Tables

MATLAB® Programming Techniques

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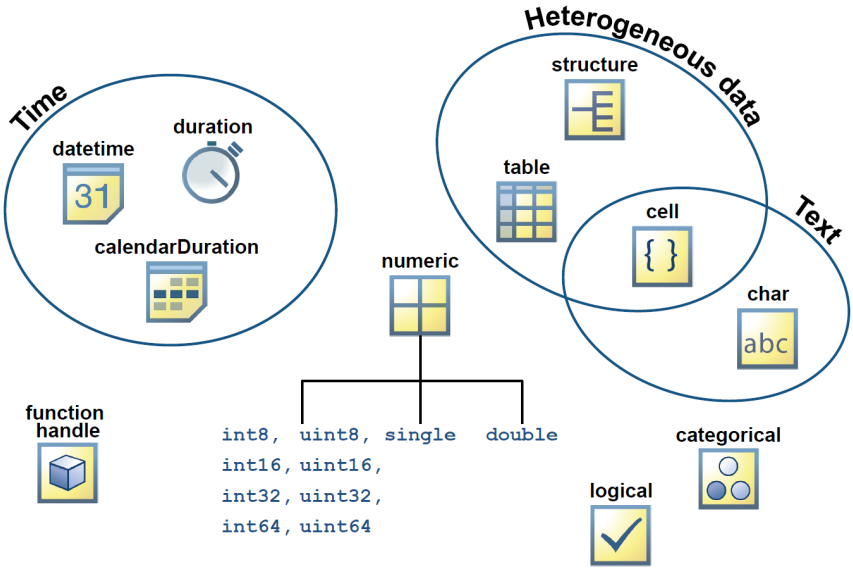
What are MATLAB data types?



What are tables?

- Table are used to store **heterogeneous data**

6-by-5

Number	Price	Fruit	Quality	Date
7	3.14	apple	good	Jan 19
6	1.41	orange	bad	Mar 13
2	6.66	banana	great	Oct 21
0	1.23	pear	bad	Jun 23
-3	4.20	aardvark	meh	Dec 25
5	0.99	guava	great	Jul 03

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>> x(4:end,{'Number','Price'})
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>> x{4:end,{'Number','Price'}}
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- Each column has a **unique name**

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- Columns can be of **different data types**

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What are tables?

- Table are used to store **heterogeneous data**
- Each column has a **unique name**
- Columns can be of **different data types**
- All column elements need to be of a **single type**
- Elements can be **accessed by column names**

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Number	Price	Fruit	Quality	Date
7	3.14	apple	good	Jan 19
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How do I create a table?

- `mytable = readtable('filename.xls')`

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- `mytable = readtable('filename.xls')`
- `patients = table(Age, Gender, Height, Weight, Smoker, 'RowNames', LastName)`

```
patients =
```

	Age	Gender	Height	Weight	Smoker
Smith	38	'Male'	71	176	true
Johnson	43	'Male'	69	163	false
Williams	38	'Female'	64	131	false
Jones	40	'Female'	67	133	false
Brown	49	'Female'	64	119	false
Davis	46	'Female'	68	142	false
Miller	33	'Female'	64	142	true
Wilson	40	'Male'	68	180	false
Moore	28	'Male'	68	183	false
Taylor	31	'Female'	66	132	false
Anderson	45	'Female'	68	128	false
Thomas	42	'Female'	66	137	false
Jackson	25	'Male'	71	174	false

How do I access elements in a table?

- `patients(3,4)`

`patients =`

	Age	Gender	Height	Weight	Smoker
Smith	38	'Male'	71	176	true
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Thomas	42	'Female'	66	137	false
Jackson	25	'Male'	71	174	false

How do I access elements in a table?

- `patients(3,4)`
- `patients('Williams', 'Weight')`

`patients =`

	Age	Gender	Height	Weight	Smoker
Smith	38	'Male'	71	176	true
Johnson	43	'Male'	69	163	false
Williams	38	'Female'	64	131	false
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Davis	46	'Female'	68	142	false
Miller	33	'Female'	64	142	true
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Taylor	31	'Female'	66	132	false
Anderson	45	'Female'	68	128	false
Thomas	42	'Female'	66	137	false
Jackson	25	'Male'	71	174	false

How do I access elements in a table?

- `patients.Height`

`patients =`

	Age	Gender	Height	Weight	Smoker
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Jackson	25	'Male'	71	174	false

How do I access elements in a table?

- `rows = {'Williams', 'Brown'}`
  `patients(rows, :)`

```
patients =
```

	Age	Gender	Height	Weight	Smoker
Smith	38	'Male'	71	176	true
Johnson	43	'Male'	69	163	false
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Brown	49	'Female'	64	119	false
Davis	46	'Female'	68	142	false
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Taylor	31	'Female'	66	132	false
Anderson	45	'Female'	68	128	false
Thomas	42	'Female'	66	137	false
Jackson	25	'Male'	71	174	false

How do I change variable names?

- `patients.Properties.VariableNames{'Gender'} = 'Sex'`

patients =

	Age	Sex	Height	Weight	Smoker
Smith	38	'Male'	71	176	true
Johnson	43	'Male'	69	163	false
Williams	38	'Female'	64	131	false
Jones	40	'Female'	67	133	false
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Anderson	45	'Female'	68	128	false
Thomas	42	'Female'	66	137	false
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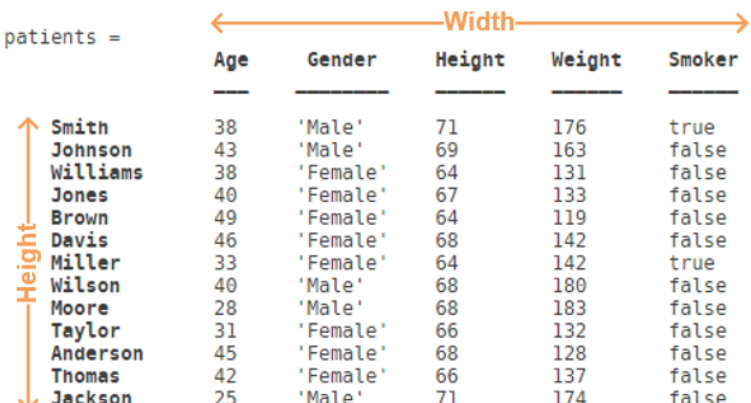
How do I get the size of a table?

- `size(patients)`
- `height(patients)`
- `width(patients)`



patients =

	Age	Gender	Height	Weight	Smoker
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Jackson	25	'Male'	71	174	false

How do I sort rows?

- `sortrows(patients, 'Age')`

	Age	Sex	Height	Weight
Jackson	25	'Male'	71	174
Hall	25	'Male'	70	189
Young	25	'Female'	63	114
Hill	25	'Female'	64	138
James	25	'Male'	66	186
Alexander	25	'Male'	69	171
Garcia	27	'Female'	69	131
Moore	28	'Male'	68	183
Walker	28	'Female'	65	123
Cooper	28	'Female'	65	127
Cox	28	'Female'	66	111
Jenkins	28	'Male'	69	189
Rivera	29	'Female'	63	130

How do I sort rows?

- `sortrows(patients, {'Age', 'Weight'}, {'ascend', 'descend'})`

	Age	Sex	Height	Weight
Hall	25	'Male'	70	189
James	25	'Male'	66	186
Jackson	25	'Male'	71	174
Alexander	25	'Male'	69	171
Hill	25	'Female'	64	138
Young	25	'Female'	63	114
Garcia	27	'Female'	69	131
Jenkins	28	'Male'	69	189
Moore	28	'Male'	68	183
Cooper	28	'Female'	65	127
Walker	28	'Female'	65	123
Cox	28	'Female'	66	111
Howard	29	'Female'	68	134

Use categorical arrays for discrete values

- `patients.Sex = categorical(patients.Sex)`
- Get weight of male patients under the age of 30:

```
ans =

                Weight
                ______

    Moore       183
    Jackson     174
    Hall        189
    James       186
    Jenkins     189
    Alexander   171
```

Use categorical arrays for discrete values

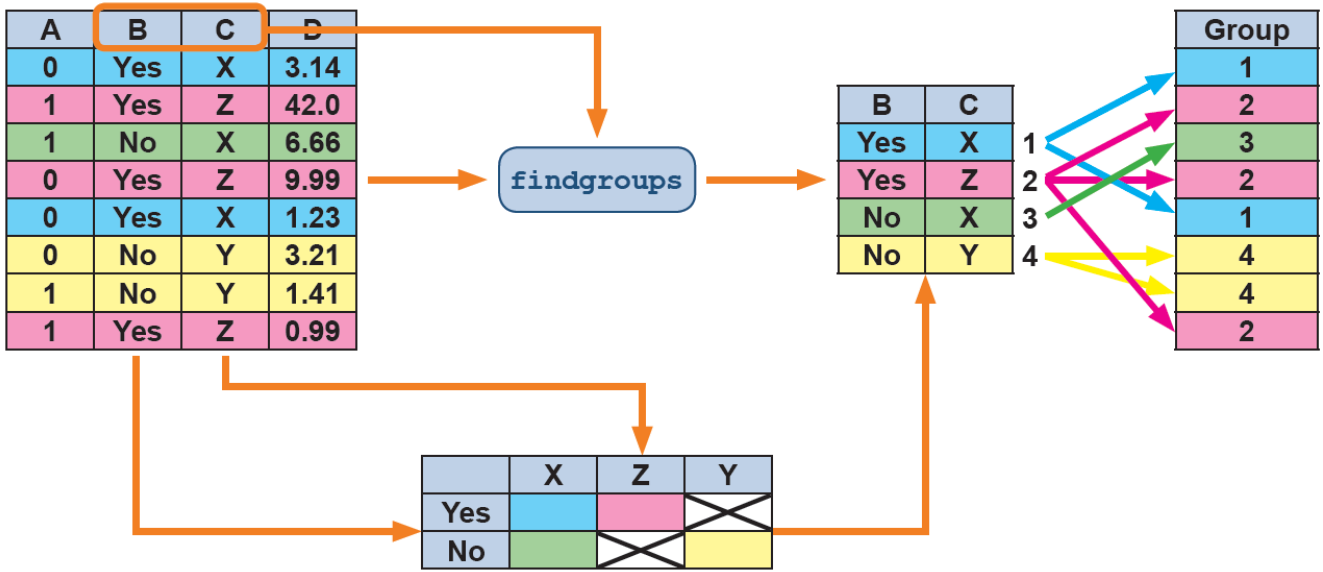
- `patients.Sex = categorical(patients.Sex)`
- Get weight of male patients under the age of 30:

```
cond = (patients.Sex == 'Male') & (patients.Age < 30)
patients(cond, 'Weight')
```

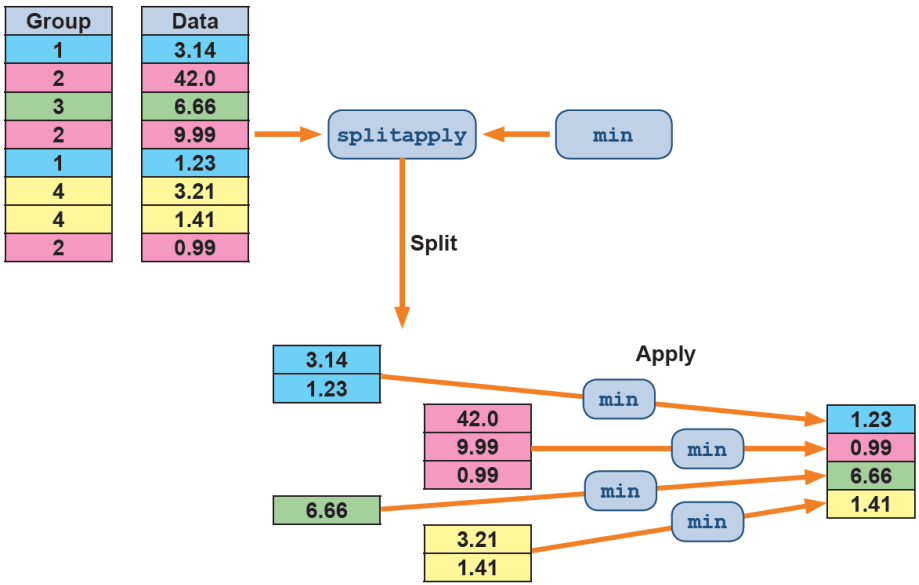
```
ans =
                Weight
                ______

    Moore       183
    Jackson     174
    Hall        189
    James       186
    Jenkins     189
    Alexander   171
```

How do I find unique groups of data?



How do I extract useful statistics from my grouped data?



How do I extract useful statistics from my grouped data?

- Split patients by age and gender:

byAgeAndSex =

Age	Sex	AvgHeight	AvgWeight
25	Female	63.5	126
25	Male	69	180
27	Female	69	131
28	Female	65.333	120.33
28	Male	68.5	186
29	Female	65	128
30	Female	68.5	132.5
30	Male	67.5	184
31	Female	65.333	134.33
31	Male	72	178
32	Female	61.5	134
32	Male	68.5	187
33	Female	65.5	128.5

How do I extract useful statistics from my grouped data?

- Split patients by age and gender:

```
T = patients(:, {'Age', 'Sex'})
[groups, byAgeAndSex] = findgroups(T)
```

- Compute average height and weight:

byAgeAndSex =

Age	Sex	AvgHeight	AvgWeight
25	Female	63.5	126
25	Male	69	180
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How do I extract useful statistics from my grouped data?

- Split patients by age and gender:

```
T = patients(:, {'Age', 'Sex'})
[groups, byAgeAndSex] = findgroups(T)
```

- Compute average height and weight:

```
byAgeAndSex.AvgHeight = splitapply(@mean, patients.Height, groups)
byAgeAndSex.AvgWeight = splitapply(@mean, patients.Weight, groups)
```

byAgeAndSex =

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31	Female	65.333	134.33
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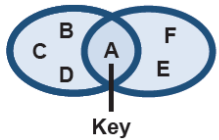
How do I merge tables?

A	B	C	D
1	Yes	X	3.1
2	Yes	Z	42.0
3	No	Y	6.66
4	Yes	Y	9.99



A	E	F
6	1	x
5	0	xxx
4	0	xx
3	0	xx

outerjoin

A	B	C	D	E	F
1	Yes	X	3.1		
2	Yes	Z	42.0		
3	No	Y	6.66	0	xx
4	Yes	Y	9.99	0	xx
6				1	x
5				0	xxx

innerjoin

A	B	C	D	E	F
3	No	Y	6.66	0	xx
4	Yes	Y	9.99	0	xx

What are the differences between `outerjoin` and `innerjoin` functions?

```
C = innerjoin(A, B)
```

```
C = outerjoin(A, B, 'MergeKeys', true)
```

```
C = outerjoin(A, B, 'MergeKeys', true, 'Type', 'Left')
```

```
C = outerjoin(A, B, 'MergeKeys', true, 'Type', 'Right')
```