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ECE 1395

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1. Regression Problem: A regression problem that can be solved with machine learning is one that predicts the age of a person based upon their job salary since most people tend to earn more as their career progresses which correlates to their age.
   1. I would use their job salary as a feature
   2. The labels would be their predicted age
   3. Data would be collected through random surveys of people employed starting at the age of 16
   4. The problem could be challenging due to the immense number of jobs out in the market that all have a different range of salaries, along with people that do not currently have jobs polluting the data.
2. Classification Problem: A classification problem could predict what college a person could go to in the future.
   1. Features included: age, income/wealth, gpa/grades, geographical location
   2. The labels would be the university
   3. Data would be collected though a database of student college acceptance letters, the universities’ acceptance requirements, and collecting the information from the population sample
   4. The problem could be challenging based upon factors such as people sometimes want to go to colleges based on personal preference and nothing else along side income/wealth not making a difference due to loans, scholarships, and grants.

3.a) See Code

3.b) What is the min/max of x, what is the mean, what is the std deviation

min\_x =

-11.9860

max\_x =

14.4556

mean\_x =

0.9976

stdD\_x =

2.7988

3.c) plot normalized histogram of xChart, histogram

Description automatically generated

Yes the histogram looks like a Gaussian Distribution due to its values being strictly taken from the Gaussian Distribution.

3.d) Use loop to add 1 to every value in x and time the operation

Elapsed time is 0.013267 seconds.

3.e) Iterate though the original x and then add 1 without using a loop

Elapsed time is 0.001086 seconds.

3.f) define vector y that contains all values 5 < x < 20

I retrieved 76341 elements in the vector for the first run and on the 2nd run i got 76564 elements. There is a difference of 223 elements, this is due to the RNG of X and how the values will never be identical.

4.a) Define matrix A, find min of each col, min in row, smallest value in A, then create matrix B whose elements are the square of A

minCol\_A =

2 1 3

minRow\_A =

1

2

6

min\_A =

1

B =

1.4142 1.0000 1.7321

1.4142 2.4495 2.8284

2.4495 2.8284 4.2426

4.b) solve system of linear equations

xyz =

0.3000

0.4000

-0.0000

4.c) Compute the norms

L1\_x1 =

2

L2\_x1 =

1.5811

L1\_x2 =

2

L2\_x2 =

1.4142

5) Use the created normalize\_col function

input1 =

0.8428 0.0932 0.4379 0.3308

0.0024 -1.2733 -0.1711 1.7447

1.6506 1.3180 -0.4573 -1.1384

0.9068 -0.2341 -0.5975 -0.8701

0.0805 0.5344 -1.3071 1.4247

output1 =

0.2420 0.2128 -0.2090 0.2218

0.0007 -2.9059 0.0817 1.1696

0.4739 3.0078 0.2183 -0.7631

0.2603 -0.5343 0.2852 -0.5833

0.0231 1.2196 0.6239 0.9551

test\_input1 =

1.0000 1.0000 1.0000 1.0000

input2 =

1.0113 0.3861 0.2033 0.5599 -0.1478 -0.5614 0.8724 -0.5982 0.5706 -0.8681

-0.7396 1.2938 1.0087 0.3014 2.7400 1.9802 -0.7378 0.1714 0.2677 -0.1414

0.3325 0.3793 0.3210 -0.4543 1.2462 0.6058 1.7506 0.4113 0.5003 0.2231

-0.2652 -0.8281 -0.0484 1.0363 0.4256 -1.0744 -0.0351 0.2996 0.1661 1.6014

-0.7538 0.4564 -1.0374 -0.3503 0.0068 -1.6511 -1.3475 -0.5510 0.3812 1.1345

2.2062 -0.4495 0.2974 0.7970 0.4183 0.5996 -0.3141 0.6981 -0.7591 -0.3212

0.5228 -0.3944 -1.9781 1.8983 -0.6683 0.4806 0.2970 0.0651 -0.4098 -0.8889

output2 =

0.4370 0.4576 -0.1648 0.1478 -0.0368 -1.4800 1.7967 -1.2054 0.7959 -1.1743

-0.3196 1.5336 -0.8178 0.0796 0.6815 5.2202 -1.5195 0.3454 0.3734 -0.1913

0.1437 0.4497 -0.2602 -0.1199 0.3099 1.5970 3.6055 0.8287 0.6978 0.3017

-0.1146 -0.9816 0.0392 0.2735 0.1059 -2.8322 -0.0722 0.6037 0.2317 2.1663

-0.3257 0.5411 0.8410 -0.0925 0.0017 -4.3526 -2.7752 -1.1103 0.5316 1.5346

0.9534 -0.5328 -0.2411 0.2104 0.1040 1.5808 -0.6470 1.4066 -1.0588 -0.4345

0.2259 -0.4675 1.6037 0.5011 -0.1662 1.2669 0.6117 0.1312 -0.5716 -1.2025

test\_input2 =

1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000