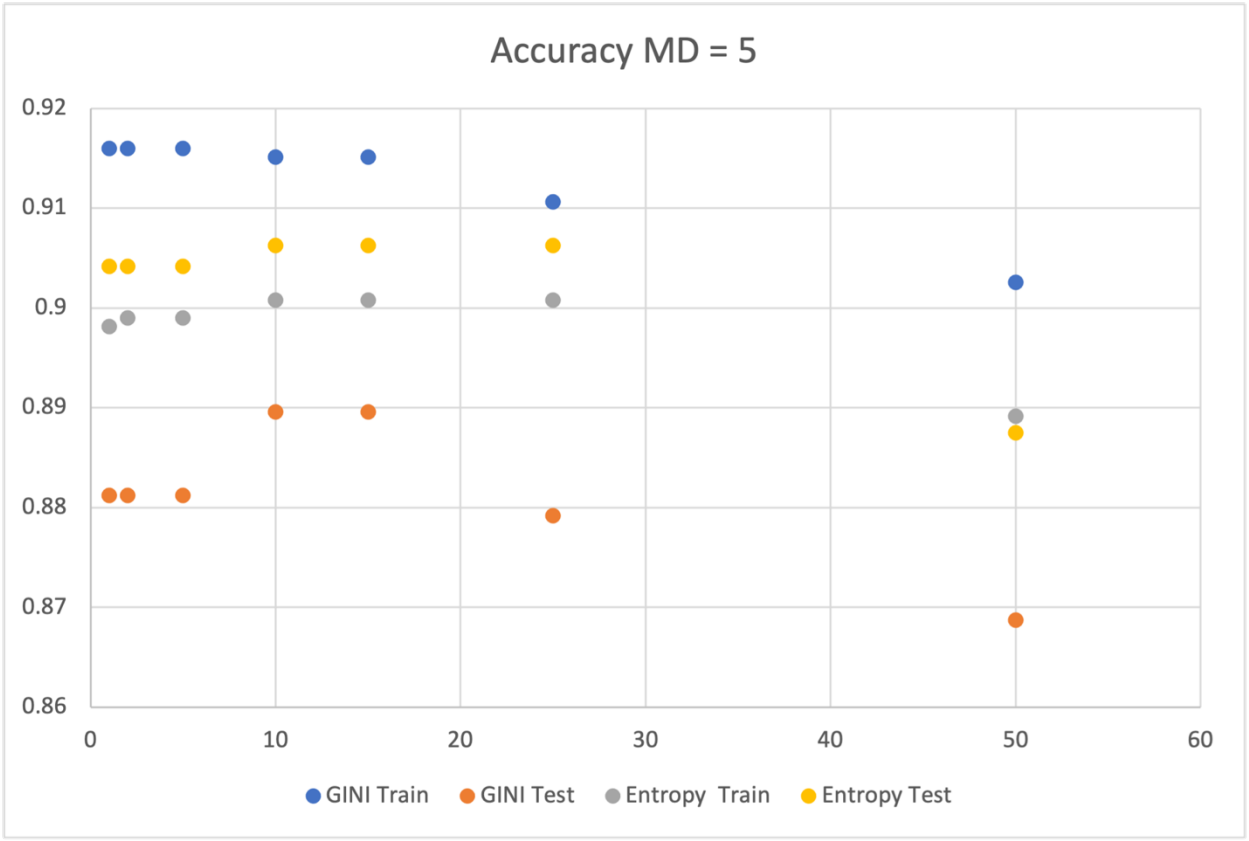
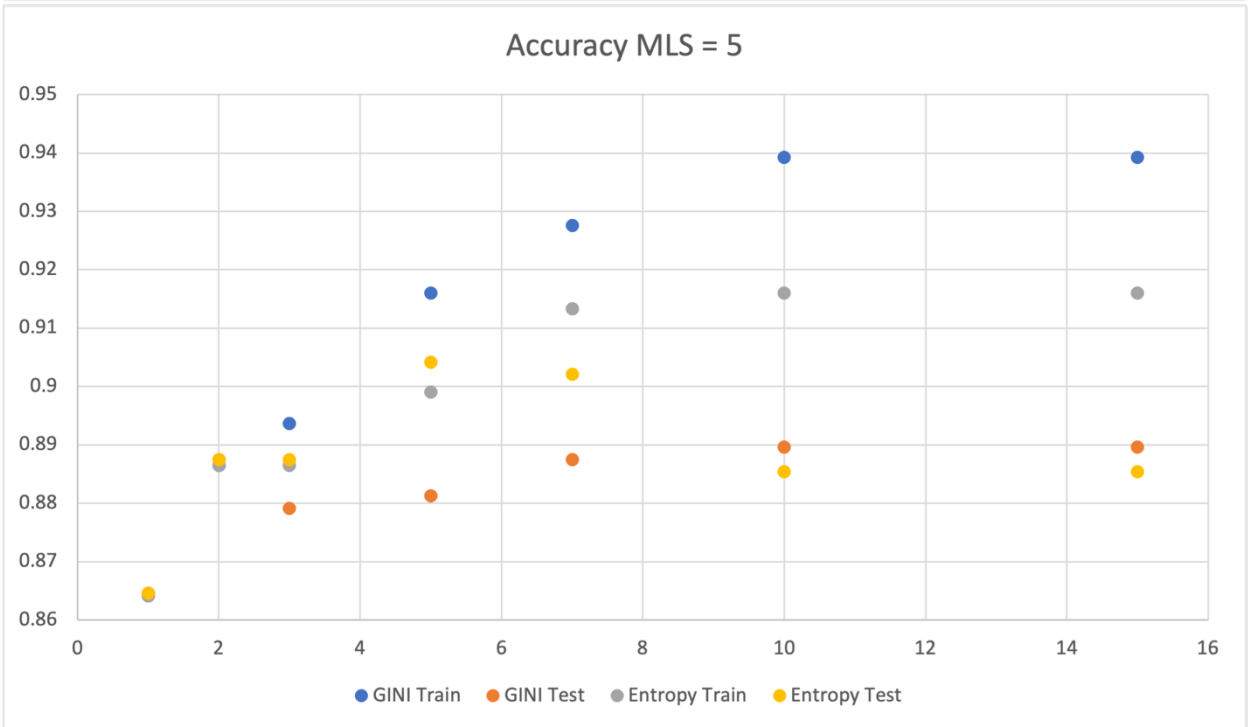
1.
c)

	Gini		Entropy	
	GINI Train	GINI Test	Entropy Train	Entropy Test
1	0.8641644325290437	0.8645833333333334	0.8641644325290437	0.8645833333333334
2	0.8865058087578195	0.8875	0.8865058087578195	0.8875
3	0.8936550491510277	0.8791666666666667	0.8865058087578195	0.8875
5	0.9159964253798034	0.88125	0.8990169794459338	0.9041666666666667
7	0.9276139410187667	0.8875	0.9133154602323503	0.9020833333333333
10	0.9392314566577301	0.8895833333333333	0.9159964253798034	0.8854166666666666
15	0.9392314566577301	0.8895833333333333	0.9159964253798034	0.8854166666666666

	Gini		Entropy	
	GINI Train	GINI Test	Entropy Train	Entropy Test
1	0.91599642537980	0.88125	0.898123324396782	0.904166666666666
2	0.91599642537980	0.88125	0.899016979445933	0.904166666666666
5	0.91599642537980	0.88125	0.899016979445933	0.904166666666666
10	0.91510277033065	0.889583333333333	0.900804289544236	0.90625
15	0.91510277033065	0.889583333333333	0.900804289544236	0.90625
25	0.91063449508489	0.879166666666666	0.900804289544236	0.90625
50	0.90259159964253	0.86875	0.889186773905272	0.8875





d) The computational complexity of the train function is O(N*D*P) since the code runs through each feature exactly once for observation exactly once for each additional depth. The computational complexity of the predict function is O(N*P) since the code runs through each datapoint exactly once for each level of depth.

2.

	Strategy	TrainAUC	ValAUC	Time
0	Holdout	0.679197	0.578410	0.008703
1	2-fold	0.775269	0.654578	0.014624
2	5-fold	0.750899	0.647883	0.038435
3	10-fold	0.769377	0.672445	0.082299
4	MCCV w/ 5	0.720033	0.629095	0.039976
5	MCCV w/ 10	0.735195	0.627075	0.067051
6	True Test	0.954458	0.824893	0.000000

3.
a)
I selected K = 5 because a small K causes increased bias and lower variance while a larger K causes decreased bias and higher variance. The value K = 5 represents a middle ground.

The optimal parameters for the KNN algorithm is 1 neighbor, uniform weight, auto algorithm, a leaf size of 1, the minkowski metric, and n_jobs = 1.

The optimal parameters for the DT algorithm is the entropy criterion, a max depth of 15, and a minimum leaf size of 1.

d)

		Decision Tree	KNN	
	Accuracy	AUC	Accuracy	AUC
Full	0.89166666666666	0.781649675625579	0.85833333333333	0.72344763670064
95%	0.87291666666666	0.731881371640407	0.86041666666666	0.72465245597775
90%	0.86458333333333	0.759499536607970	0.85416666666666	0.70157553290083
80%	0.858333333333333	0.66506024096385	0.8437	0.69555143651529

The Accuracy and AUC for both the Decision Tree and KNN is significantly negatively impacted by reducing the size of the training data.