AM 213A HW3

Joseph Moore

Winter 2022

Part 1

1.

- We can show that a positive definite matrix can be written as lower triangular matrix multiplied by its conjugate transpose. We end up with the equations 2.82 and 2.83. We've seen before how $Ax = b$ can easily be solves with substitution if A is triangular. Using this fact we have

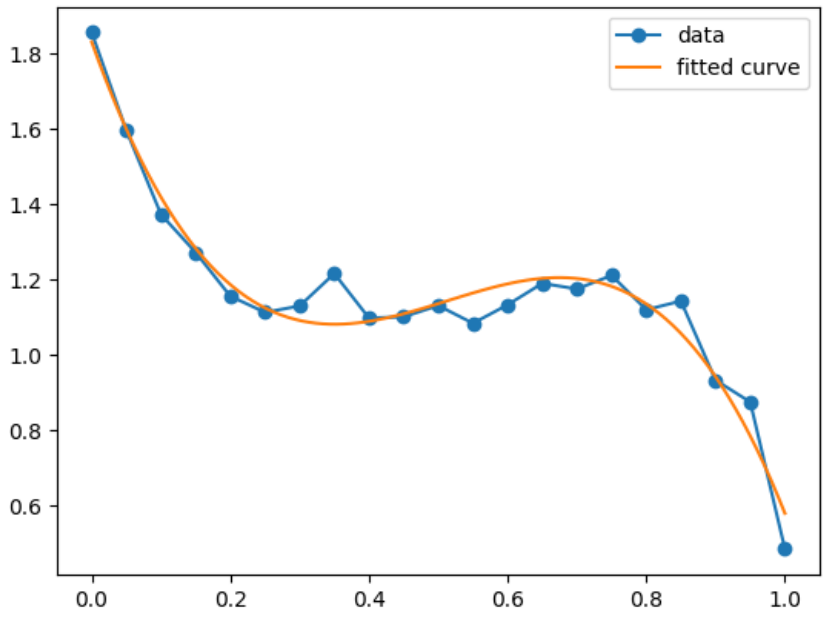
$$A^T Ax = A^T b = \tilde{A}x = \tilde{b} = LL^* x = \tilde{b}.$$

Then we solve $Ly = \tilde{b}$ for y and then $L^* x = y$ for x which is the solution to our original equation.

- The resulting equation for the third degree polynomial fit is

$$f(x) = 1.83 - 5.17x + 11.2x^2 - 7.28.$$

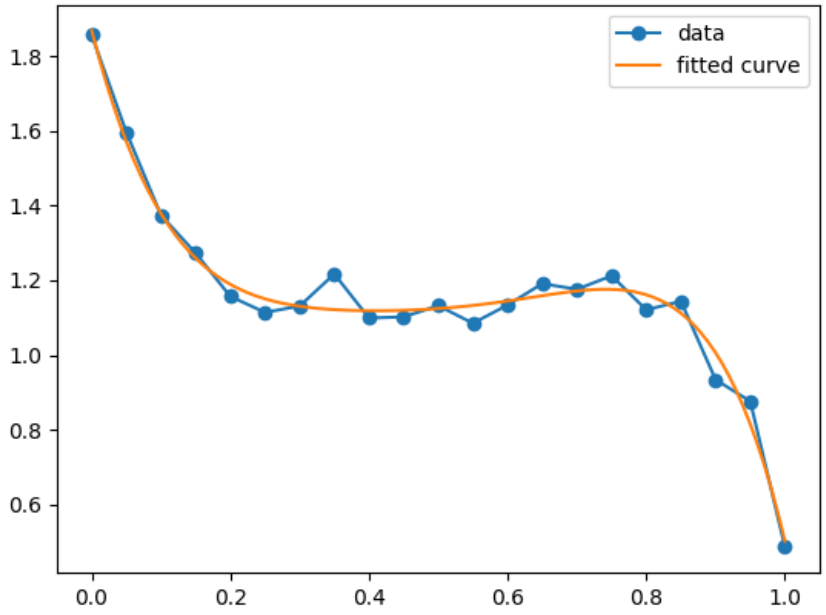
The 2-norm of the resulting error $E = ||b - Ax|| = 6.98 \cdot 10^{-6}$. Below is the resulting fitted curve.



- The resulting equation for the fifth degree polynomial fit is

$$f(x) = 1.87 - 7.25x + 28.8x^2 - 58.7x^3 + 71.0x^4 - 25.2x^5.$$

The 2-norm of the resulting error $E = ||b - Ax|| = 2.84 \cdot 10^{-5}$. Below is the resulting fitted curve.



- single precision floats only store numbers from 10^{-38} up to 10^{38}

2.