

5. Hafta-3

İnterpolasyon



Verilen $\{x_i, y_i\}, i=1,2,\dots,N$ N data noktası için x noktalarında $y=f(x)$ interpolasyon değerlerini bulalım.

```
% prosedür
```

```
xi = [x1,x2,...,xN];
```

```
yi = [y1,y2,...,yN];
```

```
y = interp1(xi,yi,x,metod);
```

```
y = spline(xi,yi,x);
```

```
y = pchip(xi,yi,x);
```

```
>> doc interp1
```

```
>> doc spline
```

```
>> doc pchip
```

```
>> doc interp2
```

```
metod = 'linear'
```

```
'spline'
```

```
'pchip'
```

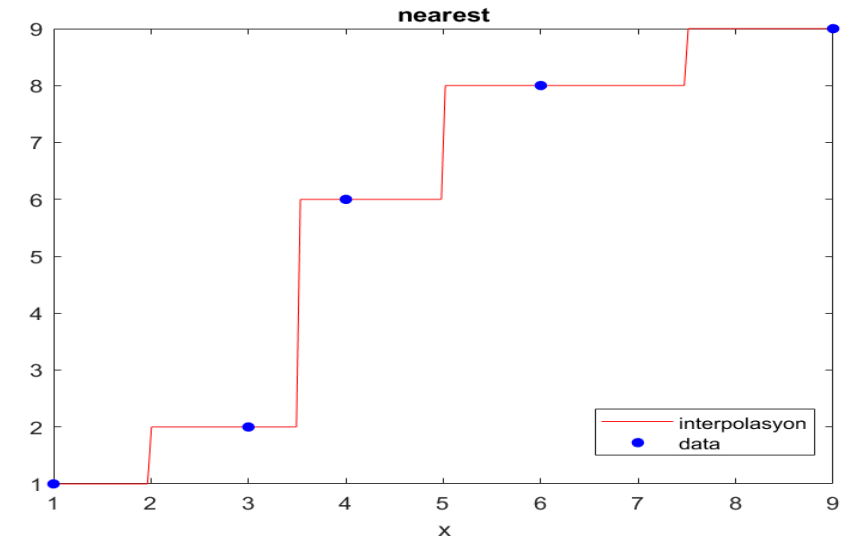
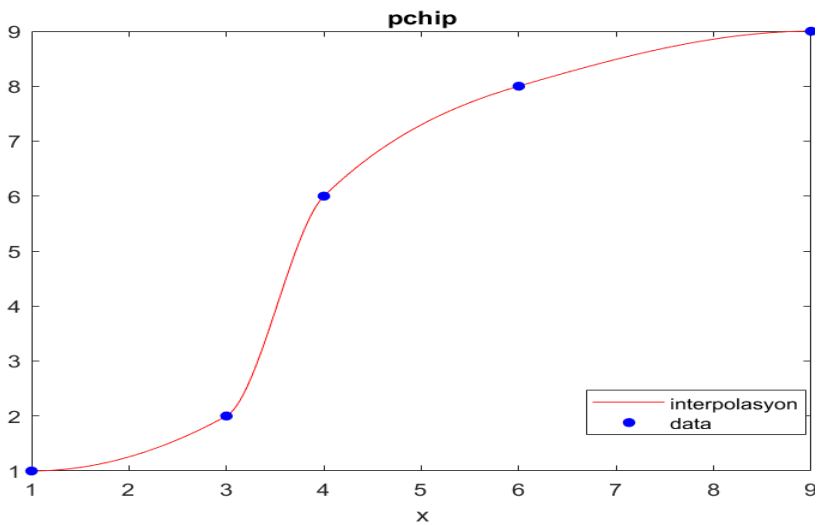
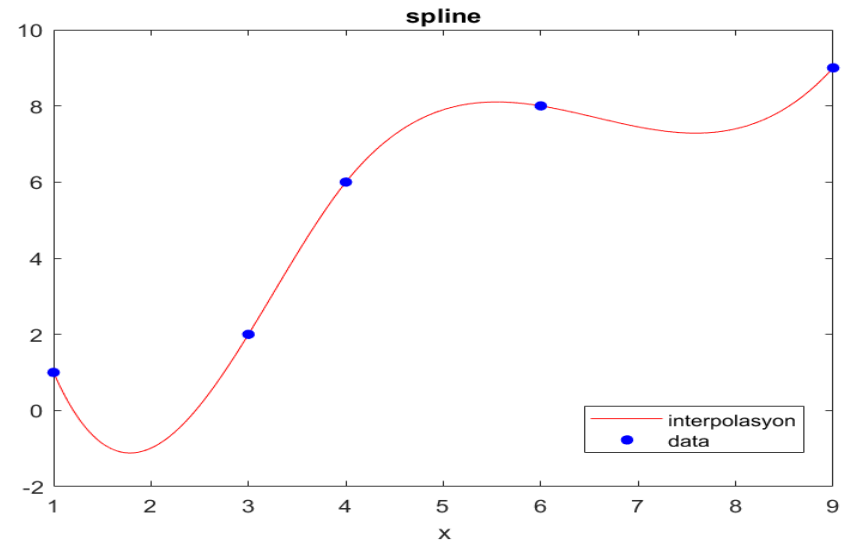
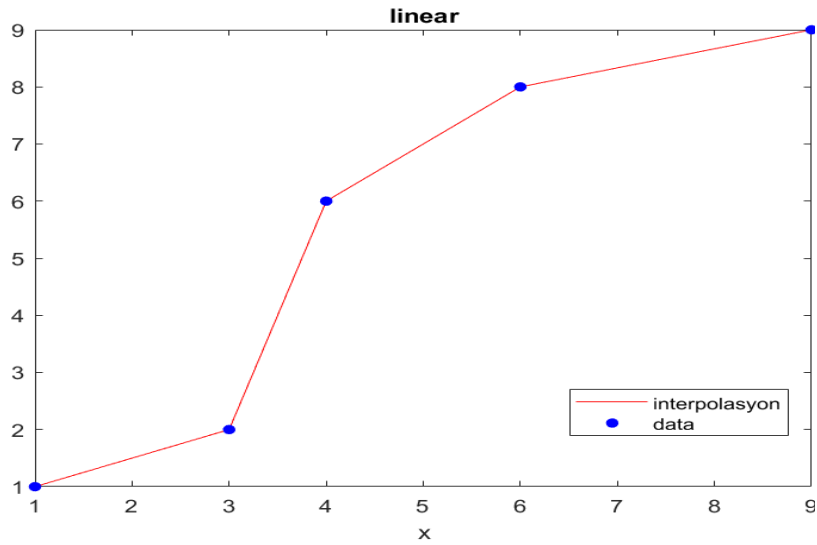
```
'nearest'
```

Varsayılan

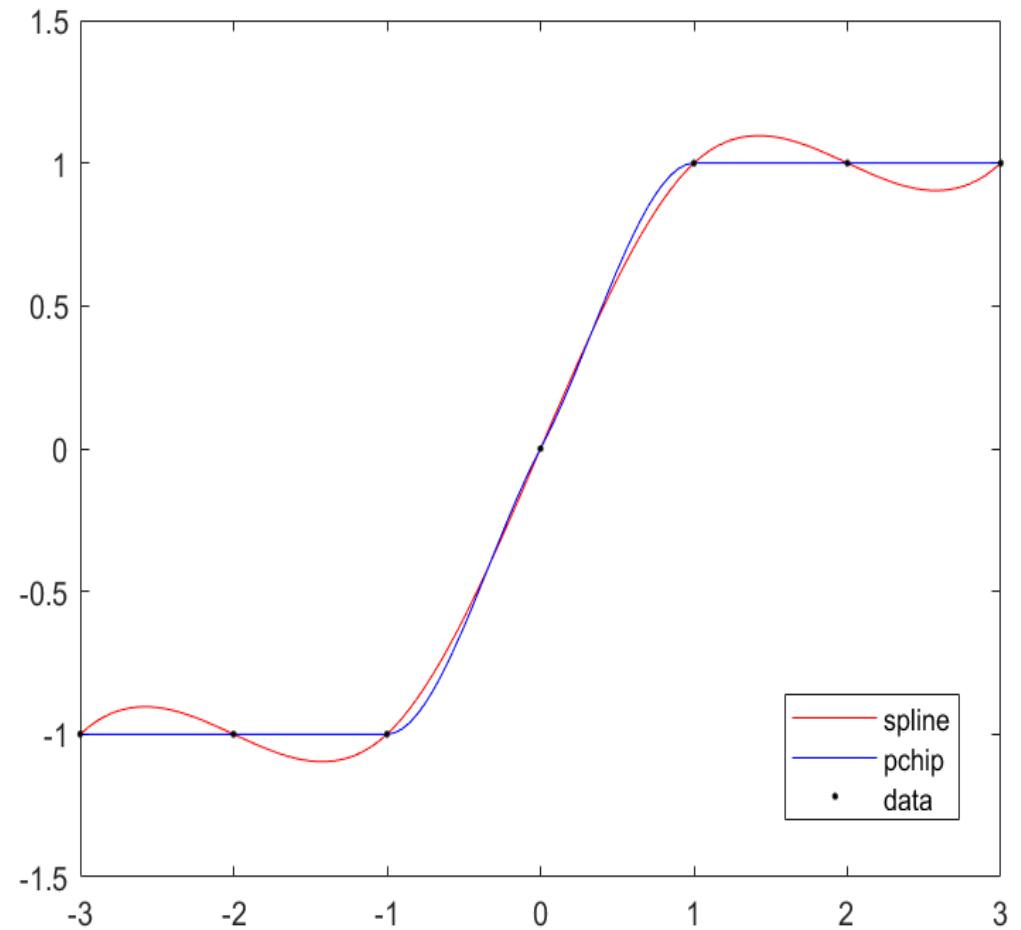
Kübik spline

Parçalı kübik Hermite

interpolasyon polinomu



```
xi = -3:3;  
yi = sign(xi);  
  
x = linspace(-3,3,121);  
  
ys = spline(xi,yi,x);  
yp = pchip(xi,yi,x);  
  
plot(x,ys,'r-',...  
      x,yp,'b-',...  
      xi,yi,'k.');
```



interp1 birden fazla sütun için de interpolasyon yapabilir.

aylar

m

y1

y2

y3

yıllar

olmayan
değerler

2

3

4

5

6

7

8

9

10

11

12

27.0

35.5

37.3

40.1

46.4

40.2

61.4

59.5

65.8

77.8

77.4

75.8

71.6

69.5

64.2

40.8

39.0

35.9

aylık
sıcaklıklar

```
Ti = [27.0    35.5    37.3  
      40.1    46.4    40.2  
      61.4    59.5    65.8  
      77.8    77.4    75.8  
      71.6    69.5    64.2  
      40.8    39.0    35.9];    % verilen datalar  
  
mi = [1 3 5 7 9 12]';           % gözlenen aylar  
m = [1:12]';                   % tüm aylar  
  
T = interp1(mi,Ti,m);           % lineer interpolasyon  
% T = interp1(mi,Ti,m,'spline') % spline
```

```
fprintf('  m      y1      y2      y3\n');  
fprintf('  -----\n');  
fprintf(' %2d    %4.1f    %4.1f    %4.1f\n', [m, T] ');
```

m	y1	y2	y3

1	27.0	35.5	37.3
2	33.5	41.0	38.8
3	40.1	46.4	40.2
4	50.8	53.0	53.0
5	61.4	59.5	65.8
6	69.6	68.5	70.8
7	77.8	77.4	75.8
8	74.7	73.5	70.0
9	71.6	69.5	64.2
10	61.3	59.3	54.8
11	51.1	49.2	45.3
12	40.8	39.0	35.9

**interpolasyon
değerleri**

`% prosedür`

`xi = [x1,x2,...,xN];`

`yi = [y1,y2,...,yN];`

`Z = interp2(xi,yi,Zi,x,y)`

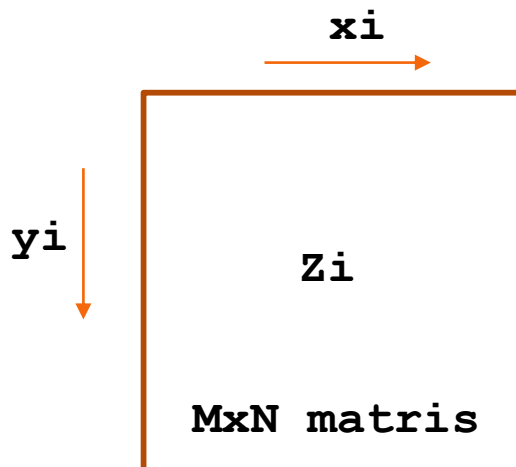
`% [Xi,Yi] = meshgrid(xi,yi);`

`% Z = interp2(Xi,Yi,Zi,x,y);`

**interp2 ile 2 boyutlu
interpolasyon**

xi, yi meshgrid'e geçirilir

**Sıklıkla görüntülerin
interpolasyonunda kullanılır.**



xi = satırlar

yi = sütunlar

x,y = tek noktalar ya da x = satır,

y = sütun ya da meshgrid(x,y)

matrisi olabilir

olmayan
değerler

m	1971	1972	1973	1974	1975
1	27.0		35.5		37.3
2					
3	40.1		46.4		40.2
4					
5	61.4		59.5		65.8
6					
7	77.8		77.4		75.8
8					
9	71.6		69.5		64.2
10					
11					
12	40.8		39.0		35.9

```
Ti = [27.0    35.5    37.3  
      40.1    46.4    40.2  
      61.4    59.5    65.8  
      77.8    77.4    75.8  
      71.6    69.5    64.2  
      40.8    39.0    35.9]; % verilen datalar  
  
mi = [1 3 5 7 9 12]'; % gözlenen aylar  
m = [1:12]'; % tüm aylar  
  
yi = [1971, 1973, 1975]; % gözlenen yıllar  
y = 1971:1975; % tüm yıllar  
  
T = interp2(yi,mi,Ti,y,m); % lineer interpolasyon
```

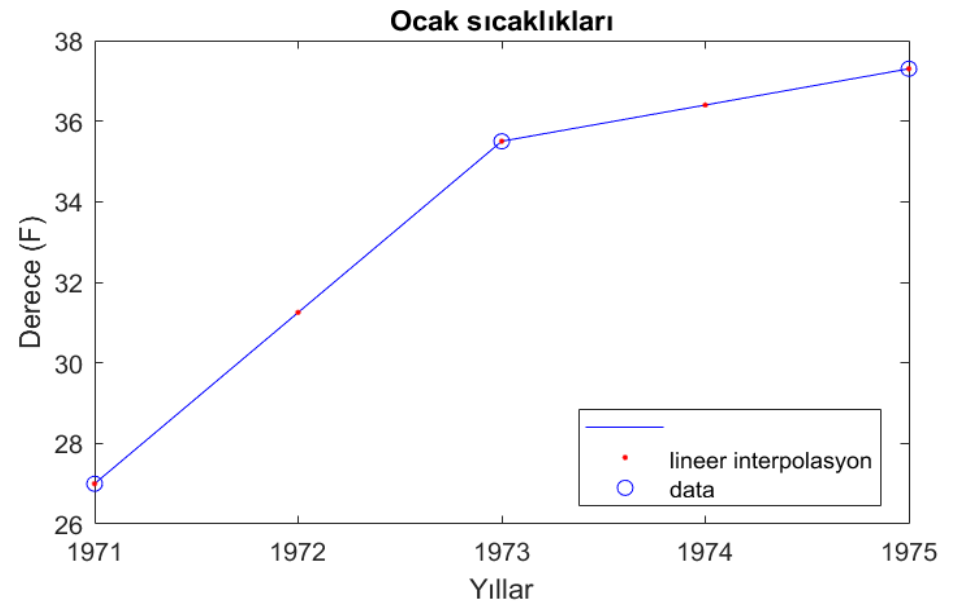
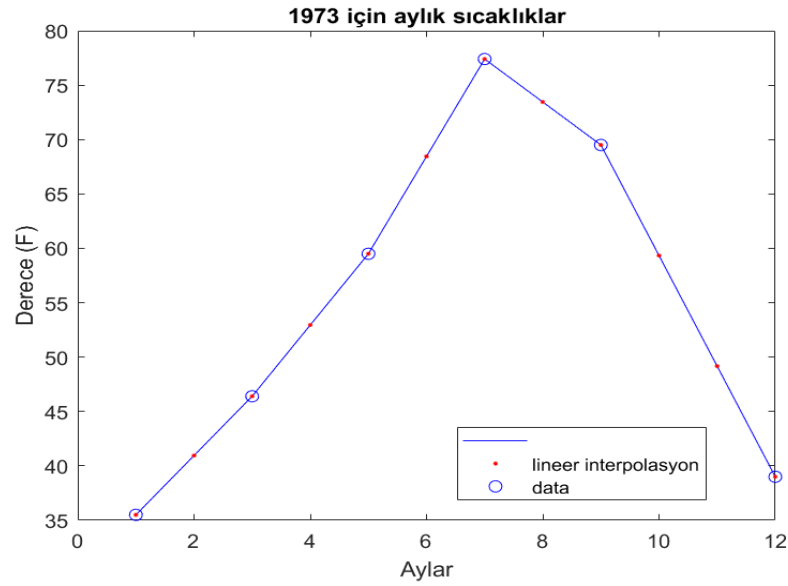
sütun

satır

```
fprintf(' m    1971    1972    1973    1974    1975\n');
fprintf(' -----\n');
fprintf(' %2d    %4.1f    %4.1f    %4.1f    %4.1f    %4.1f\n', [m, T] ');
```

m	1971	1972	1973	1974	1975
1	27.0	31.3	35.5	36.4	37.3
2	33.5	37.3	41.0	39.8	38.8
3	40.1	43.3	46.4	43.3	40.2
4	50.8	51.9	53.0	53.0	53.0
5	61.4	60.5	59.5	62.6	65.8
6	69.6	69.0	68.5	69.6	70.8
7	77.8	77.6	77.4	76.6	75.8
8	74.7	74.1	73.5	71.7	70.0
9	71.6	70.5	69.5	66.8	64.2
10	61.3	60.3	59.3	57.1	54.8
11	51.1	50.1	49.2	47.3	45.3
12	40.8	39.9	39.0	37.5	35.9

**interpolasyon
değerleri**



**2 boyutlu interpolasyon iki adet interp1 ile de yapılabilir:
Önce sütunlar için sonra da satırlar için interpolasyon yapılır.**

```
Ti = [27.0    35.5    37.3  
      40.1    46.4    40.2  
      61.4    59.5    65.8  
      77.8    77.4    75.8  
      71.6    69.5    64.2  
      40.8    39.0    35.9]; % verilen datalar  
  
mi = [1 3 5 7 9 12]'; % gözlenen aylar  
m = [1:12]'; % tüm aylar  
  
T1 = interp1(mi,Ti,m); % sütunların interpolasyonu  
  
yi = [1971, 1973, 1975]; % gözlenen yıllar  
y = 1971:1975; % tüm yıllar  
  
T = interp1(yi,T1',y)'; % lineer interpolasyon
```

Data düzeltme

```
ys = smooth(y);  
ys = smooth(y, span);  
ys = smooth(y, metod);  
ys = smooth(y, span, metod);
```

```
metod = 'moving'      (varsayılan, span=5)  
        'loess'       , 'rloess'  
        'lowess'      , 'rloess'  
        'sgolay'
```

$$y(n) = \frac{x(n-2) + x(n-1) + x(n) + x(n+1) + x(n+2)}{5}$$

$$y(n) = \frac{x(n-M) + \dots + x(n) + \dots + x(n+M)}{2M + 1}$$

Küresel sıcaklık bilgisi



```
A = load('taveGL2v.dat');  
t = A(:,1); y = A(:,end);  
ys = smooth(y,15);  
figure; plot(t,y,'r:', t,ys,'b-');  
ys = smooth(y,25);  
figure; plot(t,y,'r:', t,ys,'b-');  
ys = smooth(y,0.2,'loess');  
figure; plot(t,y,'r:', t,ys,'b-');  
ys = smooth(y,0.3,'loess');  
figure; plot(t,y,'r:', t,ys,'b-');
```

