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Reference: https://github.com/tuktik6326/SellingCarPrediction.git

Report for Car pricing prediction system

Degrees and type of regularization

After running model in degree of polynomial regression 1 and 2 and regularization, including to lasso, ridge and normal with epoch 500 epochs, it finds that regression with first degree of polynomial (linear) and without regularization(normal) provides the most accuracy with r-square of 0.588 and MSE from testing with 0.296. Another interesting point is that regression model with second of polynomial (parabola) with ridge regularization performs the least accuracy with r-square of -1.369 and MSE from testing with 9.714.

				Metrics			
Run Name	Created	Duration	test_mse	test_r2	train_loss	val_loss	
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-3	3 hours ago	1.6min	1.384	-0.811	-	-	
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-3	3 hours ago	1.7min	24.19	-6.195	-	-	
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-3	3 hours ago	2.2min	4.751	-5.723	-	-	
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-2	3 hours ago	1.4min	0.377	0.486	-	-	
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-2	3 hours ago	1.2min	9.714	-1.369	-	-	
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-2	3 hours ago	1.8min	0.248	0.65	-	-	
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-1	3 hours ago	1.8min	0.296	0.588	-	-	
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-1	3 hours ago	1.3min	5.032	0.08	-	-	
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-1	3 hours ago	1.3min	0.26	0.633	-	-	

				Metrics			
Run Name	Created	Duration	test_mse	test_r2	train_loss	val_loss	
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-1	3 hours ago	1.3min	0.26	0.633	-	-	
Fold-0	3 hours ago	41.5s	-	-	0.254	0.253	
Fold-1	3 hours ago	16.9s	-	-	0.248	0.245	
Fold-2	3 hours ago	4.2s	-	-	0.246	0.249	
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-1	3 hours ago	1.3min	5.032	0.08	-	-	
Fold-0	3 hours ago	41.4s	-	-	5.056	4.982	
Fold-1	3 hours ago	27.1s	-	-	4.946	4.967	
Fold-2	3 hours ago	447ms	-	-	4.93	4.998	
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-1	3 hours ago	1.8min	0.296	0.588	-	-	
Fold-0	3 hours ago	54.1s	-	-	0.319	0.316	
Fold-1	3 hours ago	44.3s	-	-	0.296	0.291	
Fold-2	3 hours ago	267ms	-	-	0.292	0.297	

Momentum

After running model with momentum, indicated as 0.025 and without momentum with epoch 500 epochs, it finds that regression without momentum provides accuracy more than with momentum with MSE and R-square at 0.248 and 0.65, respectively.

			Metrics			
Run Name	Created	Duration	test_mse	test_r2	train_loss	val_loss
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-2	3 hours ago	1.8min	0.248	0.65	-	-
Fold-0	3 hours ago	33.0s	-	-	1.659	1.623
Fold-1	3 hours ago	36.1s	-	-	0.299	0.314
Fold-2	3 hours ago	32.5s	-	-	0.23	0.238
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-2	3 hours ago	1.2min	9.714	-1.369	-	-
Fold-0	3 hours ago	30.0s	-	-	8.185	8.073
Fold-1	3 hours ago	461ms	-	-	8.004	8.382
Fold-2	3 hours ago	33.9s	-	-	6.918	6.708
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-2	3 hours ago	1.4min	0.377	0.486	-	-
Fold-0	3 hours ago	32.4s	-	-	1.526	1.483
Fold-1	3 hours ago	33.7s	-	-	0.393	0.421
Fold-2	3 hours ago	10.8s	-	-	0.347	0.347

Type of initialization

After running model with Zeros initialization and Xavier initialization in 500 epochs, it finds that regression with Xavier initialization provides accuracy close to with Zeros initialization with MSE and R-square at 0.248 and 0.65, respectively.

			Metrics			
Run Name	Created	Duration	test_mse	test_r2	train_loss	val_loss
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-2	3 hours ago	1.2min	9.714	-1.369	-	-
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-2	3 hours ago	1.4min	0.377	0.486	-	-
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-3	3 hours ago	2.2min	4.751	-5.723	-	-
Fold-0	3 hours ago	41.6s	-	-	2.693	3.153
Fold-1	3 hours ago	44.0s	-	-	0.498	0.509
Fold-2	3 hours ago	35.9s	-	-	0.271	0.288
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-3	3 hours ago	1.7min	24.19	-6.195	-	-
Fold-0	3 hours ago	38.0s	-	-	8.561	9.443
Fold-1	3 hours ago	36.9s	-	-	7.132	6.885
Fold-2	3 hours ago	16.1s	-	-	6.998	6.925
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-3	3 hours ago	1.6min	1.384	-0.811	-	-
Fold-0	3 hours ago	35.5s	-	-	2.529	2.842
Fold-1	3 hours ago	48.3s	-	-	0.514	0.548
Fold-2	3 hours ago	6.2s	-	-	0.463	0.455

Regression method

After running the model comparing regression method: batch gradient, stochastic gradient and mini-batch gradient 500 epochs, it finds that regression with mini-batch gradient provides the most accuracy with MSE and R-square at 0.248 and 0.65, respectively.

		Metrics				
Run Name	Created	Duration	test_mse	test_r2	train_loss	val_loss
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0.025-degree-2	2 hours ago	2.0min	0.25	0.646	-	-
Fold-2	2 hours ago	37.6s	-	-	0.231	0.238
Fold-1	2 hours ago	38.3s	-	-	0.31	0.328
Fold-0	2 hours ago	37.2s	-	-	1.777	1.739
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-2	3 hours ago	2.0min	0.248	0.65	-	-
Fold-2	2 hours ago	33.7s	-	-	0.23	0.238
Fold-1	3 hours ago	45.0s	-	-	0.299	0.314
Fold-0	3 hours ago	36.8s	-	-	1.659	1.623

		Metrics				
Run Name	Created	Duration	test_mse	test_r2	train_loss	val_loss
method-batch-initial-xavial-lr-0.01-reg-Norm-momentum-0-degree-2	2 hours ago	1.9min	0.248	0.65	-	-
Fold-2	2 hours ago	33.2s	-	-	0.23	0.238
Fold-1	2 hours ago	36.1s	-	-	0.299	0.314
Fold-0	2 hours ago	36.1s	-	-	1.659	1.623
method-batch-initial-zeros-lr-0.01-reg-Norm-momentum-0-degree-2	3 hours ago	2.3min	0.248	0.65	-	-
Fold-2	2 hours ago	41.3s	-	-	0.23	0.238
Fold-1	3 hours ago	45.8s	-	-	0.299	0.314
Fold-0	3 hours ago	39.3s	-	-	1.659	1.623

Learning rate

After running model comparing learning rates, including to 0.01, 0.001, 0.0001, in 500 epochs, it finds that regression with learning rate of 0.01 provides the most accuracy with MSE and R-square at 0.233 and 0.67, respectively. Another interesting point is that increasing the learning rate from 0.01 to 0.0001 makes model predict less accuracy.

		Metrics				
Run Name	Created	Duration	test_mse	test_r2	train_loss	val_loss
method-mini-initial-xavial-lr-0.01-reg-Norm-momentum-0-degree-2	2 hours ago	1.3min	0.233	0.67	-	-
Fold-2	2 hours ago	2.9s	-	-	0.259	0.236
Fold-1	2 hours ago	53.8s	-	-	0.15	0.222
Fold-0	2 hours ago	4.2s	-	-	0.171	0.233
method-sto-initial-xavial-lr-0.01-reg-Norm-momentum-0-degree-2	2 hours ago	5.4min	0.439	0.38	-	-
Fold-2	2 hours ago	2.0min	-	-	0.053	0.388
Fold-1	2 hours ago	1.7min	-	-	0.126	0.24
Fold-0	2 hours ago	1.6min	-	-	0.155	0.545
method-batch-initial-xavial-lr-0.01-reg-Norm-momentum-0-degree-2	2 hours ago	1.6min	0.248	0.65	-	-
Fold-2	2 hours ago	31.0s	-	-	0.23	0.238
Fold-1	2 hours ago	29.1s	-	-	0.299	0.314
Fold-0	2 hours ago	30.1s	-	-	1.659	1.624

				Metrics			
Run Name	Created	Duration	test_mse	test_r2	train_loss	val_loss
method-mini-initial-xavial-lr-0.0001-reg-Norm-momentum-0-degree-2	2 hours ago	2.7min	1.104	-0.375	-	-
Fold-2	2 hours ago	50.5s	-	-	0.529	0.663
Fold-1	2 hours ago	51.7s	-	-	3.058	2.362
Fold-0	2 hours ago	44.0s	-	-	6.919	8.73
method-mini-initial-xavial-lr-0.001-reg-Norm-momentum-0-degree-2	2 hours ago	46.5s	0.236	0.667	-	-
Fold-2	2 hours ago	1.4s	-	-	0.215	0.236
Fold-1	2 hours ago	3.6s	-	-	0.191	0.222
Fold-0	2 hours ago	30.8s	-	-	0.299	0.233
method-mini-initial-xavial-lr-0.01-reg-Norm-momentum-0-degree-2	2 hours ago	1.2min	0.233	0.67	-	-
Fold-2	2 hours ago	2.8s	-	-	0.125	0.236
Fold-1	2 hours ago	52.8s	-	-	0.242	0.221
Fold-0	2 hours ago	8.4s	-	-	0.298	0.233

Conclusion

According to result, regression model with parameters second-degree of polynomial without regularization, without momentum, Xavier initialization, method of mini-batch gradient and learning rate of 0.01 performs the most accuracy, indicating a great fit in model with MSE and R-square being 0.233 and 0.67, respectively.