Table of Contents


```
% prepare to run...
clear all  % clear out all variables
close all  % close any open figures
```

Problem 1

```
type('MyHistogram.m')
```

```
function [xCen, n] = MyHistogram(dataVec, nBins)
%{
takes in data vector and desired number of bins and
computes, edges, #elements in bins, and center pt of the bins

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%}

%finds max and mins in dataVec
maxVec = max(dataVec);
minVec = min(dataVec);
%finds bin width from range of dataVec
binWidth = (maxVec - minVec)/nBins;
xCen=[];
n=[];
edge=[];

%computes info for last element
edge(nBins) = maxVec;
edge(nBins-1) = maxVec - binWidth;
xCen(nBins) = ((edge(nBins) + edge(nBins-1))/2);
n(nBins) = length(find(edge(nBins-1)<=dataVec &
 edge(nBins)>=dataVec));

for k = 1:nBins-1
    edge(1) = [minVec];
    %computes rightward edge
    edge(k+1) = edge(k) + binWidth;
    %finds center pt
    xCen(k) = ((edge(k+1) + edge(k))/2);
    %finds #elements in each bun
    n(k) = length(find(edge(k)<=dataVec & edge(k+1)>dataVec));
end
```

```
end
```

Problem 2

```
type('BBallStats.m')
fprintf('\n-----------------------------------\n');
BBallStats;


load basketballData.mat
%{
graphs data using histograms and qqplots

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%}
figure(1)
subplot(2,2,1)
bar(MyHistogram(FieldGoalPercentage, 20))
title('Field goal percentages')


subplot(2,2,2)
qqplot(MyHistogram(FieldGoalPercentage, 20))
title('Field goal percentages')

subplot(2,2,3)
bar(MyHistogram(AveragePointsPerGame, 20))
title('Average pts per game')
xlabel('bins')
ylabel('points')

subplot(2,2,4)
qqplot(MyHistogram(AveragePointsPerGame,20))
title('Average pts per game')
%{
the two right graphs appear to follow gaussian since
their lines are mostly linear. The 2 left histogram graphs
do not appear to look graphically gaussian.
%}
figure(2)
heightVec = (HeightFeet >= 6.5)';
boxplot(AveragePointsPerGame, heightVec)
xlabel('Height: 1=>6.5, 0<6.5 ft')
ylabel('Avg pts per game')
title('Points per game vs height')
%{
Height does not seem to correlate with avg pts per game.
The taller players appear to have more range in pts scored
but the shorter players have higher median pts.
%}
```
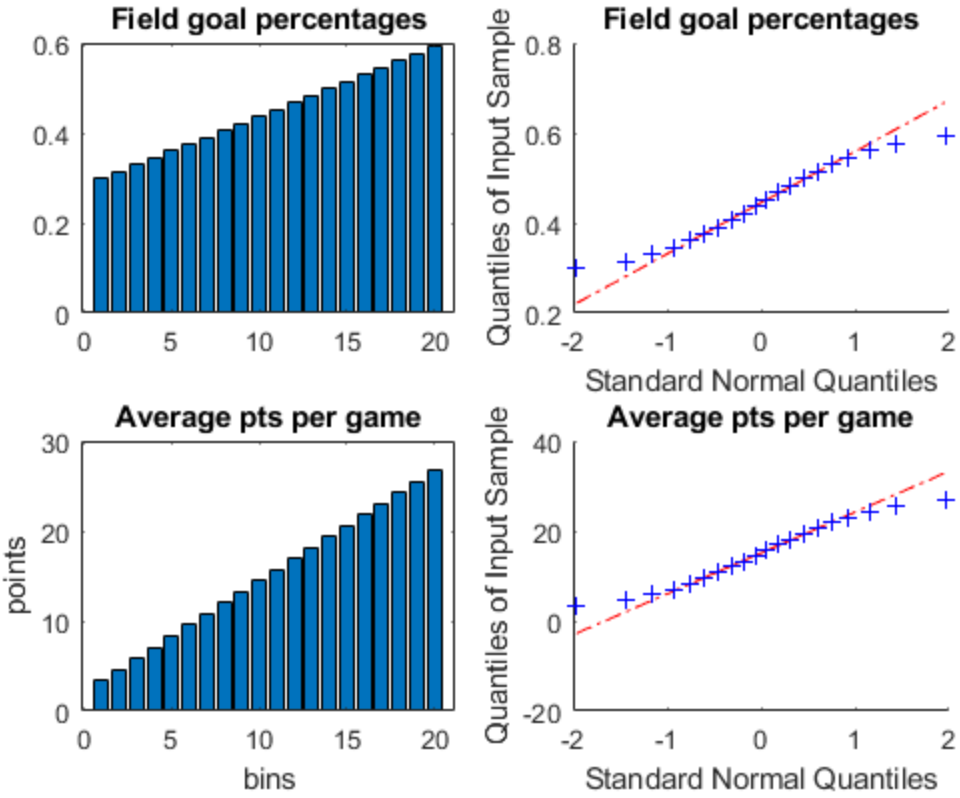
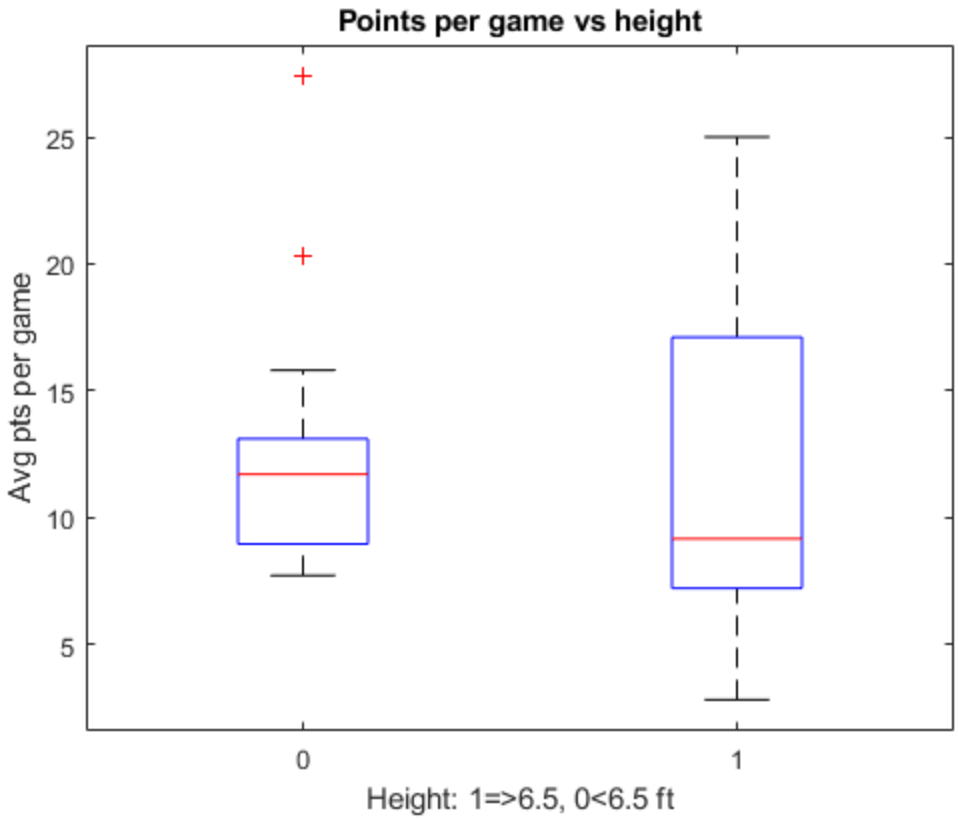

- -


Field goal percentages
0.6
0.4
0.2
0
0
5
10
15
20
Field goal percentages
Quantiles of Input Sample
0.8
0.6
0.4
0.2
-2
-1
0
1
2
Standard Normal Quantiles
Average pts per game
points
30
20
10
0
0
5
10
15
20
bins
Average pts per game
Quantiles of Input Sample
40
20
0
-20
-2
-1
0
1
2
Standard Normal Quantiles



Problem 3

```
type('CalcRsquared.m')
fprintf('\n-----------------------------------\n');
type('MyLinefit.m')
```

```
function rSquared = CalcRsquared(y, yfit)
%{
takes in 2 y vectors and finds how well data fits
by computing a R value(closer to 1, the better the fit)

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%}
%checks if vectors are same length
if length(y) ~= length(yfit)
    rSquared = NaN;
    return
end
%finds the sizes of the vectors and forces them
%to be row vectors
[M,N]=size(y);
[M2,N2] = size(yfit);
if M~=1
    y = y';
end
```

```
if M2~=1
    yfit = yfit';
end
%finds avg,ssTot,ssRes and computes the R value
yAvg = mean(y);
ssTot = sum((y - yAvg).^2);
ssRes = sum((y - yfit).^2);
rSquared = 1-(ssRes./ssTot);
end

-----------------------------------

function [yFit, coeff, rSq] = MyLinefit(x,y,isPlotted)
%{
takes in x & y values and a boolean (to determine whether
or not to graph) and finds a linear approx.

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%}
%forces isPlotted to be 0 if not inputed
if nargin <3
    isPlotted = 0;
end
%checks x and y meet length conditions
if length(x)~=length(y) || length(x)<2 || length(y)<2
    yFit= NaN;
    rSq=NaN;
    coeff=NaN;
    return
end
%forces x and y to be row vectors
[M,N]=size(y);
[M2,N2] = size(x);
if M~=1
    y = y';
end
if M2~=1
    x = x';
end
%creates A vec made of x and 1's sets y as a column
c = ones(1,length(x))';
A(:,1) = x';
A(:,2) = c;
b = y';
%creates coeff vec with m and b values
coeff = A\b;
%uses m and b to create a fitted line
yFit = coeff(1,1).*x + coeff(2,1);
%computes R value between y and yFit
rSq = CalcRsquared(y,yFit);
%plots if 1 was passed in for isPlotted
if isPlotted==1
    plot(x,yFit,'b',x,y,'ro');
    title(sprintf('R2 = %f', rSq));
```

```
    xlabel('independent variable')
    ylabel('dependent variable')
%if isPlotted==0, computes normal values (no plotting)
else
    coeff = A\b;
    yFit = coeff(1,1).*x + coeff(2,1);
    rSq = CalcRsquared(y,yFit);
return
end
```

Problem 4

```
type('TestLinearFit.m')
fprintf('\n-----------------------------------\n');
TestLinearFit;


function [yTest,yFit, yFit1samp] = TestLinearFit
%{
tests MyLinefit function with pre chosen x, y, and b values

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%}
%creates variables
x = [1,4,2,6,8,4,5,3,11,9];
m = 2.145;
b = 6.4532;
%finds y vec from pre declared variables
yTest = (m.*x)+b;

%stores line approx of x and yTest in yFit
[yFit,coeff,rSq] = MyLinefit(x,yTest,1);
fprintf('True slope=%.5f True intercept=%.5f\nEst slope=%.5f Est
 intercept=%.5f\n\n', m,b,coeff(1,1), coeff(2,1))

%intentionally passes in faulty parameters
%to check NaN returned
[yFit1samp,coeff,rSq] = MyLinefit(x,[1],1);
fprintf('x || y value doesn''t meet conditions, yFit1samp=%f',
 yFit1samp);
end

-----------------------------------
True slope=2.14500 True intercept=6.45320
Est slope=2.14500 Est intercept=6.45320

x || y value doesn't meet conditions, yFit1samp=NaN
```

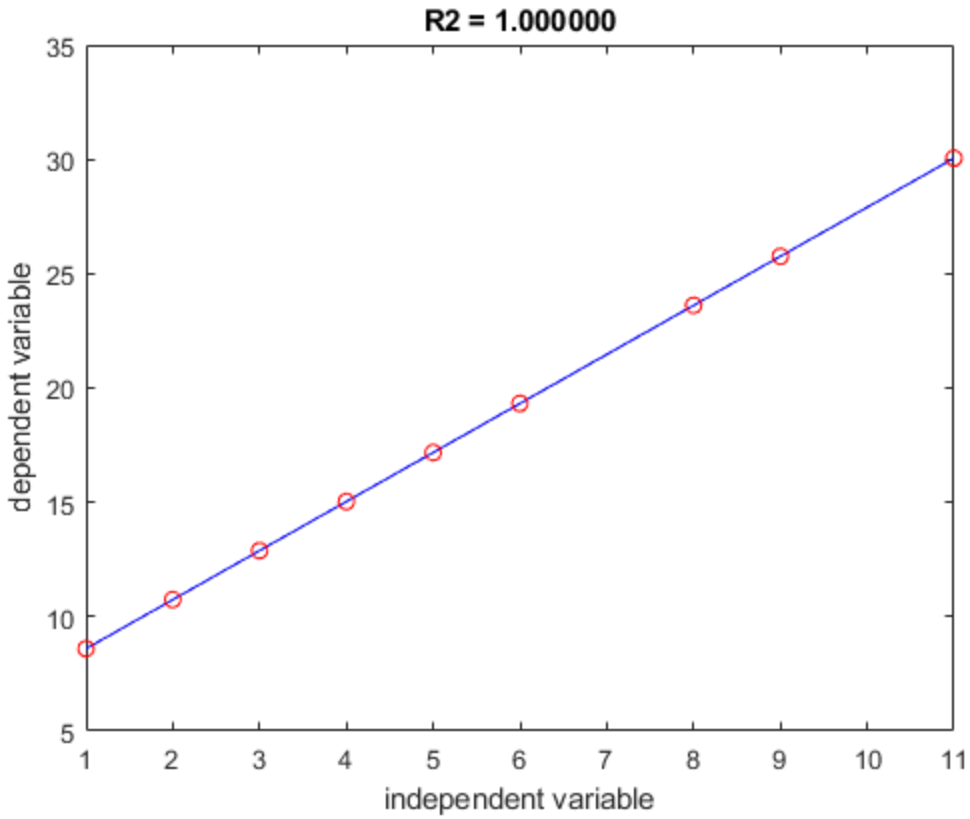

Problem 5

```
type('BasketballCorrelations.m');
fprintf('\n-----------------------------------\n');
BasketballCorrelations


load basketballData.mat
%{
finds correlations from data in basketballData

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%}
figure(2)
%creates scatter plot height vs. weight
subplot(2,3,1)
scatter(HeightFeet, WeightLbs);
MyLinefit(HeightFeet, WeightLbs,1);
xlabel('height')
ylabel('weight')
%there is a strong correlation with height vs. weight, since the R
 value
%is close to 1. There is 1 outlier (tall but low weight)

%creates scatter plot height vs. field goal %
subplot(2,3,2)
```

```
scatter(HeightFeet, FieldGoalPercentage);
MyLinefit(HeightFeet, FieldGoalPercentage,1);
xlabel('height')
ylabel('field goal percentages')
%not a strong correlation; many pts deviate from the line although the
 R
%value is closer to 1 than other graphs

%creates scatter plot height vs. free throw %
subplot(2,3,3)
scatter(HeightFeet, FreeThrowPercentage);
MyLinefit(HeightFeet, FreeThrowPercentage,1);
xlabel('height')
ylabel('free throw percentages')
%moderate correlation; the R value deviated more than expected and
 their
%is an outlier (very low %)

%creates scatter plot weight vs. field goal %
subplot(2,3,4)
scatter(WeightLbs,FieldGoalPercentage,'g');
MyLinefit(WeightLbs,FieldGoalPercentage,1);
xlabel('weight')
ylabel('field goal percentages')
%appears to not be a strong correlation, R value predicts it to be
 true
%about 25% of the time, considerable amount of outliers, especially
%the low weight but mid field goal % . This seems to be more about
 random
%correlation than actual causation, considering the low R value (but
 R
%values for weight vs field% and height vs. field% are extremely
 similar.


%creates scatter plot free throw vs. avg pts
subplot(2,3,5)
scatter(FreeThrowPercentage, AveragePointsPerGame,'g');
MyLinefit(FreeThrowPercentage, AveragePointsPerGame,1);
xlabel('free throw percentages')
ylabel('average points per games')
%weakest correlation of all the graphs (lowest R value). Free throw %
 is
%not a strong predictor for avg pts in game

%creates scatter plot field goal vs. avg pts
subplot(2,3,6)
scatter(FieldGoalPercentage, AveragePointsPerGame,'g');
MyLinefit(FieldGoalPercentage, AveragePointsPerGame,1);
xlabel('field goal percentages')
ylabel('average points per games')
%many outliers and very weak correlation, although field goal % and
 avg pts
```

```
%correlation is stronger than avg pts and free throw % (field goal
 more
%important)

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```

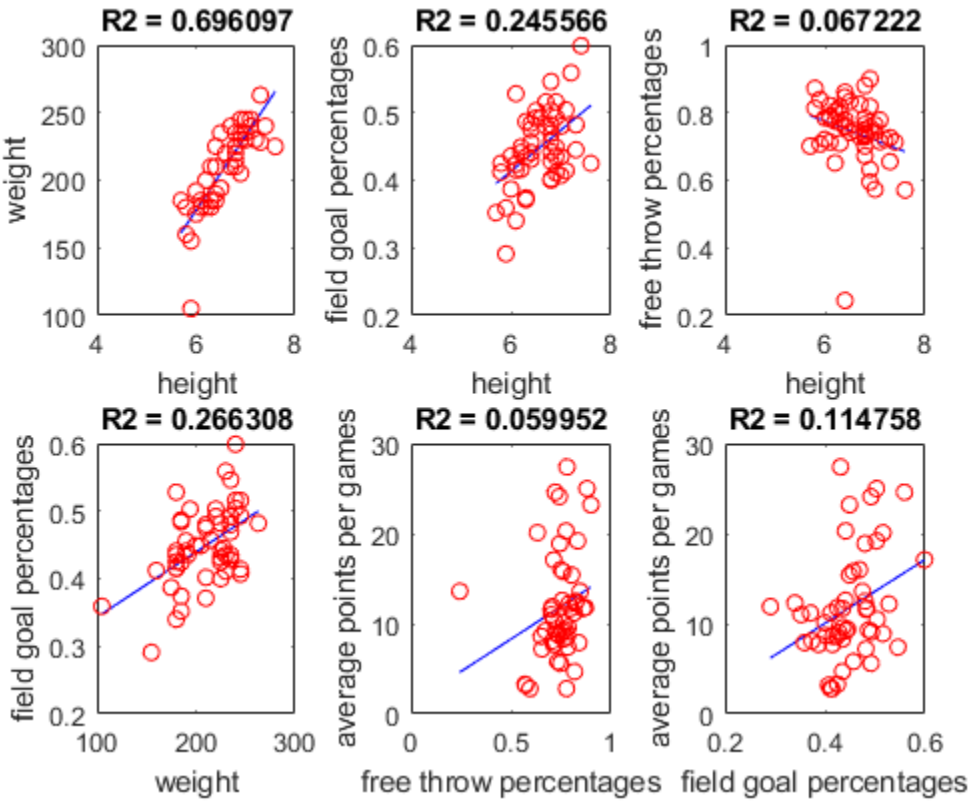

Published with MATLAB® R2017b