



Selecting and sorting data

Suppose we have a text file, **birds.txt**, with information about many kinds of birds:

Name	Family	Habitat	Size	Wingspan	BackColor	UnderColor	HeadColor	Spotted	Comment
GreatEgret	heron	marshes	39	51	white	white	white	no	longLegs
GreatBlueHeron	heron	marshes	48	72	blue/gray	black	black/white	no	longLegs
SnowyEgret	heron	marshes/ponds	24	38	white	white	white	no	longLegs
GreenHeron	heron	marshes/ponds	19	25	green	brown	black	no	darkBill
AmericanBittern	heron	marshes	28	45	brown	brown	brown	no	greenLegs
MuteSwan	waterfowl	lagoons/ponds	60	96	white	white	white	no	orangeBill
CanadaGoose	waterfowl	wetlands/fields	40	72	brown	brown	black/white	no	fliesInV
SnowGoose	waterfowl	marshes/fields	28	58	white	white	white	no	orangeBill
AmericanBlackDuck	waterfowl	wetlands	23	36	brown	brown	brown	no	yellowBill
NorthernPintail	waterfowl	marshes/ponds	26	35	gray	white	brown	no	longTail
Mallard	waterfowl	wetlands	24	36	brown	gray	green	no	purpleChest
BlueWingedTeal	waterfowl	marshes/ponds	15	24	brown	brown	blue/gray	yes	blueShoulders
Osprey	hawk/eagle	wetlands	23	72	brown	white	brown/white	yes	whiteLegs
BaldEagle	hawk/eagle	wetlands	32	80	brown	brown	white	no	yellowBeak
NorthernHarrier	hawk/eagle	marshes/fields	22	54	gray	gray	brown	no	longTail
CoopersHawk	hawk/eagle	woods	17	28	gray	white	gray	no	orangeLegs
RedTailedHawk	hawk/eagle	woods/fields	22	58	brown	white	brown	yes	orangeTail
PeregrineFalcon	hawk/eagle	marshes/cities	18	44	gray	gray	black/white	no	sideburn
...									

Suppose we'd like to **select** all the herons,
select the birds with giant wingspans,
sort by size or wingspan,
sort alphabetically by name...



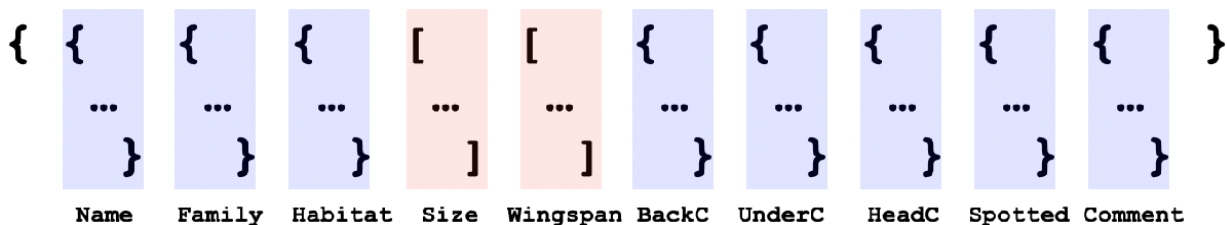
Let's first load the data and see what we have

```
% load the content of the birds.txt text file into a variable named birds

fid = fopen('birds.txt');
birds = textscan(fid, '%s %s %s %u %u %s %s %s %s %s', 'HeaderLines', 1);
fclose(fid);

% print the content of the birds cell array in a nice format

printBirdInfo(birds)
```



```

function printBirdInfo (birds)
% prints out all the information stored in the input cell array
for i = 1:length(birds{1})
    fprintf('%22s %10s %17s %3u %3u %12s %12s %12s %4s %17s\n', ...
        birds{1}{i}, birds{2}{i}, birds{3}{i}, birds{4}{i}, birds{5}{i}, ...
        birds{6}{i}, birds{7}{i}, birds{8}{i}, birds{9}{i}, birds{10}{i});
end

```

Selecting data

Now let's return to the tasks of **selecting** all the herons and **selecting** the birds with large wingspans

```

% first, let's select a subset of data in a simpler context
% create a cell array with a nested cell array and vector
numbers = { {'one' 'two' 'three' 'four' 'five'} [3 5 0 2 6] };

% create a new cell array that only contains the middle
% three elements of the nested cell array and vector

newNums = cell(1,2)

indices = [2 3 4];

newNums{1} = numbers{1}(indices);
newNums{2} = numbers{2}(indices);

% view the structure and content of newNums

newNums

newNums{1}

```

```

function newBirds = getHerons (birds)
% return cell array of information about herons
indices = find(strcmp(birds{2}, 'heron'));
newBirds = cell(1,10);
for i = 1:10
    newBirds{i} = birds{i}(indices);
end

```



```

function newBirds = getLargeWings (birds)
% return cell array of info about birds with large wings
indices = find(birds{5} > 48);
newBirds = cell(1,10);
for i = 1:10
    newBirds{i} = birds{i}(indices);
end

```



```

% select the herons and print the result
herons = getHerons(birds)
printBirdInfo(herons);

% select the birds with large wingspan and print the result
wings = getLargeWings(birds)
printBirdInfo(wings);

```

Sorting numbers

```

% vector of unsorted numbers
nums = [7 2 9 7 8 3 6 1 3 4];

% MATLAB has a built-in sort function
sortNums = sort(nums)

sortNums = sort(nums, 'descend')

% also return a vector indicating the index of each
% number in the original unsorted vector

nums

[sortNums, sortIndices] = sort(nums)

% what does this expression return?
nums(sortIndices)

```

Sorting strings

```

% cell array of unsorted strings
words = {'early' 'cloud' 'heights' 'a' 'black' 'great' 'from' 'descended'};

% sort the contents of the cell array

```

```

sortWords = sort(words)

% also return a vector indicating the index of each
% string in the original unsorted cell array

[sortWords, sortIndices] = sort(words)

```

```

% a slight variation...

words = {'early' 'Cloud' 'heights' 'A' 'black' 'Great' 'from' 'Descended'};

sortWords = sort(words)

```

```

% when ordering strings, MATLAB uses the ASCII code, in which
% all capital letters appear before all lowercase letters

sortWords = sort(lower(words))

```

Sorting the bird data

```
function newBirds = sortByWingspan (birds)
```

```
% sort birds by wingspan
```

```
[~, indices] = sort(birds{5});
```

```
newBirds = cell(1,10);
```

```
for i = 1:10
```

```
    newBirds{i} = birds{i}(indices);
```

```
end
```



```
function newBirds = sortByName (birds)
```

```
% sort birds alphabetically by name
```

```
[~, indices] = sort(lower(birds{1}));
```

```
newBirds = cell(1,10);
```

```
for i = 1:10
```

```
    newBirds{i} = birds{i}(indices);
```

```
end
```



```

% test our sorting functions

sortWings = sortByWingspan(birds);

printBirdInfo(sortWings)

sortNames = sortByName(birds);

printBirdInfo(sortNames)

```