.com/threads/best-fit-curve-using-q-r-factorization.499210/>

<https://en.wikipedia.org/wiki/Numerical_methods_for_linear_least_squares#Orthogonal_decomposition_methods>

<https://www.youtube.com/watch?v=OCLFZwi40nM&ab_channel=LAFFLinearAlgebra-FoundationstoFrontiers%28www.ulaff.net%29>

Least squares with QR Decomposition: <https://johnwlambert.github.io/least-squares/>

SVD