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%=====
%ORDINAL CORRELATION
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%=====
%CORRELATION BETWEEN LINES
%=====
clear
clc

%perfect negative correlation-----
x = 0 : .1 : 100;

y = -1*x;

figure, plot(x,y)

file_name = "/Users/charlesdavi/Desktop/Temp_Octave_Files/neg_corr.png"

saveas(gcf,file_name)

[X a] = sort(x);
[Y b] = sort(y);

corr = sum(abs(a.-b)) %maximizes the measure of correlation

max_corr = corr

1 - 2*corr/max_corr %same calculation but on [-1,1] scale

%perfect positive correlation-----
x = 0 : .1 : 100;

y = x;

figure, plot(x,y)

[X a] = sort(x);
[Y b] = sort(y);

corr = sum(abs(a.-b)) %minimizes the measure of correlation, at zero

1 - 2*corr/max_corr %same calculation but on [-1,1] scale

%noisy positive correlation-----
x = 0 : .1 : 100;

y = x;

num_items = size(x,2)

noise_vector = 1 - 2*rand(1,num_items);%adds noise to the range values

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y = y + noise_vector;

figure, plot(x,y)

[X a] = sort(x);
[Y b] = sort(y);

corr = sum(abs(a.-b)) %this should be less than half the maximum

corr/max_corr

1 - 2*corr/max_corr %same calculation but on [-1,1] scale

%no correlation, one random dimension-----
x = 0 : .1 : 100;
num_items = size(x,2)

noise_vector = 1 - 2*rand(1,num_items);%generates random range values
y = noise_vector;

figure, plot(x,y)

[X a] = sort(x);
[Y b] = sort(y);

corr = sum(abs(a.-b)) %this should be approximately half the maximum

corr/max_corr

1 - 2*corr/max_corr %same calculation but on [-1,1] scale

%no correlation, two random dimensions-----
noise_vector = 1 - 2*rand(1,num_items);%generates random domain values
x = noise_vector;

noise_vector = 1 - 2*rand(1,num_items);%generates random range values
y = noise_vector;

figure, scatter(x,y)

[X a] = sort(x);
[Y b] = sort(y);

corr = sum(abs(a.-b)) %this should be approximately half the maximum

corr/max_corr

1 - 2*corr/max_corr %same calculation but on [-1,1] scale

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