**Assignment 4**

By Harsh Sharma

**Question P1**. (Univariate outlier detection) You will use randomly generated numbers for univariate outlier test.

(1) Generate 200 normally distributed random numbers

(2) Show the summary of the numbers using min, Q1, Median, Mean, Q3 and Max

(3) Draw the boxplot of this data

(4) Report the values of any data points which lie beyond the extremes of the whiskers

**Solution:**

The solution is in the R file called ‘P1 Solution.R’. Here are the answers.

(1)

[1] 1.370958e+00 -5.646982e-01 3.631284e-01 6.328626e-01 4.042683e-01 -1.061245e-01

[7] 1.511522e+00 -9.465904e-02 2.018424e+00 -6.271410e-02 1.304870e+00 2.286645e+00

[13] -1.388861e+00 -2.787888e-01 -1.333213e-01 6.359504e-01 -2.842529e-01 -2.656455e+00

[19] -2.440467e+00 1.320113e+00 -3.066386e-01 -1.781308e+00 -1.719174e-01 1.214675e+00

[25] 1.895193e+00 -4.304691e-01 -2.572694e-01 -1.763163e+00 4.600974e-01 -6.399949e-01

[31] 4.554501e-01 7.048373e-01 1.035104e+00 -6.089264e-01 5.049551e-01 -1.717009e+00

[37] -7.844590e-01 -8.509076e-01 -2.414208e+00 3.612261e-02 2.059986e-01 -3.610573e-01

[43] 7.581632e-01 -7.267048e-01 -1.368281e+00 4.328180e-01 -8.113932e-01 1.444101e+00

[49] -4.314462e-01 6.556479e-01 3.219253e-01 -7.838389e-01 1.575728e+00 6.428993e-01

[55] 8.976065e-02 2.765507e-01 6.792888e-01 8.983289e-02 -2.993090e+00 2.848830e-01

[61] -3.672346e-01 1.852306e-01 5.818237e-01 1.399737e+00 -7.272921e-01 1.302543e+00

[67] 3.358481e-01 1.038506e+00 9.207286e-01 7.208782e-01 -1.043119e+00 -9.018639e-02

[73] 6.235182e-01 -9.535234e-01 -5.428288e-01 5.809965e-01 7.681787e-01 4.637676e-01

[79] -8.857763e-01 -1.099781e+00 1.512707e+00 2.579214e-01 8.844023e-02 -1.208965e-01

[85] -1.194329e+00 6.119969e-01 -2.171398e-01 -1.827567e-01 9.333463e-01 8.217731e-01

[91] 1.392116e+00 -4.761739e-01 6.503486e-01 1.391110e+00 -1.110789e+00 -8.607926e-01

[97] -1.131739e+00 -1.459214e+00 7.998255e-02 6.532043e-01 1.200965e+00 1.044751e+00

[103] -1.003209e+00 1.848482e+00 -6.667734e-01 1.055138e-01 -4.222559e-01 -1.223502e-01

[109] 1.881930e-01 1.191610e-01 -2.509255e-02 1.080727e-01 -4.854352e-01 -5.042171e-01

[115] -1.661099e+00 -3.823337e-01 -5.126503e-01 2.701891e+00 -1.362116e+00 1.372562e-01

[121] -1.493625e+00 -1.470436e+00 1.247024e-01 -9.966391e-01 -1.822614e-03 -4.282589e-01

[127] -6.136716e-01 -2.024678e+00 -1.224748e+00 1.795164e-01 5.676206e-01 -4.928774e-01

[133] 6.288407e-05 1.122890e+00 1.439856e+00 -1.097114e+00 -1.173196e-01 1.201498e+00

[139] -4.697296e-01 -5.246948e-02 -8.610730e-02 -8.876790e-01 -4.446840e-01 -2.944488e-02

[145] -4.138688e-01 1.113386e+00 -4.809928e-01 -4.331690e-01 6.968626e-01 -1.056368e+00

[151] -4.069848e-02 -1.551545e+00 1.167170e+00 -2.736457e-01 -4.678453e-01 -1.238252e+00

[157] -7.762034e-03 -8.002822e-01 -5.334923e-01 1.287675e+00 -1.755259e-01 -1.071782e+00

[163] 1.632069e-01 -3.627384e-01 5.900135e-01 1.432422e+00 -9.926925e-01 4.546503e-01

[169] 8.489806e-02 8.955656e-01 -2.297781e-01 8.366191e-01 -1.745056e+00 1.689459e+00

[175] 8.647780e-01 -1.507760e-01 -1.449007e+00 6.430087e-01 4.831939e-01 -6.355626e-03

[181] 1.514559e-01 -5.841090e-01 3.688067e-01 2.946543e-01 -2.792594e-01 -1.336237e+00

[187] 7.007488e-01 5.541966e-01 -8.363066e-01 -1.594588e+00 2.049586e-01 -3.450880e-01

[193] 2.526117e-01 -1.294002e+00 -9.591704e-01 1.085775e+00 4.037749e-01 5.864875e-01

[199] 1.815228e+00 1.288214e-01

(2)

Min. 1st Qu. Median Mean 3rd Qu. Max.

-2.99309 -0.61011 -0.01643 -0.02748 0.63363 2.70189

(3)

A diagram of a box plot

Description automatically generated

(4)

[1] -2.656455 -2.993090 2.701891

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