CS1112 Discussion Exercise 13

1 Is one `Interval` in some array of `Intervals`?

Suppose we have an array of `Intervals` (.1,.5), (.2,.7), and (.8,.9). If we ask whether an `Interval` (.3,.4) "is in" the array of `Intervals`, we will answer "yes, yes, no" since
(.3,.4) is in (.1,.5),
(.3,.4) is in (.2,.7), but
(.3,.4) is not in (.8,.9).

Recall that class `Interval` has an `isIn` method that would be useful here. Implement the following function (independent function, not an instance method):

```
function tf = isInRange(inter, interArray)
% inter: an Interval
% interArray: 1-d array of Intervals
% tf: a logical vector (1s and 0s) the same length as interArray where
%     tf(k)=1 if inter "is in" interArray(k); otherwise tf(k)=0.
```

Later using MATLAB, test your function by typing the following in the *Command Window*:

```
a= intervalArray(4);  % Create a length 4 array of Intervals using the
                      %   function implemented in lecture.
b= Interval(.3,.5)
v= isInRange(b,a)     % Why isn't the function call   something.isInRange(...)  ?
                      % Answer: isInRange isn't an instance method; it's its own function.
```

2 Analyze class `LocalWeather`

A partially completed classdef for `LocalWeather` is given on the next page. Read the properties and the constructor of class `LocalWeather`; ask questions if there is anything that you do not understand. Answer the following questions and then complete methods `getAnnualPrecip` and `getMonthlyAveTemps`.

4.1 By reading class `LocalWeather` above and the file `ithacaWeather.txt`, answer the following questions.

```
ithaca= LocalWeather('ithacaWeather.txt')
disp(ithaca.city)      % What is the output? _____________________________

disp(ithaca.precip)    % What is the output? _____________________________

disp(ithaca.precip(11))  % What is the output? ____________________________

a= ithaca.temps        % What is the type of a? ___________________________

b= ithaca.temps(11)    % What is the type of b? ___________________________

disp(ithaca.temps(11).left)  % What is displayed?  What is it? _____________
```

4.2 Implement function `getAnnualPrecip`, which calculates and returns the total annual precipitation. If any month's precipitation data is missing, the returned value should be `NaN`, a value in `Matlab` of type `double` that indicates that a value is not-a-number.

4.3 Implement function `getMonthlyAveTemps` which returns the vector (length 12) of monthly average temperatures. Calculate a month's average temperature as the average between the month's high and low temperatures. If a month is missing temperature data, its average temperature should be set to `NaN`. The built-in function `isnan` can be used to check whether a variable stores the value `NaN`: `isnan(x)` returns true (1) if `x` is `NaN` and false (0) otherwise.

Later, using MATLAB, type in your method bodies and test the updated class by creating a `LocalWeather` object and calling its methods.

```
classdef  LocalWeather < handle
% Weather data (monthly low, high, and precip) for a city from a standard
% city weather data file.

    properties
        city= '';  % City name string
        temps= Interval.empty();
                % array of 12 Intervals, each (monthly low, monthly high)
        precip  % numeric vector of length 12, each monthly precipitation
    end

    methods
        function lw = LocalWeather(fname)
            if nargin==1
                fid= fopen(fname, 'r');
                % Get city name
                s= fgetl(fid);
                lw.city= s(3:length(s));
                % Read pass headers lines (next 3 lines)
                for k=1:3
                    s= fgetl(fid);
                end
                % Read monthly data (next 12 lines)
                for k= 1:12
                    s= fgetl(fid);
                    lw.temps(k)= Interval(str2double(s(4:8)), ...
                                          str2double(s(12:16)));
                    lw.precip(k)= str2double(s(20:24));
                end
                fclose(fid);
            end
        end

        function showMonthData(self, m)
        % Show data for month m.  m is an integer and 1<=m<=12.
            mo= {'Jan','Feb','Mar','Apr','May','June',...
                 'July','Aug','Sep','Oct','Nov','Dec'};
            fprintf('%s Data\n', mo{m})
            fprintf('Temperature range: ')
            disp(self.temps(m))
            fprintf('Average precipitation: %.2f\n', self.precip(m))
        end

        function p = getAnnualPrecip(self)
        % If any month is missing precip data, display a warning message
        % and p is NaN.  Otherwise p is annual precipitation.
            p=0;
        end

        function tempVec = getMonthlyAveTemps(self)
        % tempVec is length 12 vector of monthly average temperatures.
        % tempVec(m) is average between month m's high and low temps.
        % If a month is missing either high or low temp (NaN), then that
        % month's average is also NaN.
            tempVec= zeros(1,12);
        end

        function showCityName(self)
            disp(self.city)
        end
    end %methods
end %classdef
```