

Introduction of Polyfit function in MATLAB

TA

Name: LIN, YI-HSUAN

Email: linyh@solab.me.ntu.edu.tw

Syntax & Description

1. `p = polyfit(x,y,n)`

- Returns the coefficients for a polynomial $p(x)$ of degree n that is a best fit (in a least-squares sense) for the data in y .
- The coefficients in p are in descending powers, and the length of p is $n+1$.
- $p(x) = p_1x^n + p_2x^{n-1} + \dots + p_nx + p_{n+1}$.

2. `[p,S] = polyfit(x,y,n)`

- Returns a structure S that can be used as an input to `polyval` to obtain error estimates.

3. `[p,S,mu] = polyfit(x,y,n)`

- `mu(1)` is `mean(x)`, and `mu(2)` is `std(x)`.
- Using these values, `polyfit` centers x at zero and scales it to have unit standard deviation, $\hat{x} = \frac{x - \bar{x}}{\sigma_x}$

Example: Fit Polynomial to Set of Point (1/2)

- Create a vector of 5 equally spaced points in the interval $[0,1]$, and evaluate $y(x)=1/(1+x)$ at those points.
- Fit a polynomial of degree 4 to the 5 points.
- Evaluate the original function between 0 and 2.
- Evaluate the polynomial fit on a finer grid of points between 0 and 2.

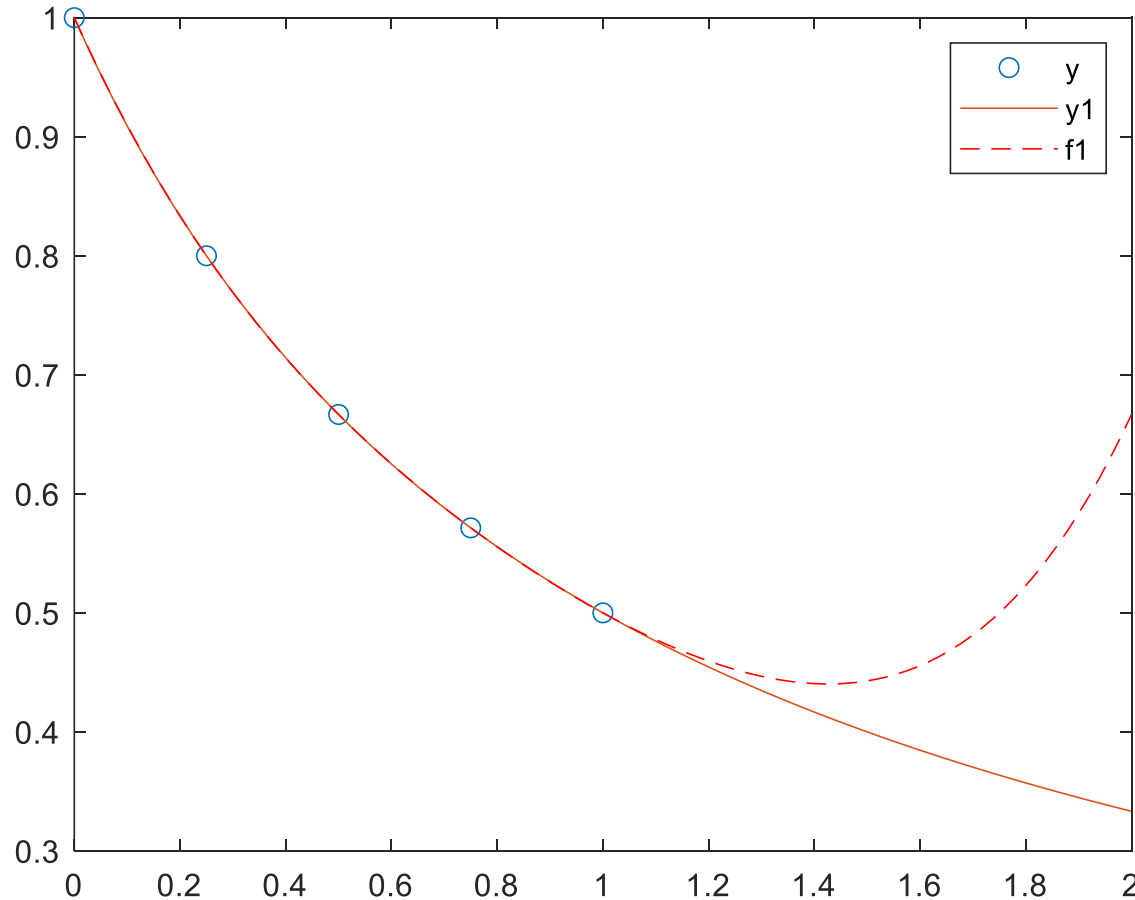
```
4 | x = linspace(0,1,5);  
5 | y = 1./(1+x);
```

```
9 | p = polyfit(x,y,4);
```

```
12 | x1 = linspace(0,2);  
13 | y1 = 1./(1+x1);
```

```
14 | f1 = polyval(p,x1);
```

Example: Fit Polynomial to Set of Point (2/2)



The polynomial fit is good in the original $[0,1]$ interval, but quickly diverges from the fitted function outside of that interval.

Reference

1. <https://www.mathworks.com/help/matlab/ref/polyfit.html#bufeks8-1>