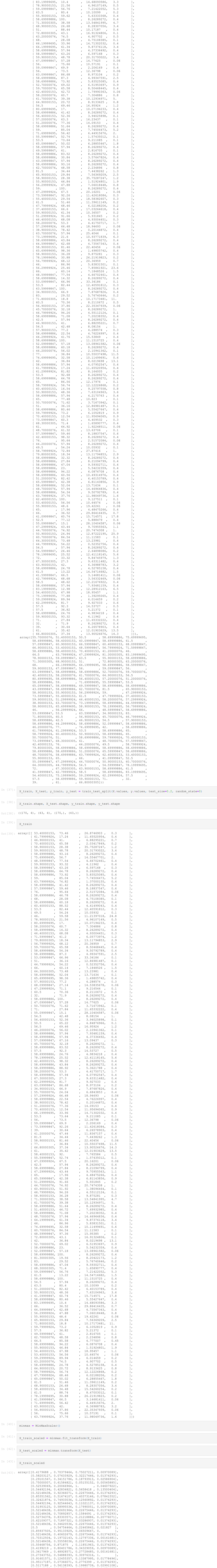


## Running a Lasso Regression Analysis

Your assignment is to run a Lasso regression analysis using K-fold cross validation to identify a subset of predictors from a larger pool of predictor variables that best predicts a quantitative response variable.





```
array([[ 48.673, 55.70000076, 24.04, 6.684353],
       [ 76.318, 51.4000153, 46.72, 7.6922985],
       [ 75.131, 58.6999886, 88.92, 7.5362188],
       [ 73.131, 58.6999886, 30.46, 7.2161833],
       [ 75.301, 58.4000153, 92., 7.765584],
       [ 74.241, 60.9000153, 45.22, 8.9801686],
       [ 75.246, 58.6999886, 46.78, 7.2628972],
       [ 81.307, 61.5, 88.74, 8.17030312],
       [ 75.057, 61.0999847, 71.16, 8.094937],
       [ 70.739, 60.9000153, 51.92, 7.43806644],
       [ 76.854, 60.9000153, 38.84, 7.5631983],
       [ 75.057, 60.4000153, 88.52, 7.44189303],
       [ 68.344, 60.9999847, 27.14, 7.45383578],
       [ 70.349, 58.6999886, 35.46, 7.62689272],
       [ 80.009, 48.5999847, 97.36, 7.253485],
       [ 76.072, 61.0999847, 71.16, 8.2628972],
       [ 56.081, 71.9999847, 41.2, 6.05737944],
       [ 75.131, 58.6999886, 30.46, 7.2161833],
       [ 67.185, 58.4000153, 34.48, 7.54526054],
       [ 66.618, 60.9000153, 65.58, 7.23417849],
       [ 75.47, 61.0999847, 71.16, 8.094937],
       [ 53.183, 46., 59.58, 7.1121391018],
       [ 73.488, 61.5, 85.58, 7.477107],
       [ 78.005, 63.7999924, 78.46, 8.9801686],
       [ 73.731, 47.2999924, 71.11, 6.71554],
       [ 65.439, 61.3000153, 35.46, 7.62689272],
       [ 50.411, 83.1999695, 10.4, 7.468093586],
       [ 63.125, 78.9999847, 21.56, 7.13824081],
       [ 61.61, 60.9999886, 56.76, 7.5381982],
       [ 81.012, 63.5, 80.4, 7.101009],
       [ 71.158, 55.9000153, 59.62, 7.53353488],
       [ 73.131, 58.6999886, 46.78, 7.2628972],
       [ 48.398, 71.3000105, 38.58, 7.13541995],
       [ 60.854, 61.3000153, 26.46, 7.82689272],
       [ 79.12, 51., 88.44, 7.101787],
       [ 73.456, 62.9000105, 43.1, 7.16632806],
       [ 73.131, 58.6999886, 78.46, 8.9801686],
       [ 61.061, 68., 28.85, 7.475108385],
       [ 48.397, 66.1999847, 31.96, 7.447373942],
       [ 57.379, 64.1999847, 63.84, 7.87676138],
       [ 81.618, 51.2999994, 91.66, 7.531845],
       [ 81.857, 46.4000153, 61.88, 7.52628972],
       [ 73.127, 58.2000076, 66.38, 7.44157093],
       [ 83.394, 57.2999924, 54.18, 7.184963],
       [ 73.403, 58.9000153, 78.42, 8.9801686],
       [ 67.017, 63.7000076, 57.94, 7.254046],
       [ 57.134, 73.1999965, 21.6, 7.10377189],
       [ 73.131, 58.6999886, 43.84, 7.2628972],
       [ 68.846, 64.5999847, 62.68, 7.473567343],
       [ 80.442, 66.9000153, 61.16, 7.23861148],
       [ 74.576, 65.6999695, 98.36, 7.149805742],
       [ 67.714, 58.9000153, 38.28, 7.9078281],
       [ 67.484, 78.1999847, 35.46, 7.62689272],
       [ 73.339, 56.7999924, 68.12, 7.203659],
       [ 72.637, 66., 88.96, 7.53831501],
       [ 48.398, 56.7999924, 55.46, 7.82689272],
       [ 56.786, 66., 60.14, 7.17848526],
       [ 74.088, 61.0999847, 71.16, 8.094937],
       [ 73.131, 58.6999886, 14.32, 7.2628972],
       [ 79.378, 53.5, 82.44, 7.3321846],
       [ 80.934, 63.5999847, 100., 7.8268972],
       [ 74.847, 64.9000153, 66.9, 7.87687826],
       [ 66.718, 83., 75.58, 7.57676138],
       [ 54.21, 71.8000105, 18.8, 7.10173481],
       [ 61.5, 60.9000153, 55.22, 7.5381982],
       [ 76.848, 56.9000153, 37.86, 7.223347939],
       [ 51.444, 45.7000076, 32.18, 7.2628972],
       [ 79.434, 46.7999847, 35.46, 7.62689272],
       [ 73.131, 58.6999886, 71.08, 7.20238352],
       [ 80.499, 42.5, 57.94, 7.8268972],
       [ 58.582, 61.9000153, 42.48, 7.8268972],
       [ 73.373, 58.6999886, 92.48, 7.8268972],
       [ 68.97, 58.6999886, 41.26, 7.47626997],
       [ 69.317, 44.2999924, 21.56, 7.153849],
       [ 73.131, 58.6999886, 100., 8.9801686],
       [ 68.498, 52.9999847, 57.18, 7.130896182],
       [ 74.573, 58.6999886, 60.18, 7.2628972],
       [ 72.13, 46.2000076, 56.02, 7.10941362],
       [ 50.239, 77., 36.84, 7.105507398],
       [ 60.579, 59.999995, 32.58, 7.52628972],
       [ 62.465, 42., 36.84, 7.8268972],
       [ 73.131, 58.6999886, 57.94, 7.254046],
       [ 68.785, 61.2999924, 12.24, 7.5381982],
       [ 80.734, 61.2999924, 81.82, 7.1490505],
       [ 76.652, 53.5, 92.68, 7.8268972],
       [ 76.522, 58.6999886, 55.46, 7.6268972],
       [ 80.654, 58.6999886, 86.56, 7.1219796],
       [ 74.044, 61.2999924, 78.46, 8.9801686],
       [ 54.675, 60.4000153, 16.54, 7.92579558],
       [ 51.879, 50.9000153, 48.36, 7.63149603],
       [ 73.131, 58.6999886, 57.94, 7.254046],
       [ 81.097, 65., 77.48, 7.10823],
       [ 72.974, 50.7000076, 71.62, 7.371673942],
       [ 65.437, 51., 38.18, 7.5381982],
       [ 73.131, 58.6999886, 80.46, 7.55427647],
       [ 76.128, 59.7999847, 63.84, 7.8268972],
       [ 62.791, 70.4000153, 12.54, 7.119564065],
       [ 72.477, 73.9999847, 60.3, 7.409532],
       [ 73.9, 68.3000105, 71.4, 7.92579558],
       [ 68.749, 61., 64.92, 7.192248511],
       [ 79.128, 48.7000076, 61.32, 7.6313706],
       [ 79.499, 57.2999924, 55.46, 7.6268972],
       [ 79.158, 42.4000153, 98.32, 7.8268972],
       [ 77.653, 44.2000076, 57.94, 7.8268972],
       [ 73.979, 49.5, 54.24, 7.1010532],
       [ 68.823, 61.2999924, 72.84, 7.5381982],
       [ 55.442, 79.8000105, 18.34, 7.11379853],
       [ 73.131, 58.6999886, 32.32, 7.2628972],
       [ 74.461, 58.6999886, 27.84, 7.5381982],
       [ 72.283, 58.6999886, 47.04, 7.93930211],
       [ 72.444, 58.6999886, 23., 7.5381982],
       [ 73.131, 58.6999886, 94.22, 7.60876708],
       [ 64.666, 58.6999886, 60.56, 7.49314976],
       [ 73.131, 51.2000076, 82.42, 7.5381982],
       [ 59.318, 65.5999847, 42.38, 7.61143856],
       [ 74.522, 58.6999886, 52.04, 7.137184],
       [ 73.131, 48.7000076, 57.94, 7.254046],
       [ 73.131, 58.6999886, 54.34, 7.90579269],
       [ 67.794, 63.7999924, 61.16, 7.8268972],
       [ 81.126, 62.4000153, 100., 7.912751],
       [ 75.446, 63.4000153, 56.56, 7.1016574],
       [ 79.341, 58.6999886, 89.46, 7.92579558],
       [ 67.852, 65., 17.96, 7.484752666],
       [ 51.219, 66., 36.52, 7.29846135],
       [ 62.197, 41.0999847, 60.74, 7.8268972],
       [ 61.404, 52.5, 77.12, 7.5888479],
       [ 61.452, 47.2999924, 43.44, 7.97095563],
       [ 70.563, 44.7000076, 74.92, 7.20744308],
       [ 68.718, 50.9000153, 24.94, 7.5381982],
       [ 81.439, 60.7000076, 84.54, 7.111583],
       [ 82.38, 64.3000105, 73.48, 7.1323981],
       [ 75.85, 46.7999847, 54.22, 7.6268972],
       [ 73.131, 54.5, 73.46, 7.2628972],
       [ 58.199, 78.1999847, 26.46, 7.6268972],
       [ 58.199, 78.1999695, 55.52, 7.1218145],
       [ 74.126, 72., 33.32, 7.9474979],
       [ 57.062, 63.9000153, 42., 7.63698783],
       [ 72.317, 58.6999886, 24.78, 7.2628972],
       [ 70.124, 61.5, 31.22, 7.5381982],
       [ 74.515, 41.5999847, 66.68, 7.14681411],
       [ 73.979, 42.7999924, 68.68, 7.5381982],
       [ 64.986, 58.5, 48.62, 7.12167625],
       [ 73.131, 58.6999886, 57.94, 7.254046],
       [ 61.116, 58.6999886, 12.98, 7.5381982],
       [ 68.494, 54.4000153, 67.98, 7.1895457],
       [ 76.548, 57.2999924, 71.68, 7.92579558],
       [ 70.107, 59.2999847, 89.46, 7.92579558],
       [ 78.531, 62.7999924, 81.7, 7.927033],
       [ 77.005, 57.5, 92.3, 7.5381982],
       [ 68.287, 57.5, 36.82, 7.5381982],
       [ 75.181, 71., 27.84, 7.116532222],
       [ 72.832, 32., 71.9, 7.2628972],
       [ 65.493, 39., 30.64, 7.2628972],
       [ 49.025, 61., 35.42, 7.12019629],
       [ 51.384, 66.8000105, 37.34, 7.30526676]]
```

```
In [57]: scaler = StandardScaler()

In [58]: X_scaled = scaler.fit_transform(X)

In [59]: X_scaled

Out[59]: array([-0.32224668, -0.30727861, -0.11155512, -0.37816201],
       [-0.73868884, -0.75567566, -0.43511132, -0.70360129],
       [-0.32823881, -0.80558118, -1.38210403, -0.69342621],
       [-0.0621041, 1.77837, -0.0035342, 0.84626791],
       [-0.32823881, -0.0058118, -1.38210403, -0.69342621],
       [-0.62844773, -0.02570309, 1.51373213, -0.29051371],
       [-0.44893193, -1.354608, 0.30295988, -0.96510624],
       [-0.574597, -0.0058118, -0.43527663, -0.28793181],
       [-1.27937005, 0.29757041, 1.37435029, -0.17241801],
       [-1.1652473, -0.18187896, 0.4507443, -0.87216482],
       [-0.06899702, 0.23500147, -0.21118937, -1.3604742],
       [-0.59799333, 0.82940759, 1.15731824, -0.0266599],
       [-0.53697613, 0.18288064, 0.54847667, 0.13232458],
       [-0.1255427, 0.98583029, -1.27826359, 0.8449319],
       [-0.7967341, 0.86069242, -0.7137729, -0.10121254],
       [-0.02872384, -0.54711201, 0.76384625, 2.032866182],
       [-1.07367341, -0.04765259, 0.12038736, -1.08218883],
       [-0.6469849, -0.1253425, -0.2006239, -0.6829672],
       [-1.51361788, 1.35081667, -0.47281309, -0.57662054],
       [-0.32823881, -0.0058118, 1.85922743, -0.2074306],
       [-0.31618079, -0.02570309, -0.26218915, 1.03232458],
       [-0.3776315, 1.2256788, 0.37703637, -1.25134075],
       [-0.60341226, -1.81935059, -0.40104764, 0.93191813],
       [-1.8338989, -1.31877897, 0.1862485, 0.8787918],
       [-0.36692999, 0.61041589, 0.123827464, -0.79125929],
       [-0.85647646, 0.53741761, 0.7489265, -1.36284603],
       [-0.35424969, -0.18323159, 0.61473813, -0.0470525],
       [-1.58919669, 2.36235085, -1.6406729, -0.21697881],
       [-0.13121466, 2.56489816, 0.3931200, 0.68871682],
       [-0.7561982, 2.11207431, -1.51854907, -0.76066871],
       [-0.00471863, -0.0472387, -0.00276771, -0.38284516],
       [-1.8527114, -0.58613406, -0.10321305, -0.01070201],
       [-0.02872384, -0.28640765, 0.12038736, -1.08218883],
       [-0.32823881, -0.0058118, -1.38210403, -0.69342621],
       [-0.2920903, 1.1939326, -0.0785633, -0.67893631],
       [-0.22711357, 1.06925607, -1.28807207, -0.2074306],
       [-0.97313488, -0.7378878, 1.36143171, -0.1128972],
       [-0.3636188, 1.47955834, -0.59099545, -1.24302471],
       [-0.3902314, -0.47484939, 0.76114864, -0.1691879],
       [-0.8788179, -0.97466176, -0.2377833, -0.75873193],
       [-0.35239931, 0.78794666, -0.98458134, 0.87471295],
       [-1.37984206, 0.5793101, 0.19445385, 0.06291651],
       [-0.32823881, -0.0058118, 0.04804335, -0.8591935],
       [-0.99801901, -0.00484704, 0.27713273, -0.8685994],
       [-1.59391617, -0.11071865, 0.36403759, -0.69464636],
       [-0.70853957, -1.20408803, 0.01962249, 0.88477293],
       [-0.9781139, -0.27937963, 0.81110046, 0.1793455],
       [-1.02836504, -0.27937963, 0.56305285, -1.22257871],
       [-0.4932695, -0.28640765, 0.12038736, 0.48104435],
       [-0.94545329, 0.46442137, -1.2856427, -0.6291591],
       [-1.31846676, -0.0058118, 1.3124113, -0.7552365],
       [-0.99929387, 0.1098632, 0.37703637, -1.2660847],
       [-0.3395101, -1.69421228, -0.60735898, -1.1906019],
       [-0.29280175, -0.0465385, 0.16889425, -0.8677058],
       [-0.0670523, -0.1842685, -0.75118577, 1.007596],
       [-0.9218082, -0.2232877, -0.54712103, -0.0825127],
       [-0.51183228, -0.2232877, 0.54411659, 1.250735],
       [-1.17354448, 2.29978112, -1.74911339, 0.09613068],
       [-0.32823881, -0.0058118, 0.6335946, -0.2074306],
       [-0.09292072, -0.23426674, -0.19224175, -0.93180051],
       [-1.07019291, -0.15084136, 0.27885521, 1.12921593],
       [-1.234867, -0.76563231, 0.8849315, 0.6898471],
       [-0.54521291, -0.0058118, 0.22324671, -0.2074306],
       [-0.081934, -0.0768529, 0.14550203, -0.2074306],
       [-1.25842498, 1.3612447, -0.01741076, -0.51202471],
       [-0.63656553, 0.67298482, -0.2930107, -0.53812617],
       [-0.32823881, -0.0058118, 0.04804335, -0.2074306],
       [-1.06347973, -0.9433346, 0.1781128, 0.8425466],
       [-0.32823881, -0.0058118, 0.04804335, -0.2074306],
       [-0.63440856, -0.0058118, -1.1894365, -0.9291525],
       [-1.05524285, -1.62121532, 0.04804335, -0.2074306],
       [-0.6546669, -0.0058118, 1.5668395, -0.2074306],
       [-0.11520498, 0.43278089, 0.53161616, -0.69464636],
       [-1.73644087, 2.3832069, -0.96391162, -0.34445381],
       [-0.3811965, 0.75641059, -1.1199442, -0.32435885],
       [-0.0190046, -0.02647782, 0.2486846, 0.4037495],
       [-0.86782824, -0.28640765, -0.4094389, -1.33765021],
       [-0.3769691, -0.2469457, -0.851598, -0.8262185],
       [-1.3717086, 0.3368585, 1.85922743, -0.2074306],
       [-0.50551833, -0.33854856, -1.174915, -0.63284791],
       [-0.7425704, -0.2975704, -0.2039785, 0.31811871],
       [-0.3122335, -1.1100047, 0.5010568, -0.2074306],
       [-0.0670523, -0.2156214, 0.40209592, 1.263041],
       [-1.13350884, 0.11071865, 0.19445385, -0.6291591],
       [-1.24804861, -0.76610428, -1.5009107, -0.59729259],
       [-1.27373436, -1.27708499, 0.48469115, -0.16597031],
       [-0.32780529, -0.0465385, -0.6335946, -0.2074306],
       [-1.44052914, -0.14041334, 0.41579209, 0.58395671],
       [-0.35717781, -0.05919867, 0.29955134, -1.5889429],
       [-0.3343841, -0.526905, 0.04804335, 2.6658169],
       [-0.82179529, -0.28640765, 0.12038736, -1.08218883],
       [-0.32823881, -0.0058118, 0.14550203, -0.2074306],
       [-0.48484599, 0.7355375, 1.7886559, -1.34121591],
       [-0.25884784, 0.02643782, -0.8846777, 0.06316171],
       [-0.28737556, 0.23907658, -1.11721203, 0.28039825],
       [-0.35078157, -1.1925425, -0.6786185, -0.2074306],
       [-0.2750248, -1.31877897, 1.29770008, -0.61605511],
       [-0.37818343, -0.2469457, 1.3506761, -0.8425466],
       [-1.4321062, -0.76683862, 0.14277956, -0.38786848],
       [-0.50782227, -1.04766529, 0.89205885, -0.80996351],
       [-0.32823881, -0.0058118, 1.8303173, -0.69464636],
       [-0.230698, -0.57839708, 0.6436181, 3.99715961],
       [-1.0688811, -0.5668419, 1.10320023, 0.4874039],
       [-1.1739136, -0.5165208, 1.85922743, -0.2074306],
       [-0.51421661, -0.24763592, 0.43387809, -0.27859511],
       [-0.3678363, -0.5386265, 0.9257762, 0.6291591],
       [-1.72239408, 1.37167352, 0.7373995, 0.11286015],
       [-0.44637156, -0.13288589, 0.58287232, -0.21581322],
       [-0.7010284, -0.18213835, 0.6163988, 0.4037495],
       [-1.35080234, -1.35080234, -0.1021355, -0.2074306],
       [-1.03203252, -1.23537249, 1.61025359, -0.39293398],
       [-0.32823881, -0.0058118, 0.61387689, -0.2074306],
       [-1.12677288, -1.0372487, 0.04804335, -0.2074306],
       [-1.2485252, -0.43240266, 0.6142547, -0.53845381],
       [-0.35446645, -0.23420266, 0.04804335, -0.2074306],
       [-0.7425704, -0.077844, 0.8774158, -0.87340881],
       [-0.1251785, -0.0058118, -1.47634839, -0.2074306],
       [-0.08511746, -1.49607705, -0.6869841, 1.0255681],
       [-0.32823881, -0.0058118, 1.85922743, -0.2074306],
       [-0.17387599, -0.6862789, 0.04804335, 0.60202181],
       [-0.48450805, -0.0058118, 0.14550203, -0.2074306],
       [-0.22191933, -0.2979443, 0.03151625, -0.2074306],
       [-0.2527658, 1.91393869, -0.86056303, 0.71633651],
       [-0.53207111, 1.67490917, -1.04400678, 0.10334861],
       [-0.82772813, -1.7358317, 0.86056303, -0.2478159],
       [-0.32823881, -0.0058118, 0.04804335, -0.90855327],
       [-0.1416912, 0.33885487, -0.7057654, 0.3615356],

```