Topics: Logical arrays

Reading (ML): review Sec 4.3

Logical arrays and operations

elev= 8*rand(4,3) + 10 % example, elevations on a map
L= elev > 14 % returns a logical array
any(L)
all(L)

% 1-d examples
vec= elev(3,:)
L= vec>14 % logical array indicating result from vec>14
vecHigh= vec(L) % extract just the cells with values > 14

vecHigh= vec(vec>14) % combine last two statements in one
% this shortcut works for VECTORS only, not matrices

ind= find(vec>14) % get the indices where vec>14
vecHigh= vec(ind) % extract just the cells with values > 14

% Create a vector same as vec above except that all the values below 14
% are "zeroed out"

L= (vec>14) % a LOGICAL vector
vecHigh= zeros(1,length(vec))
vecHigh(L)= vec(L) % assign only to the cells with logical value 1

ind= find(vec>14) % a vector of INDICES
vecHigh= zeros(1,length(vec))
vecHigh(ind)= vec(ind) % assign only to the cell numbers stored in ind

% 2-d examples
L= elev>14 % logical array (matrix)
elevHigh= elev(elev>14) % a VECTOR!!!

[ri,ci]= find(elev>14) % ri is vector that stores row index where elev>14
% ci is vector that stores col index where elev>14

Reminder about random number generator rand

MATLAB’s pre-defined function rand generates a number in the range of 0 to 1 randomly. In other words, function rand generates a number from the standard uniform distribution: any number in the range of 0 to 1 is equally likely to occur. Note that the range is the open interval (0,1).
Example: filtering data in a matrix

Generate a matrix `elev` of random values. Then create a matrix `elevHigh` to store only the values in `elev` that exceed threshold value `x`. Matrix `elevHigh` should be the same as `elev` except that the values below `x` are “zeroed out.” Do not use `if` statements.

```matlab
% Prompt user to enter the number of rows and number of columns
nr = input('Please enter the number of rows: ');
nc = input('Please enter the number of columns: ');

% Prompt user to enter a threshold value
x = input('Please enter a threshold value: ');

% Randomly generate a nr-by-nc matrix of numbers, each in range (12,20)
elev =

% Store in ri and ci the indices corresponding to the values in elev that are greater than threshold x

% Create matrix elevHigh

elevHigh

% Display matrices
elev
elevHigh
```