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Project 4 Report

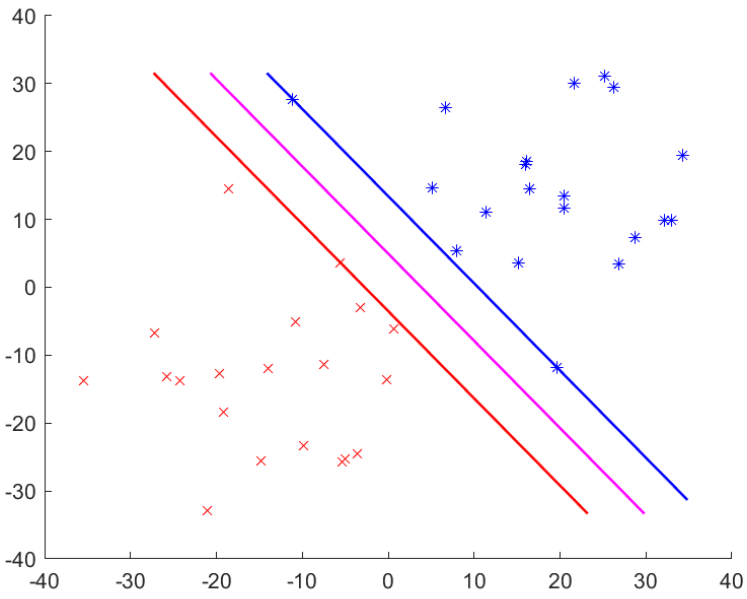
Rho Manipulation:

In order to find exactly where the Rho value no longer converged entirely, we created a table that included each data set, Rho value, amount of steps the convergence occurred in, or a notation if the convergence did not occur. Our conclusion pulled from the table is the convergence no longer occurred on any data set when Rho is >= 482,500 or <= 0.000121. Interestingly, throughout the testing of smaller values of Rho (0.001, 0.002, 0 .000333, 0.00025, 0.00014, 0.00013) the first data set (image 1) is what continued to converge while all other data sets failed.

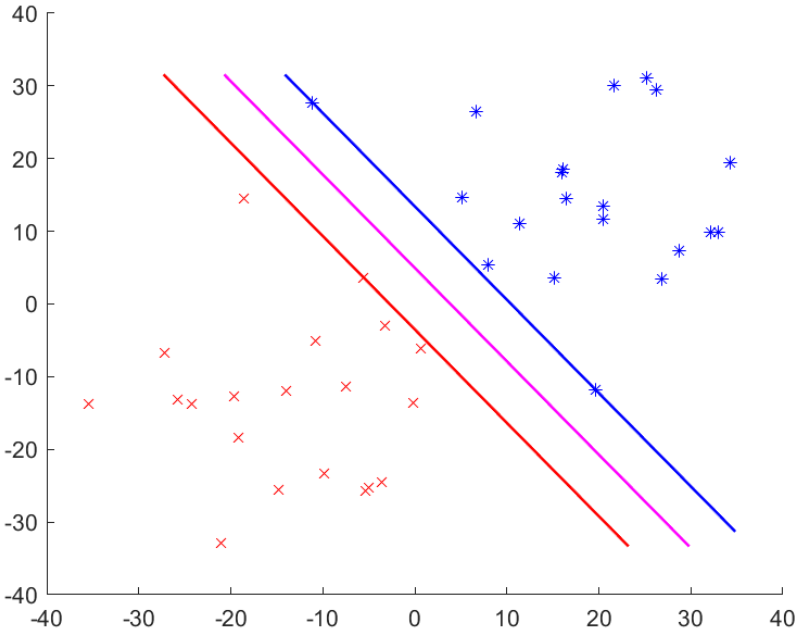
Furthermore, the second and fourth data set on the testing of the larger Rho values (5000, 10,000, 50,000) remained while the first and third did not convolve. It was not until the Rho values exceeded 100,000 when just the second data set remained up until complete failure at 482,500.

Lastly, after many attempts, we are concluding that there is no Rho value that will allow the third data set to convolve. Thus, the two sets points defined by u3 and v3 are not separable and hard SVM fails.

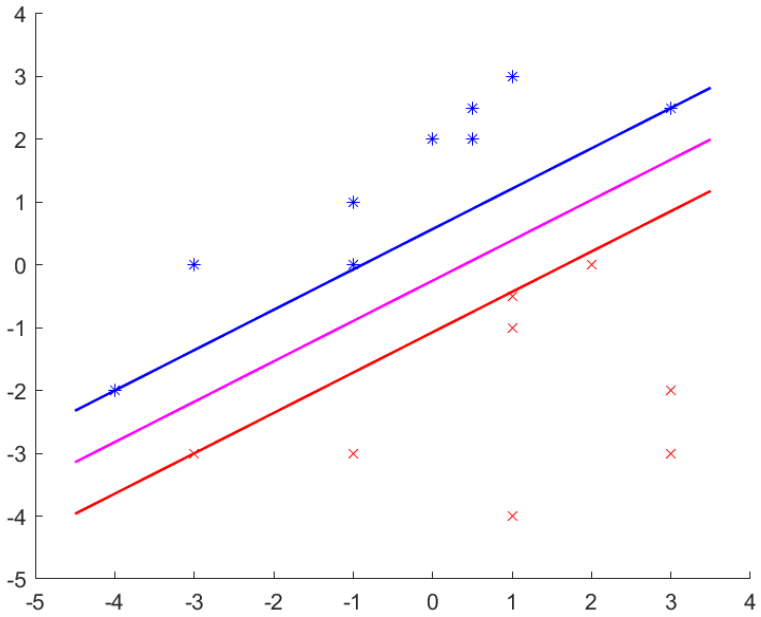
When Rho = 482,000, the second data point converges and looks like this:



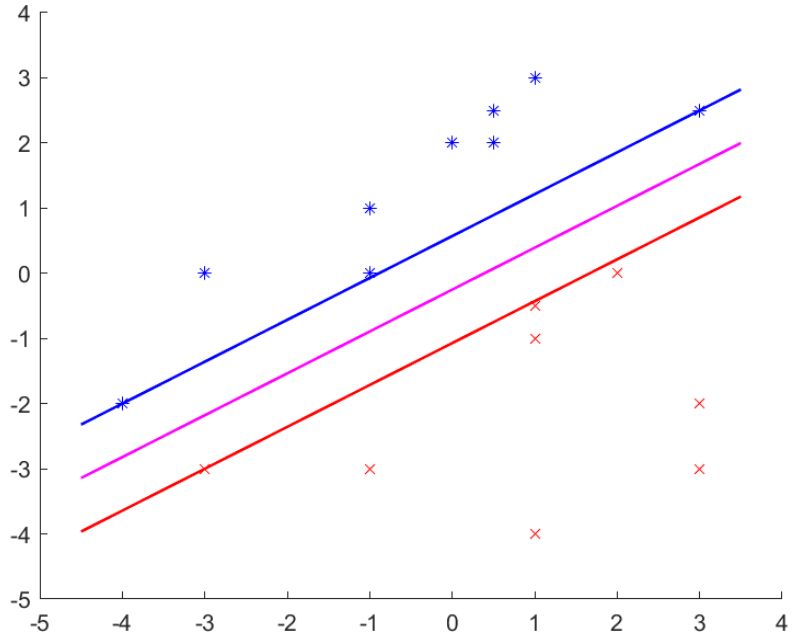
When Rho = 482,500, the second data point does not converge and looks like this:



When Rho = 0.00013, the first data point looks like this:



When Rho = 0.000121, the first data point does not converge and looks like this:

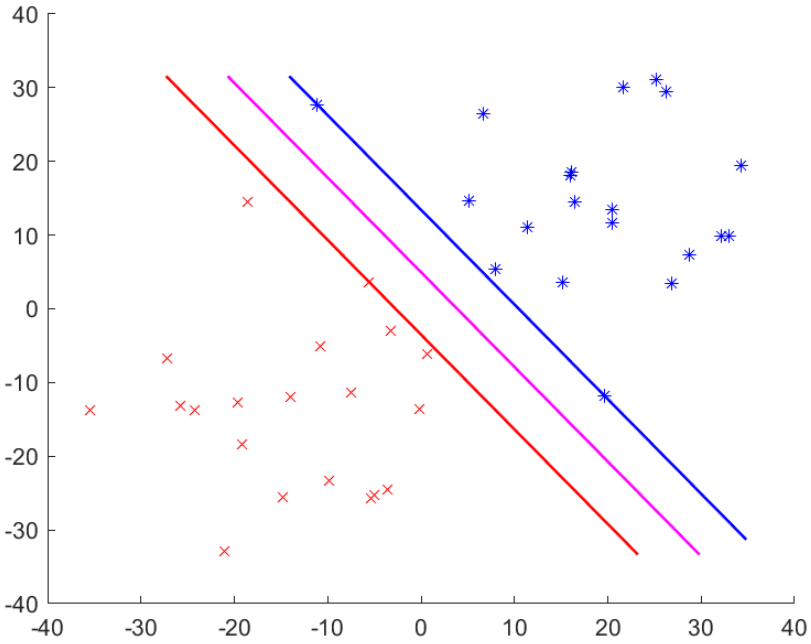


Even though the convergence changes between the smallest and largest values, visually the plots remain unaffected (other than by scale).

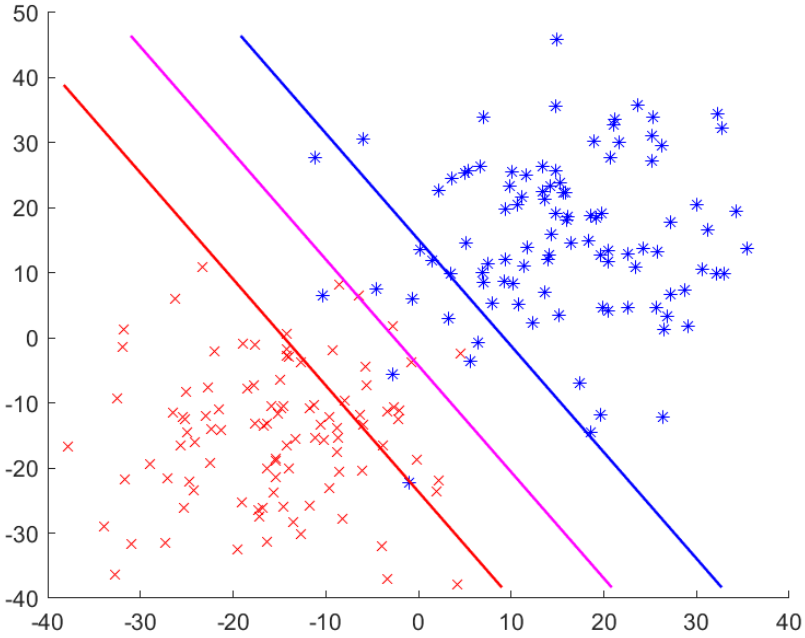
Random Seed Implementations: Data Set Two

Below are the output graphs of different Random Seed values used on the second data set. When altering the random seed, we always used ‘2’ as the column vector value because manipulating this value created an error. However, we changed the row size and the plus minus value and displayed the results below. The value manipulations created different plots varying in amount and distance between each hyperplane. It also changed the location of each hyperplane. The higher the plus minus value became, the more compact the data sets became. When varying the plus value from the minus value, the data set became more intertwined than if the plus minus stayed consistently the same value.

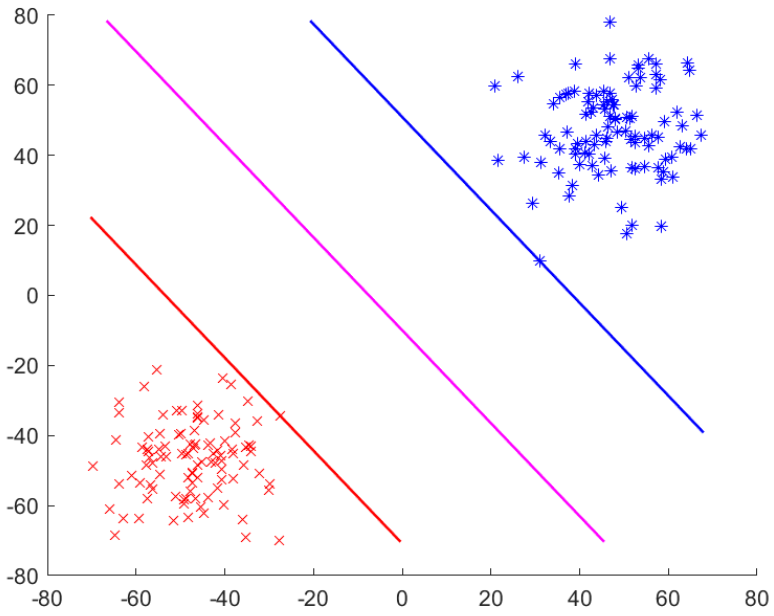
Random Seed = 10.1*randn(2,20)+-15 (original):



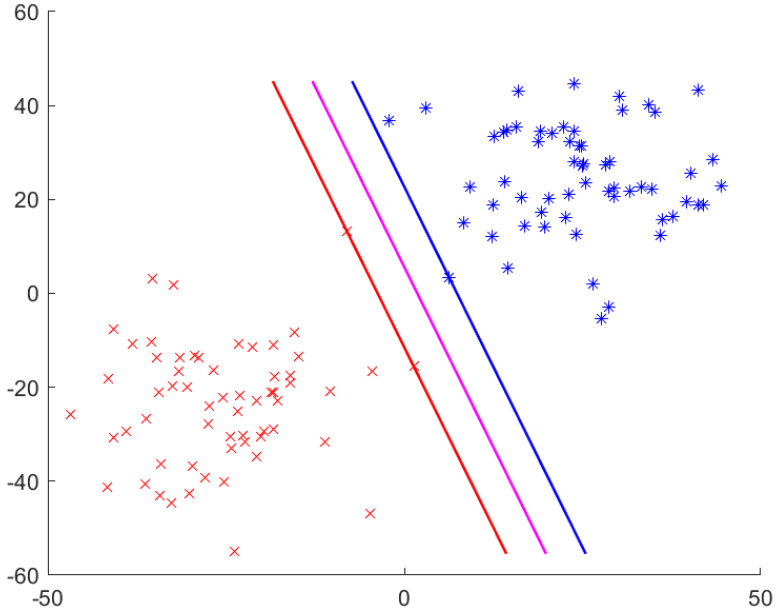
Random Seed = 10.1*randn(2,100)+-15:



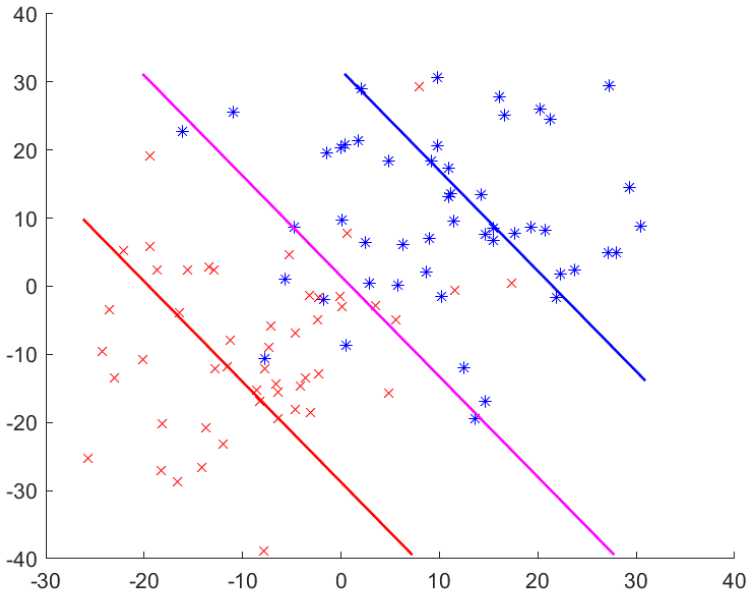
Random Seed = 10.1*randn(2,100)+-47:



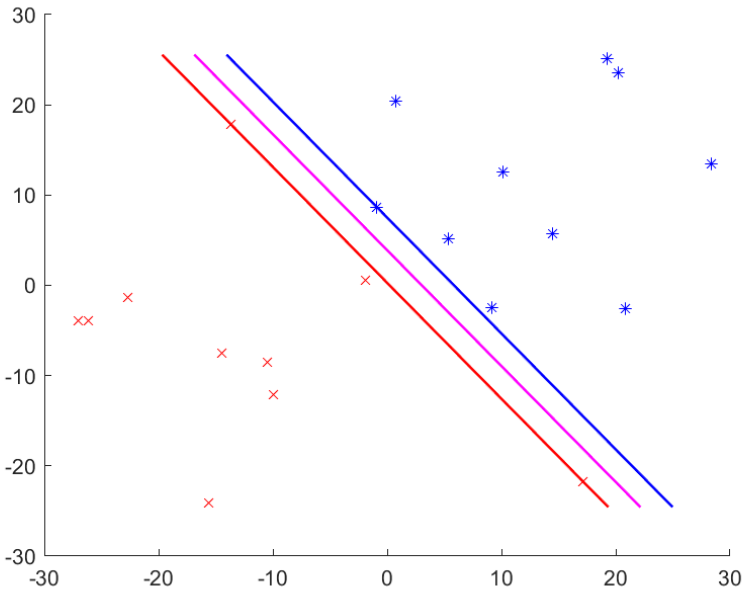
Random Seed = 10.1*randn(2,60)+-24:



Random Seed = 10.1*randn(2,50)+10 -8



Random Seed = 10.1*randn(2,10)+-9:



Data Set	Rho Value	Converged in Steps	Did not Converge
v{1}, u{1}	10	417	
v{2}, u{2}	10	10161	
v{3}, u{3}	10		✓
v{4}, u{4}	10	110640	
v{1}, u{1}	0.001	24095	
v{2}, u{2}	0.001		✓
v{3}, u{3}	0.001		✓
v{4}, u{4}	0.001		✓
v{1}, u{1}	0.0001		✓
v{2}, u{2}	0.0001		✓
v{3}, u{3}	0.0001		✓
v{4}, u{4}	0.0001		✓
v{1}, u{1}	0.0002	110660	
v{2}, u{2}	0.0002		✓
v{3}, u{3}	0.0002		✓
v{4}, u{4}	0.0002		✓
v{1}, u{1}	0.00033	67967	
v{2}, u{2}	0.00033		✓
v{3}, u{3}	0.00033		✓
v{4}, u{4}	0.00033		✓
v{1}, u{1}	0.00025	88959	
v{2}, u{2}	0.00025		✓
v{3}, u{3}	0.00025		✓
v{4}, u{4}	0.00025		✓
v{1}, u{1}	0.00014	156942	
v{2}, u{2}	0.00014		✓
v{3}, u{3}	0.00014		✓
v{4}, u{4}	0.00014		✓
v{1}, u{1}	0.00013	168996	
v{2}, u{2}	0.00013		✓
v{3}, u{3}	0.00013		✓
v{4}, u{4}	0.00013		✓
v{1}, u{1}	0.00011		✓
v{2}, u{2}	0.00011		✓
v{3}, u{3}	0.00011		✓
v{4}, u{4}	0.00011		✓
v{1}, u{1}	0.00012		✓

v{2}, u{2}	0.00012		✓
v{3}, u{3}	0.00012		✓
v{4}, u{4}	0.00012		✓
v{1}, u{1}	0.000121		✓
v{2}, u{2}	0.000121		✓
v{3}, u{3}	0.000121		✓
v{4}, u{4}	0.000121		✓
v{1}, u{1}	0.000122	179756	
v{2}, u{2}	0.000122		✓
v{3}, u{3}	0.000122		✓
v{4}, u{4}	0.000122		✓
v{1}, u{1}	5000		✓
v{2}, u{2}	5000	1744	
v{3}, u{3}	5000		✓
v{4}, u{4}	5000	13757	
v{1}, u{1}	10000		✓
v{2}, u{2}	10000	3678	
v{3}, u{3}	10000		✓
v{4}, u{4}	10000	28003	
v{1}, u{1}	50000		✓
v{2}, u{2}	50000	18629	
v{3}, u{3}	50000		✓
v{4}, u{4}	50000	140678	
v{1}, u{1}	100000		✓
v{2}, u{2}	100000	37259	
v{3}, u{3}	100000		✓
v{4}, u{4}	100000		✓
v{1}, u{1}	400000		✓
v{2}, u{2}	400000	148974	
v{3}, u{3}	400000		✓
v{4}, u{4}	400000		✓
v{1}, u{1}	500000		✓
v{2}, u{2}	500000		✓
v{3}, u{3}	500000		✓
v{4}, u{4}	500000		✓
v{1}, u{1}	450000		✓
v{2}, u{2}	450000	167510	
v{3}, u{3}	450000		✓

v{4}, u{4}	450000		✓
v{1}, u{1}	475000		✓
v{2}, u{2}	475000	176888	
v{3}, u{3}	475000		✓
v{4}, u{4}	475000		✓
v{1}, u{1}	480000		✓
v{2}, u{2}	480000	178745	
v{3}, u{3}	480000		✓
v{4}, u{4}	480000		✓
v{1}, u{1}	485000		✓
v{2}, u{2}	485000		✓
v{3}, u{3}	485000		✓
v{4}, u{4}	485000		✓
v{1}, u{1}	482500		✓
v{2}, u{2}	482500		✓
v{3}, u{3}	482500		✓
v{4}, u{4}	482500		✓
v{1}, u{1}	482000		✓
v{2}, u{2}	482000	179421	
v{3}, u{3}	482000		✓
v{4}, u{4}	482000		✓