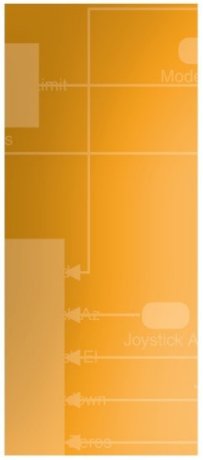
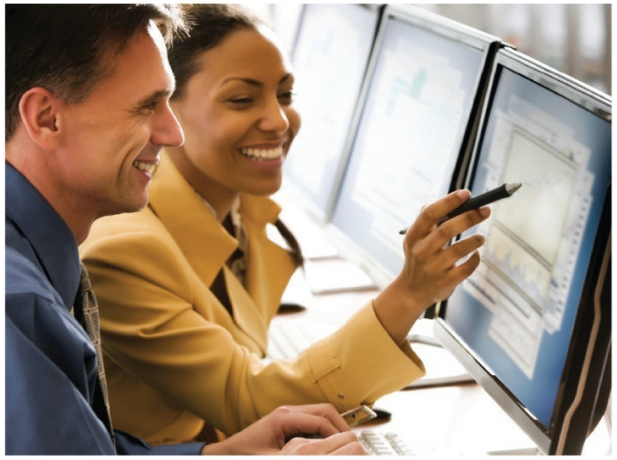
Analysis and Visualization with Matrices

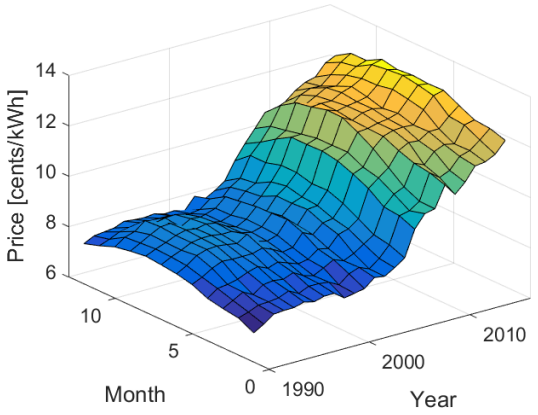
MATLAB® Fundamentals for Aerospace Applications

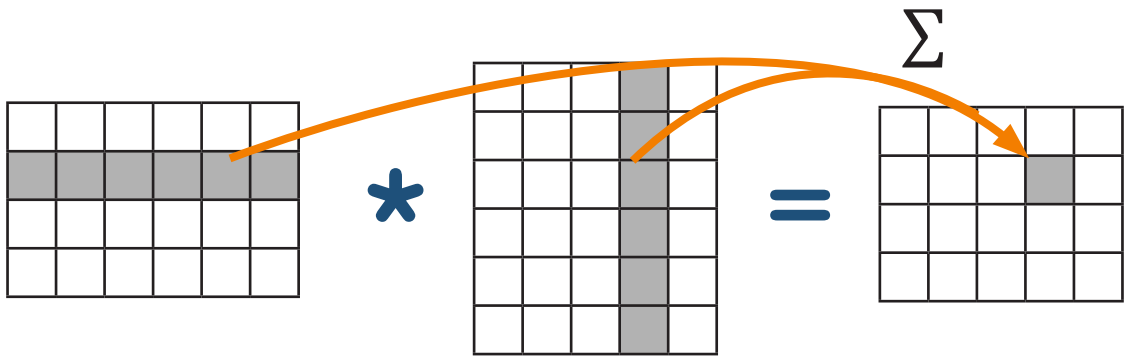




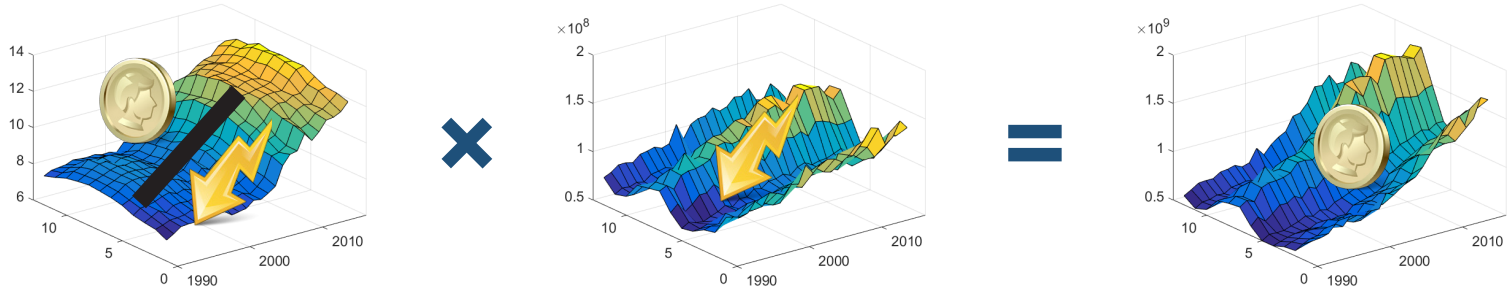
Outline

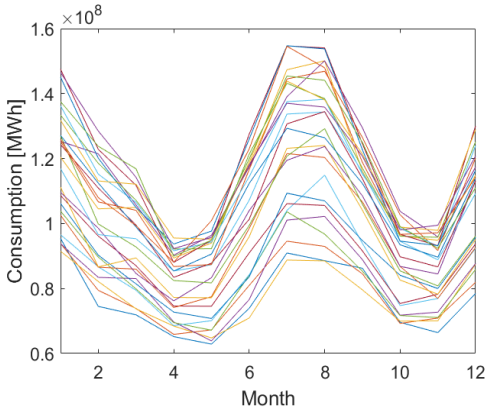
- Creating and manipulating matrices
- Calculations with matrices
- Statistics with matrices of data
- Matrix visualization

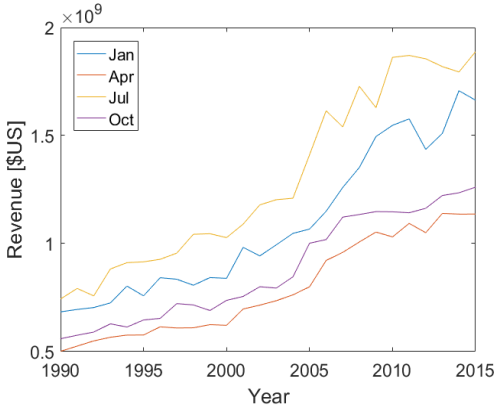




Course Example: Electricity Consumption







Concatenating Arrays

A

2	3
5	7
11	13

B

-1	1
1	-1

C

0
8
0

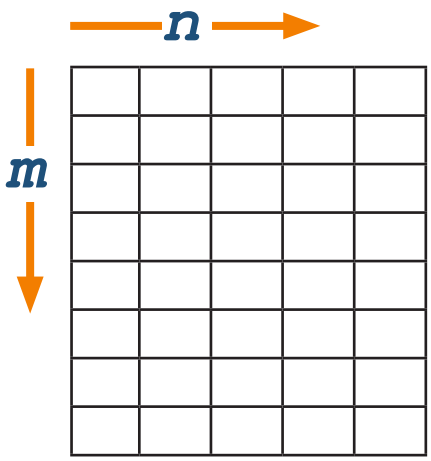
```
X = [A;B]
```

2	3
5	7
11	13
-1	1
1	-1

```
Y = [A,C]
```

2	3	0
5	7	8
11	13	0

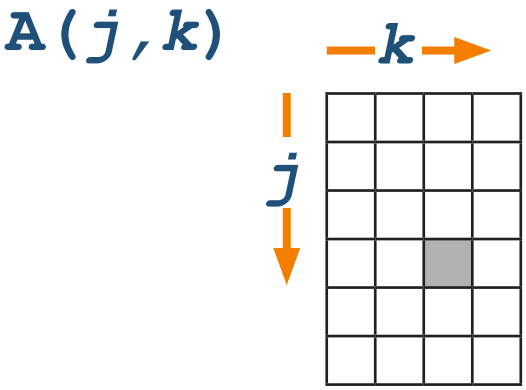
Creating Matrices with Functions

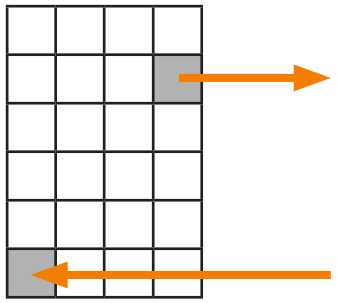



```
A = fun(m,n);
```

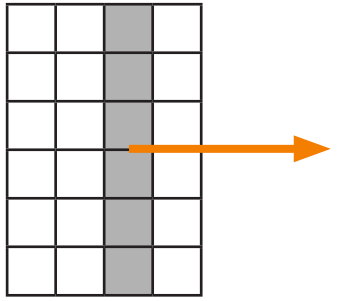
compan	pascal
eye	rand
gallery	randn
hadamard	rosser
hankel	toeplitz
hilb	vander
invhilb	wilkinson
magic	zeros
ones	

Accessing Data in Matrices





```
x = A(2,end)
A(end,1) = x
```

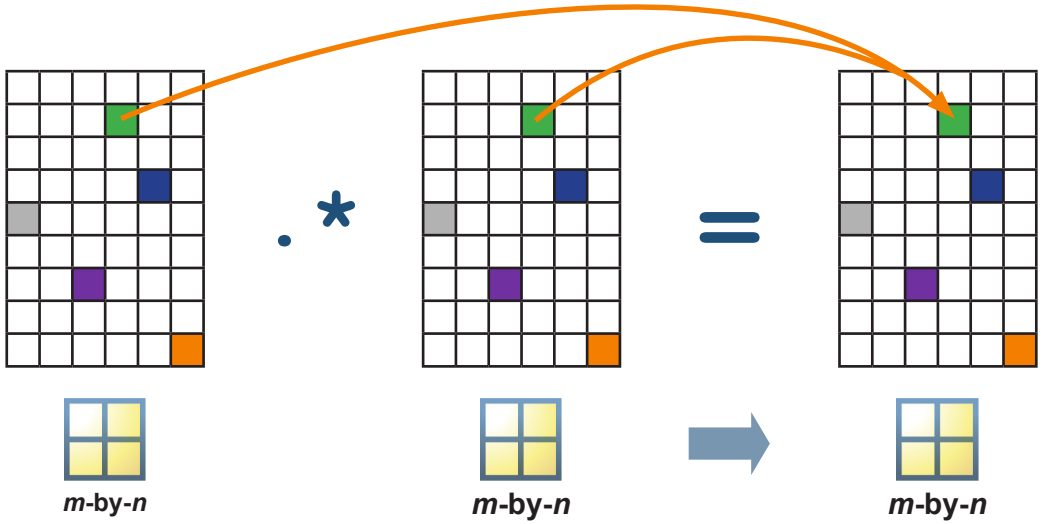


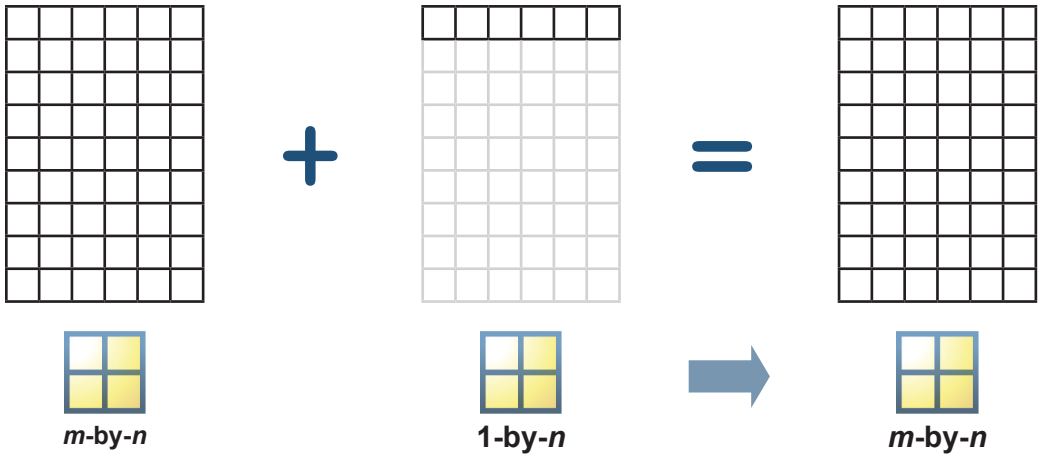
```
x = A(1:6,3)
x = A(1:end,3)
x = A(:,3)
```

Matrix Operations

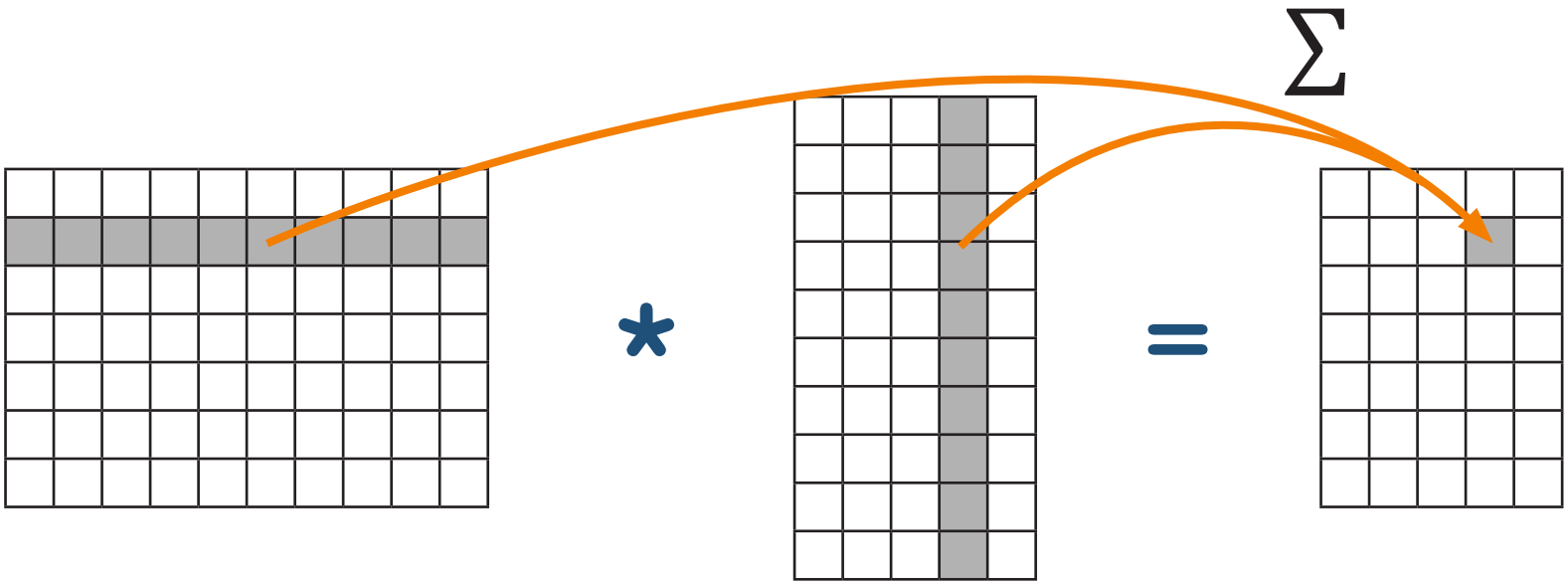
```
priceDMWh = price*10
```

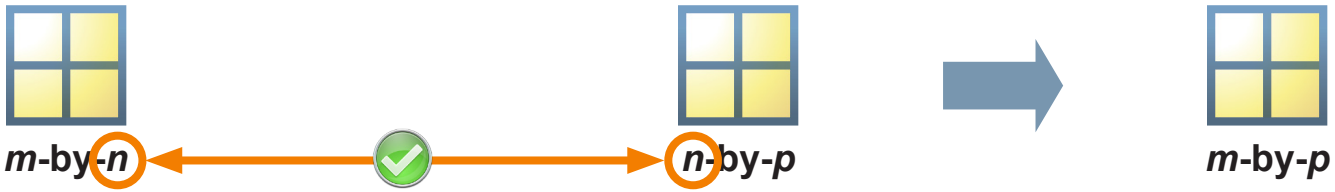
Array Operations





Matrix Mathematics



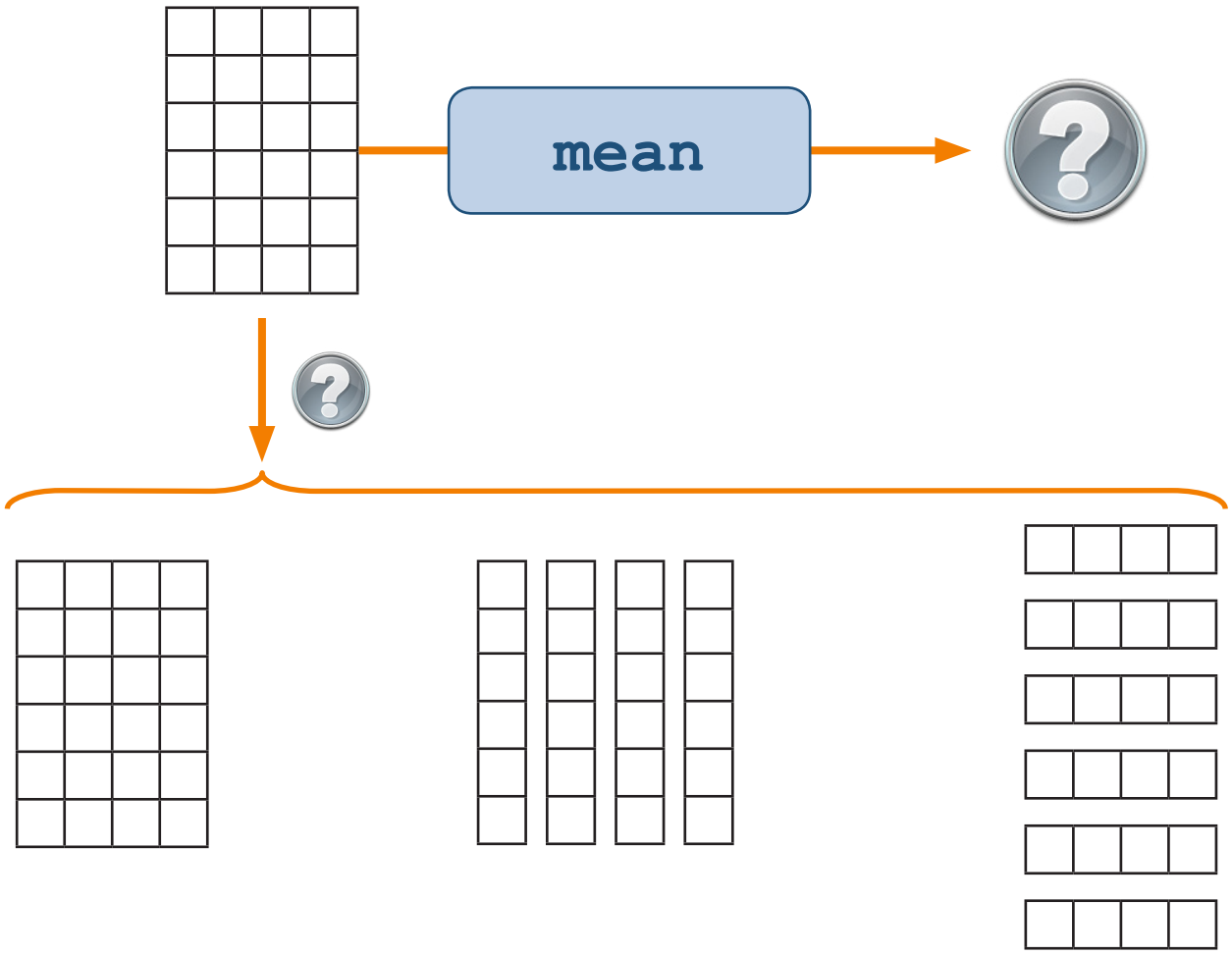


Mathematical Functions

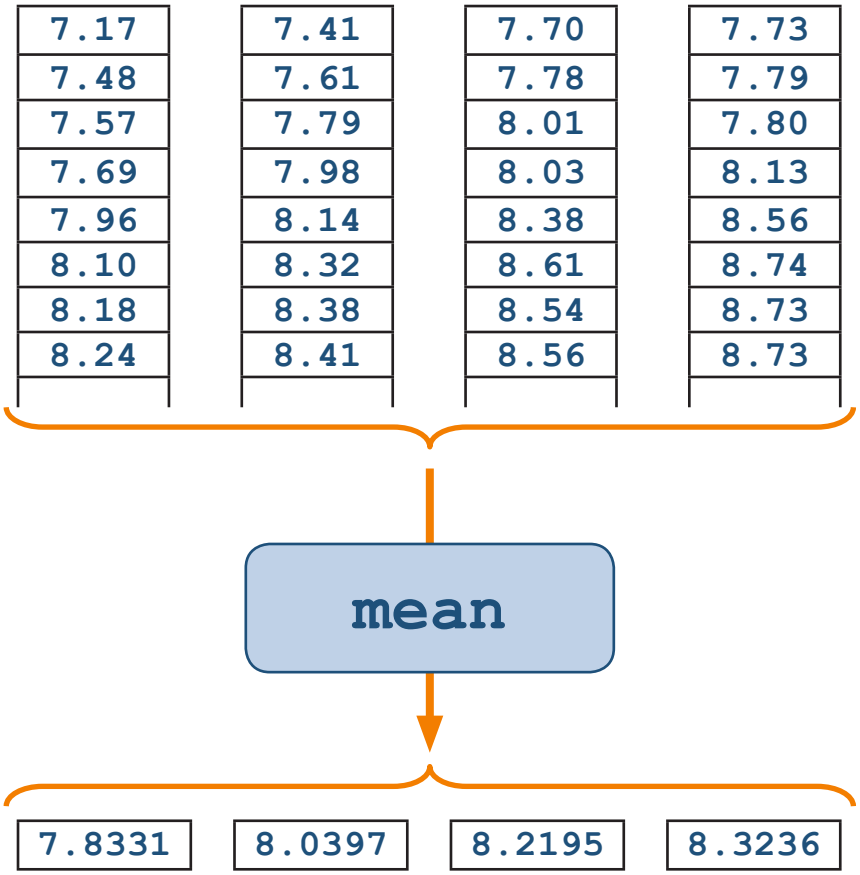
"Vectorized"

```
sin
sind
sinh
asin
exp
log
log2
log10
sqrt
nthroot
abs
angle
floor
ceil
round
mod
```

Data in the MATLAB® Environment



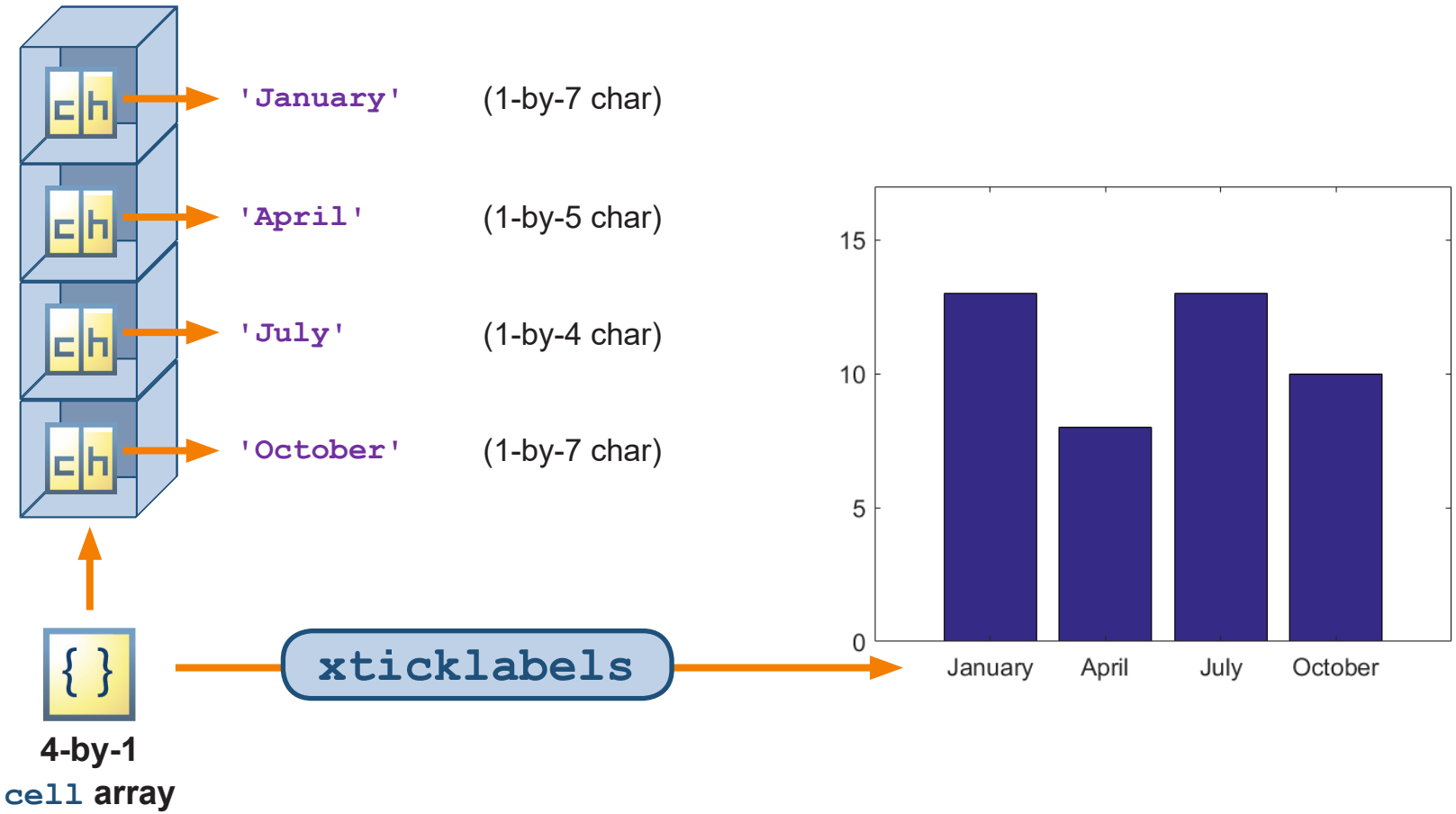
Statistical Operations




```
max
min
mean
median
std
sum
prod
diff
gradient
cumsum
cumprod
corrcoef
cov
```

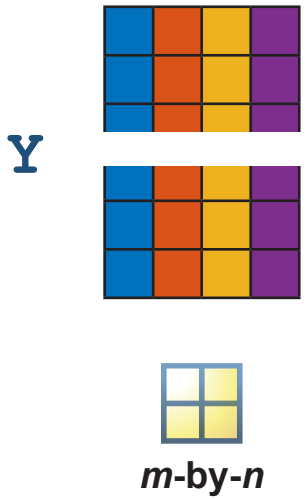
Creating Arrays of Text

```
Q = {'January';'April';'July';'October'};
```

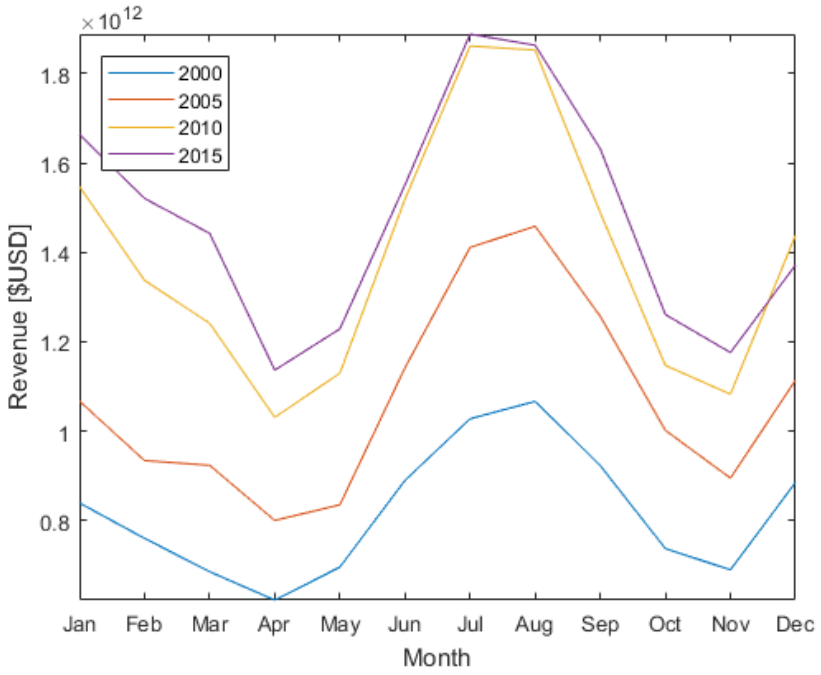


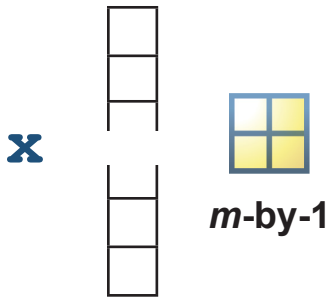
Plotting Multiple Columns

```
plot(x,Y)
```



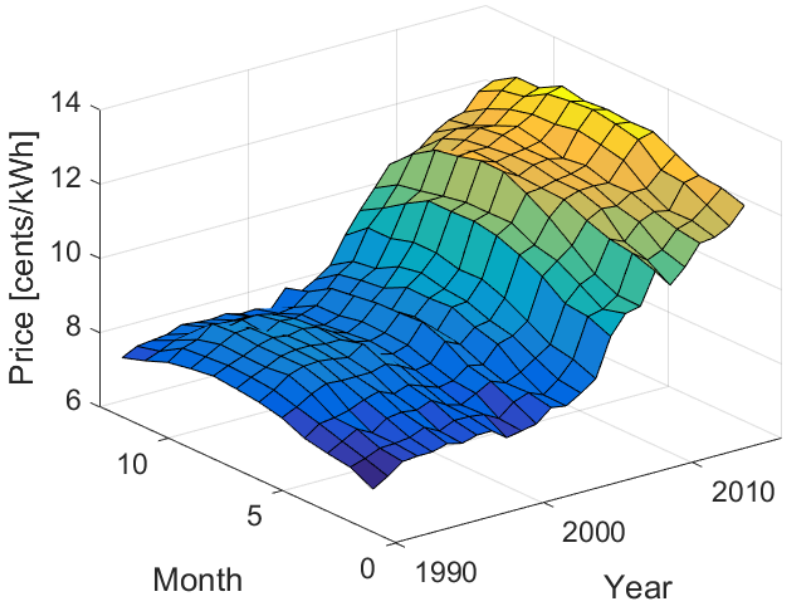
n plots





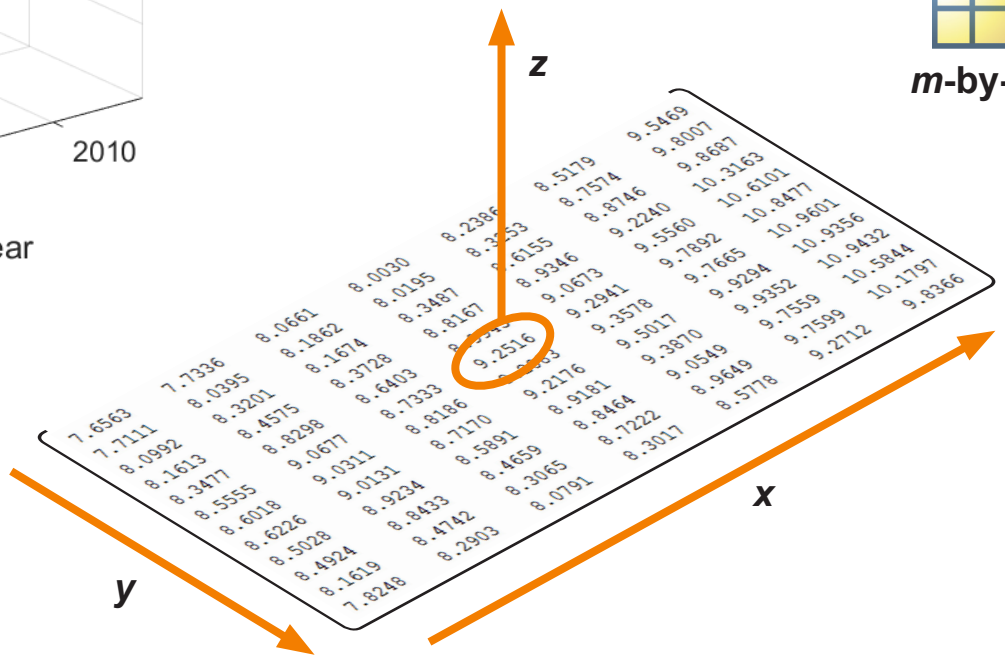
Matrix Visualization

```
surf(yr,mth,price)
```




```
price
```

m-by-*n*



Reshaping

	1990	1991	1992	1993
Jan	7.17	7.41	7.70	7.73
Feb	7.48	7.61	7.78	7.79
Mar	7.57	7.79	8.01	7.80
Apr	7.69	7.98	8.03	8.13
May	7.96	8.14	8.38	8.56
Jun	8.10	8.32	8.61	8.74
Jul	8.18	8.38	8.54	8.73
Aug	8.24	8.41	8.56	8.73

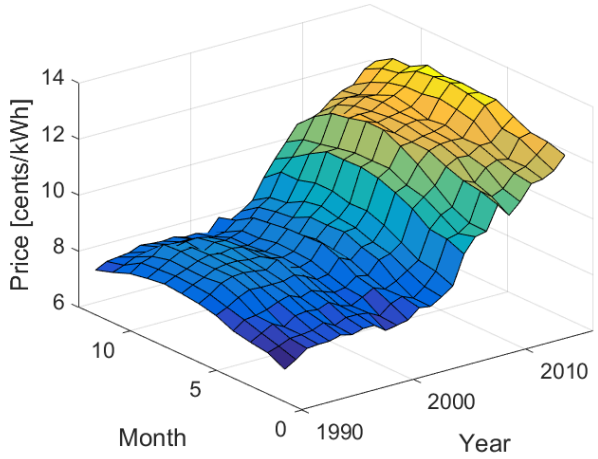
m-by-*n*

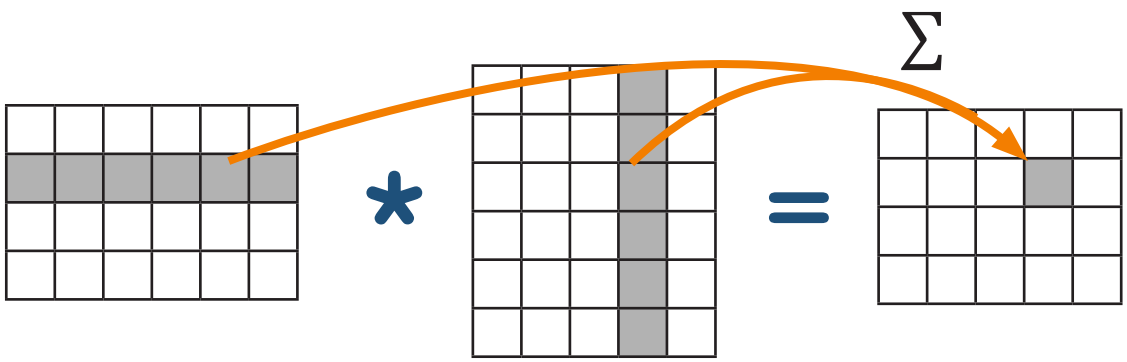
7.17
7.48
7.57
7.69
7.96
8.10
8.18
8.24
...
...
7.41
7.61
7.79
7.98
8.14
8.32
8.38
8.41
...
...
7.70
7.78
8.01
8.03
8.38
...

mn-by-1

Summary

- Creating and manipulating matrices
- Calculations with matrices
- Statistics with matrices
- Matrix visualization





Test Your Knowledge

1. (Select all that apply): Given a 2-by-3 matrix `A` and a 3-by-2 matrix `B`, which of the following operations are valid?

   A. `A+B`

   B. `A.+B`

   C. `A*B`

   D. `A.*B`

2. If `A` is a 15-by-7 matrix, which of the following commands will result in five line plot on the same axes?

   A. `plot(A)`

   B. `plot(A(:,3:end))`

   C. `plot(A(11:end,:))`

   D. `plot(A(2:6))`