

The file *USpopulation.txt* contains the US population (in millions) taken from the decennial census from 1900 to 2010. You previously solved a learning problem with this data using the monomials. Now we will solve a learning problem in a different basis.

- (a) Transform the time variable so that $\tau = -1$ at year 1900 and $\tau = 1$ at year 2010
- (b) Create a design matrix using the first eleven Legendre Polynomials
- (c) Solve the learning problem 11 times, starting with using only the leftmost column in your design matrix in the solution and increasing the number of columns until you have used the full matrix. Report the sum of squared error, the predicted population in 2020, and the condition number of the design matrix. What do you notice?