

Report Of:

CSE472 (Machine Learning Sessional) Assignment# 2:

Logistic Regression with Bagging and Stacking

ID: 1905062

How to Run my script:

1. There are 3 preprocessing functions for 3 datasets. We need to keep the caller function (below the function segment of each function) of that dataset and comment out others to preprocess the specific data set.(last line of cell number 48,49,50)
2. In the validating pipeline segment(cell number 51) we need to follow the comment out instruction of below (line 5-9) :

```
##### Data splitting and manipulation #####  
  
X_train, X_test, y_train, y_test = train_test_split(Features, Target, test_size=0.2, random_state=73) ### will comment out in 2nd dataset  
# X_train=Features[Features.index <= 32560] #####--> for 2nd dataset only.. will comment out for others  
# X_test=Features[Features.index > 32560] #####--> for 2nd dataset only.. will comment out for others  
# X_train=X_train.reset_index(drop=True) #####--> for 2nd dataset only.. will comment out for others  
# X_test=X_test.reset_index(drop=True) #####--> for 2nd dataset only.. will comment out for others
```

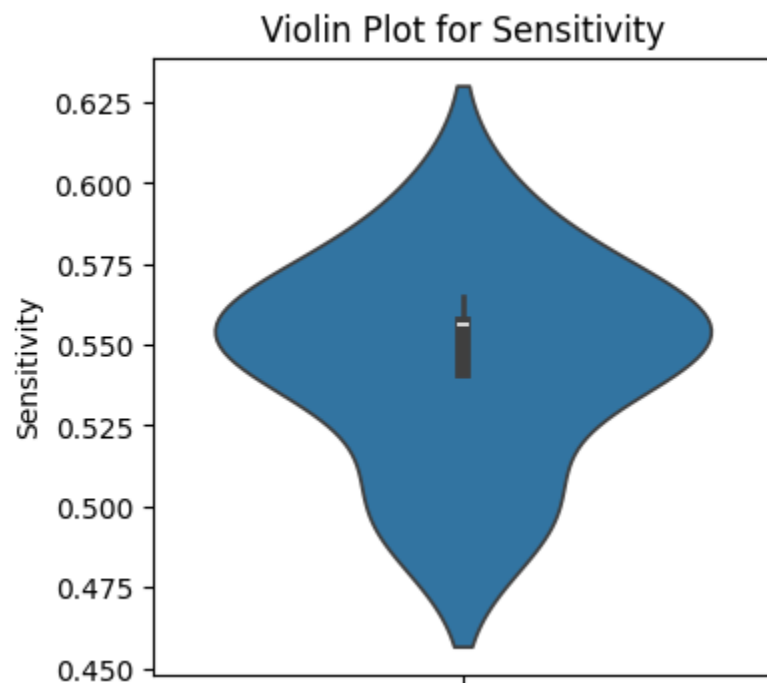
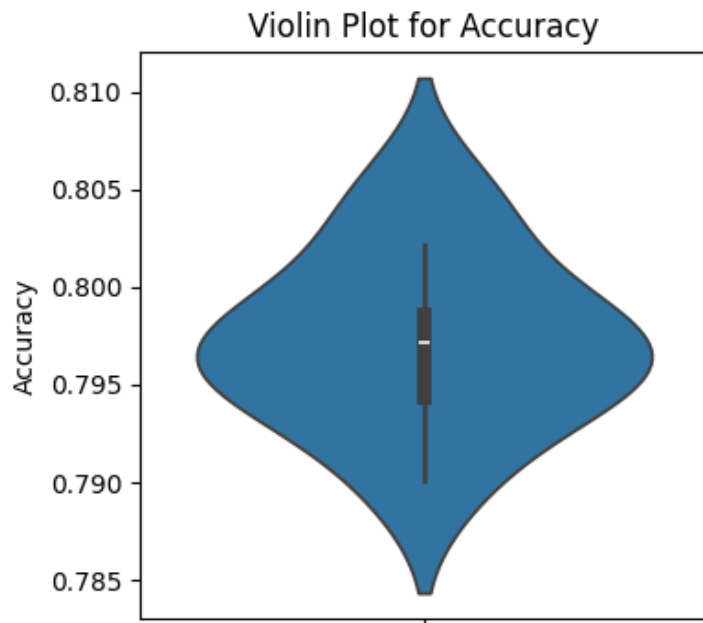
Dataset1:

Performance on Test set

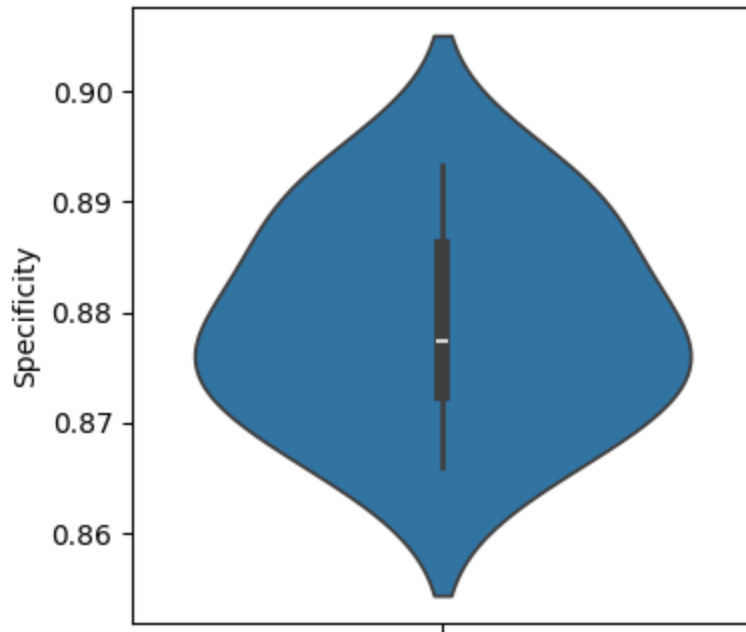
	Accuracy	Sensitivity	Specificity	Precision	F1-Score	AUROC	AUPR
LR	0.797232 ±0.004437	0.545250 ±0.030208	0.879245 ±0.009061	0.595317 ±0.010491	0.568718 ±0.016787	0.614212 ±0.006353	0.614212 ± 0.006353
Voting ensemble	0.798577	0.544928	0.881132	0.598726	0.570561	0.852220	0.619602
Stacking	0.797865	0.568116	0.872642	0.592145	0.579882	0.851857	0.601660

ensemble							
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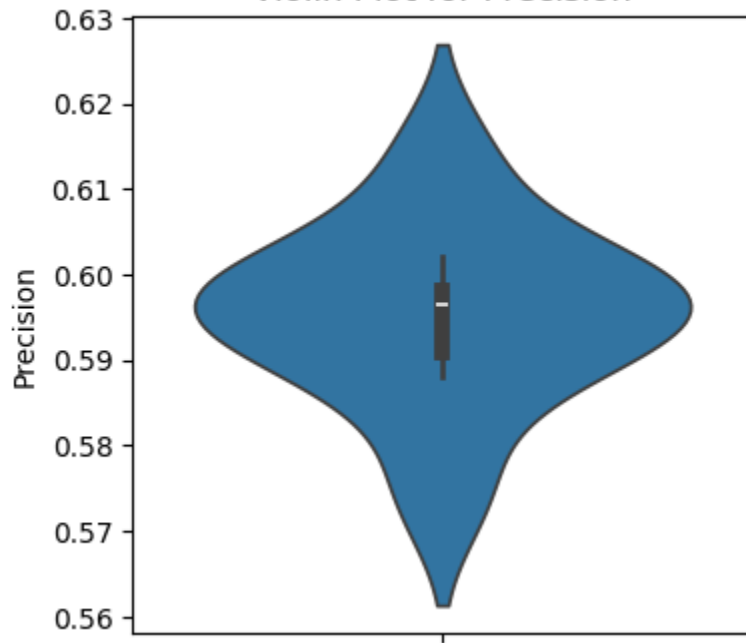
Violin plots for each performance metric for the 9 bagging LR learners:



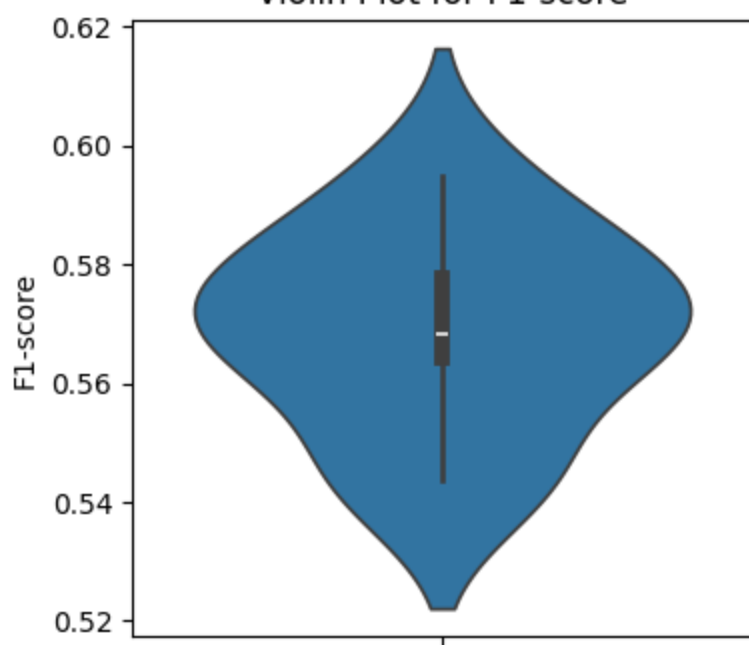
Violin Plot for Specificity

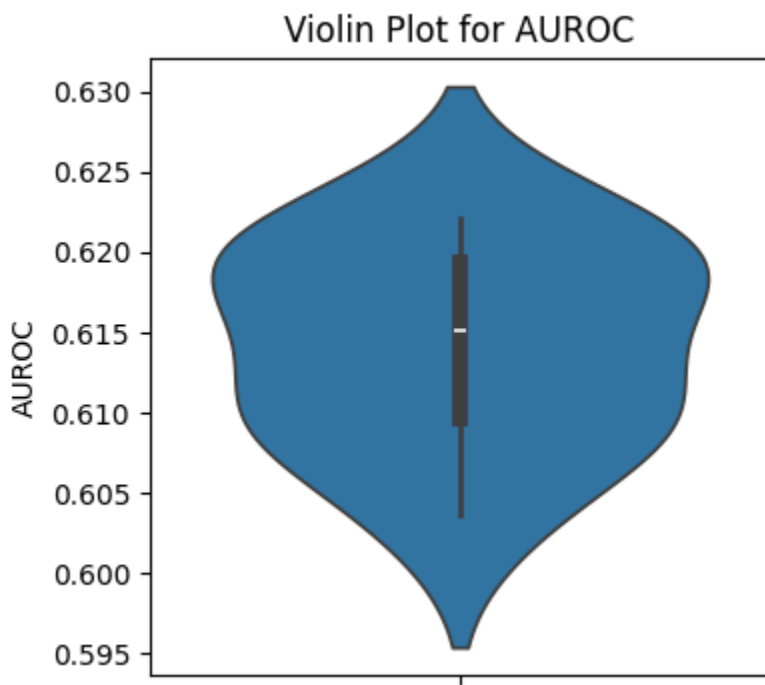
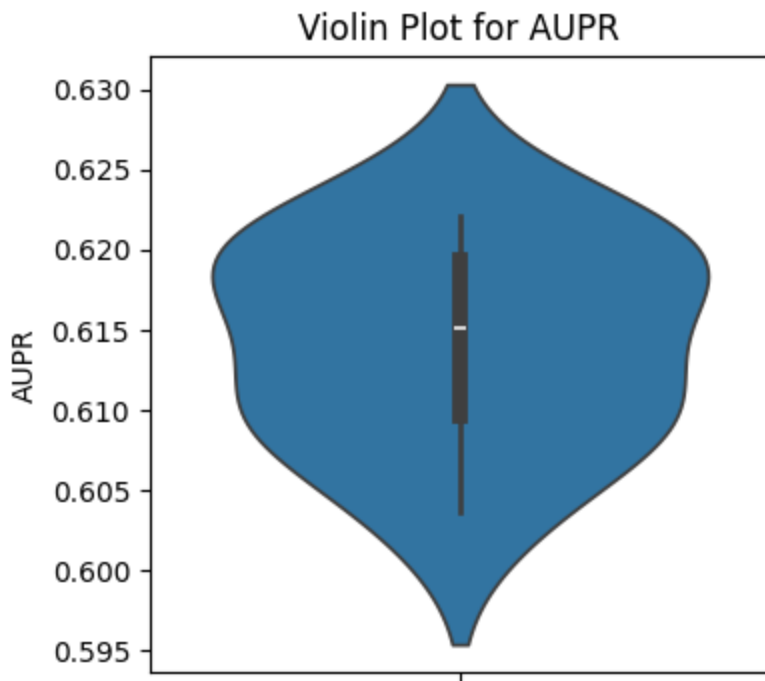


Violin Plot for Precision



Violin Plot for F1-score



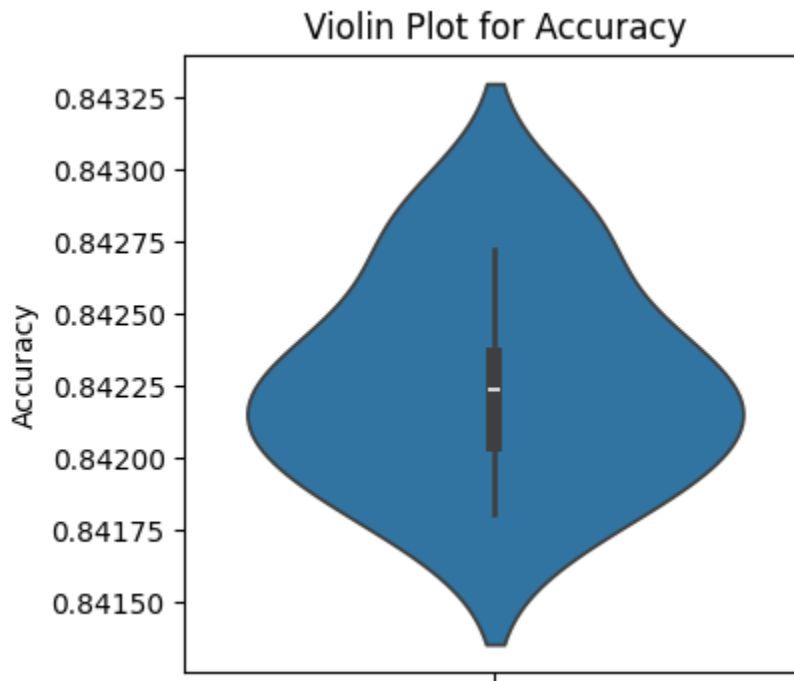


Dataset 2:

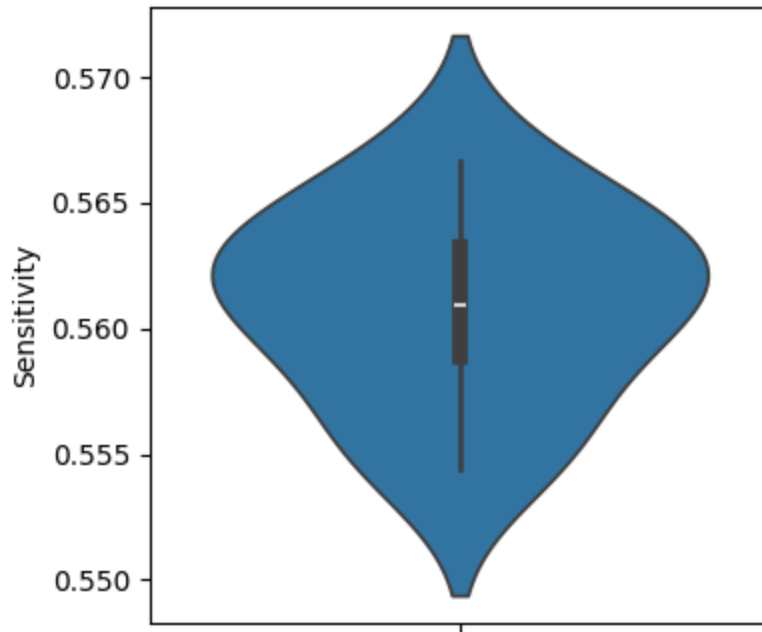
Performance on Test set

	Accuracy	Sensitivity	Specificity	precision	F1-score	AUROC	AUPR
LR	0.842269 ± 0.000348	0.560877 ± 0.003890	0.929385 ± 0.001099	0.710912 ± 0.001964	0.627033 ± 0.001895	0.731380 ± 0.000996	0.731380 ± 0.000996
Voting ensemble	0.842542	0.561947	0.929412	0.711367	0.627890	0.890841	0.731560
Stacking ensemble	0.839835	0.541905	0.932071	0.711795	0.615339	0.890748	0.729070

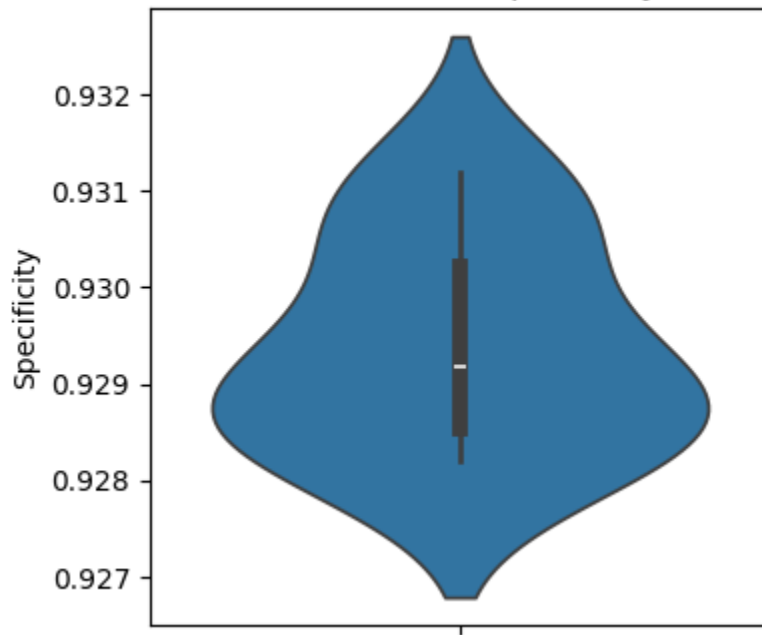
Violin plots for each performance metric for the 9 bagging LR learners:



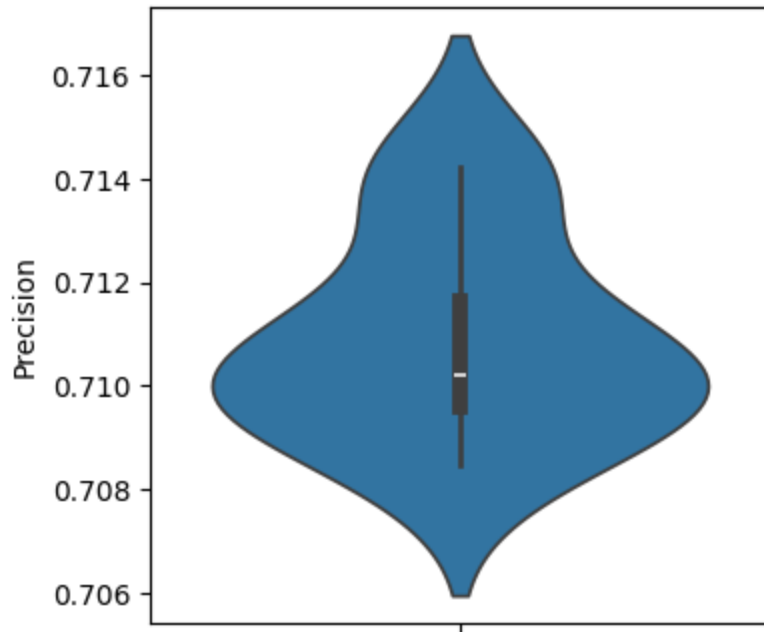
Violin Plot for Sensitivity



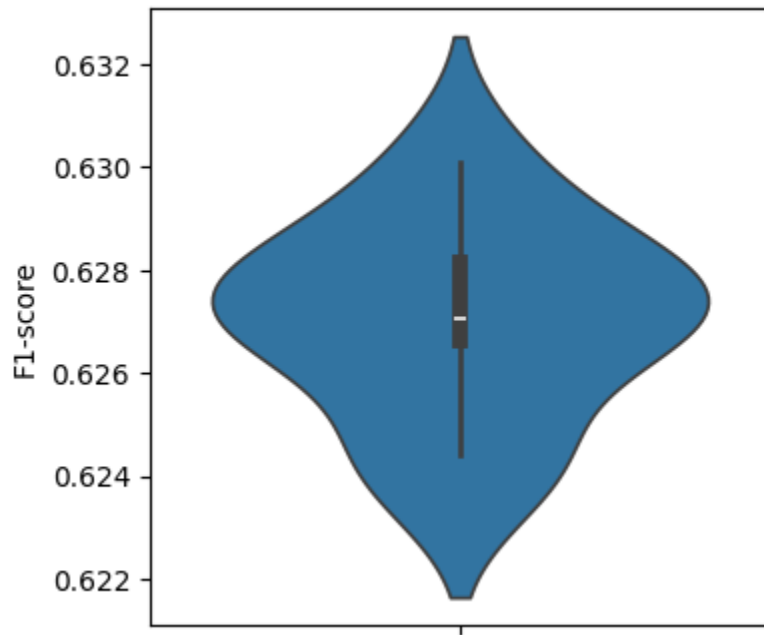
Violin Plot for Specificity

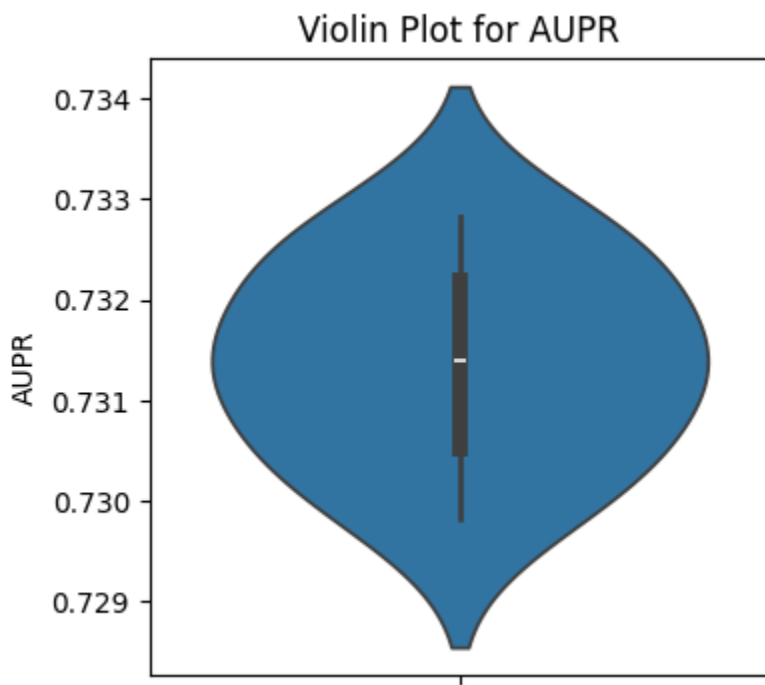
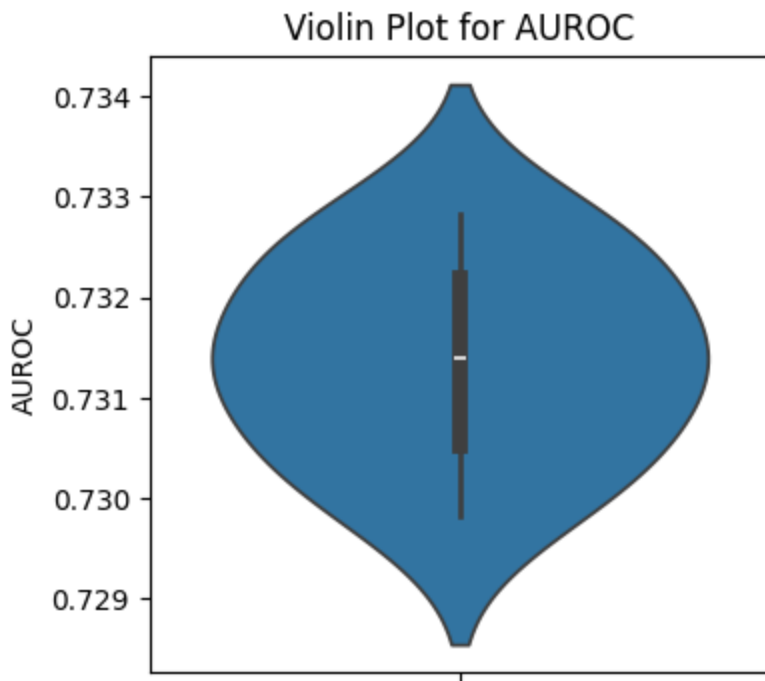


Violin Plot for Precision



Violin Plot for F1-score



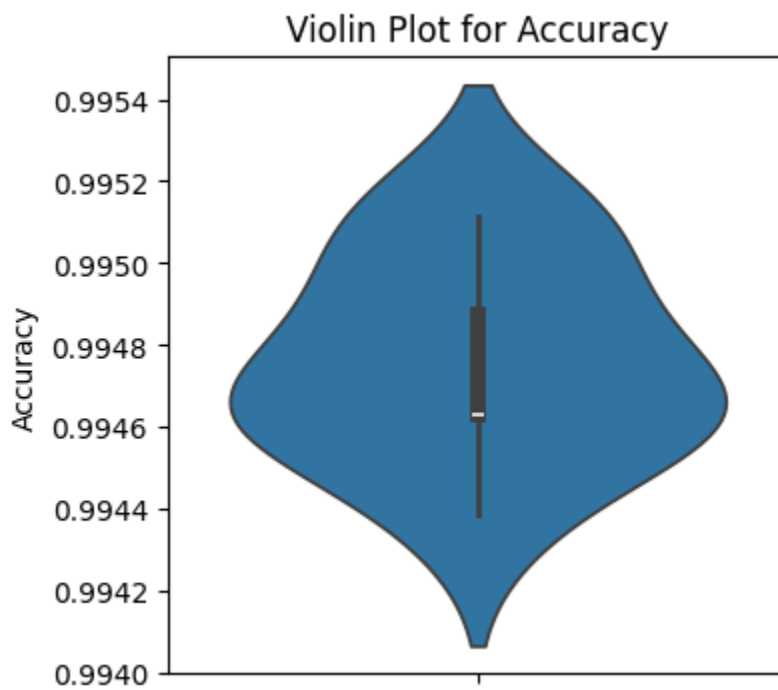


Dataset 3:

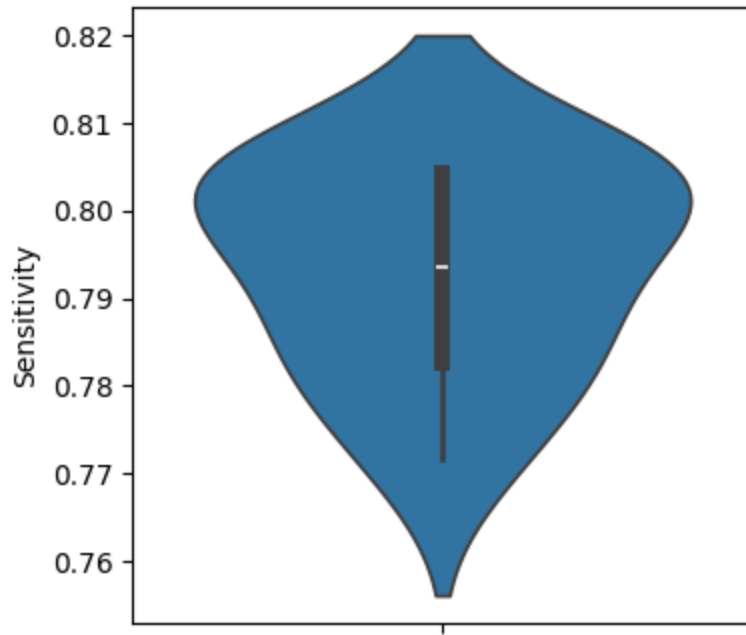
Performance on Test set

	Accuracy	Sensitivity	Specificity	precision	F1-score	AUROC	AUPR
LR	0.994763 ± 0.000248	0.793478 ± 0.012153	0.999389 ± 0.000220	0.967785 ± 0.011099	0.871903 ± 0.006546	0.885959 ± 0.003212	0.885959 ± 0.003212
Voting ensemble	0.994872	0.793478	0.999500	0.973333	0.874251	0.963519	0.886183
Stacking ensemble	0.995360	0.815217	0.999500	0.974026	0.887574	0.956419	0.887476

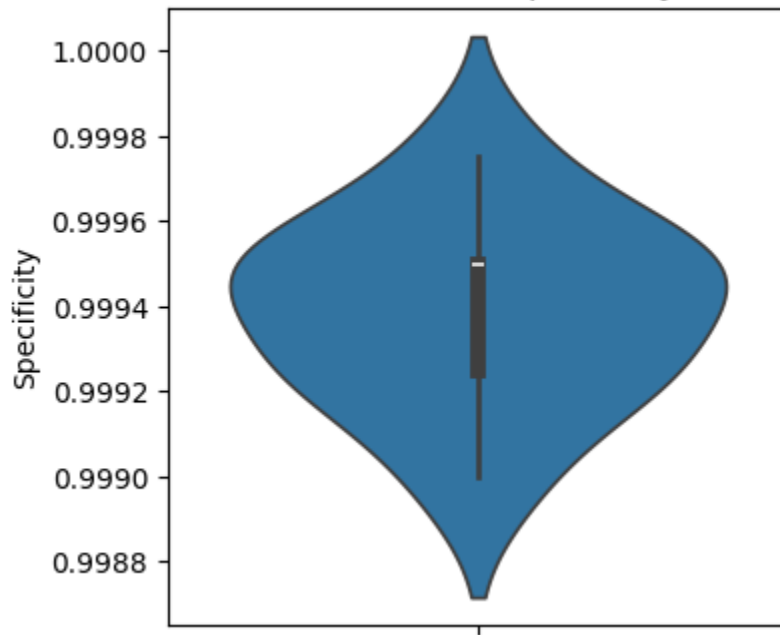
Violin plots for each performance metric for the 9 bagging LR learners:



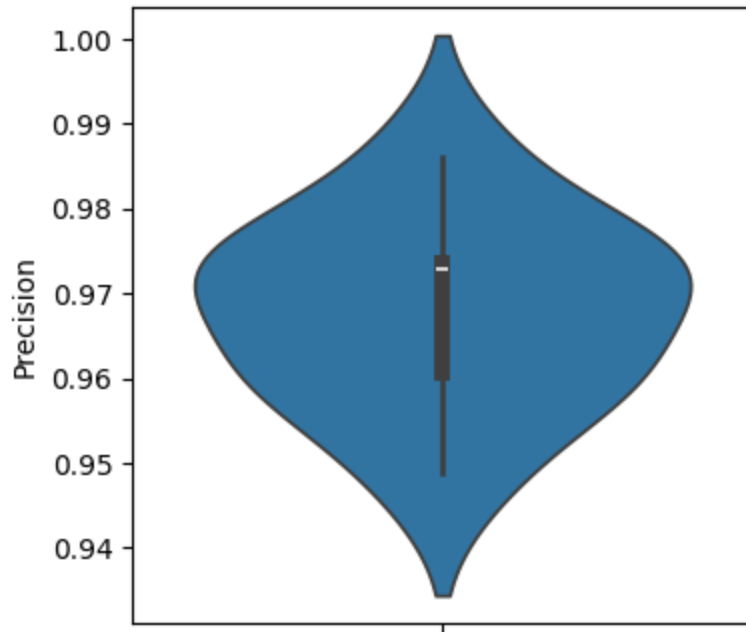
Violin Plot for Sensitivity



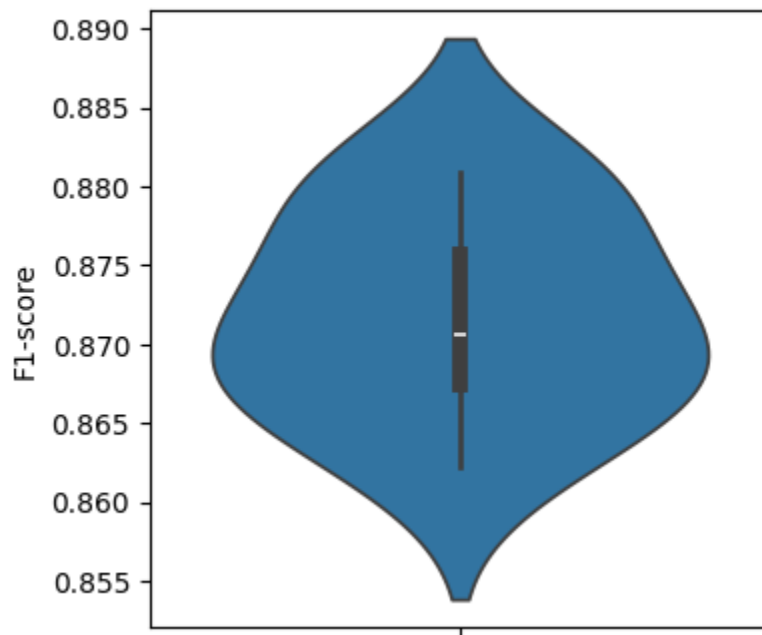
Violin Plot for Specificity

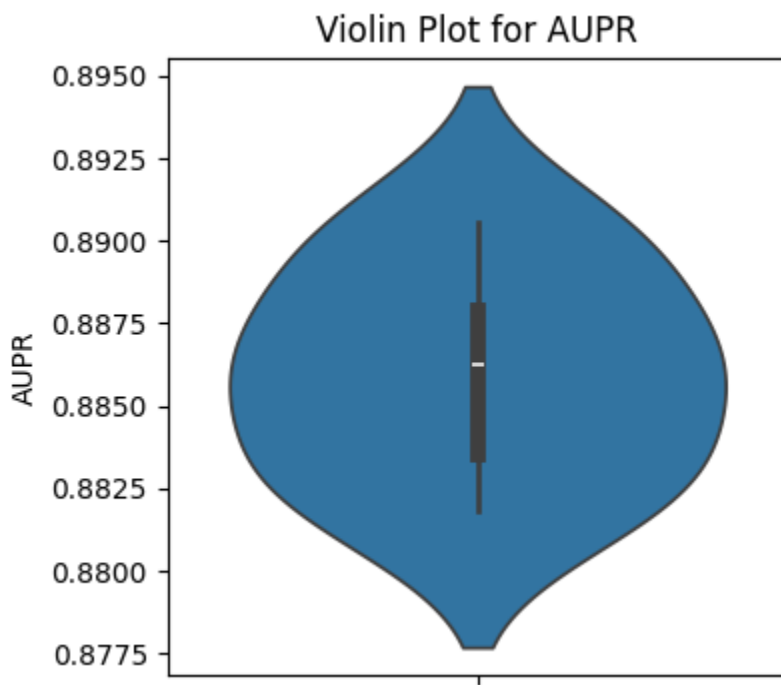
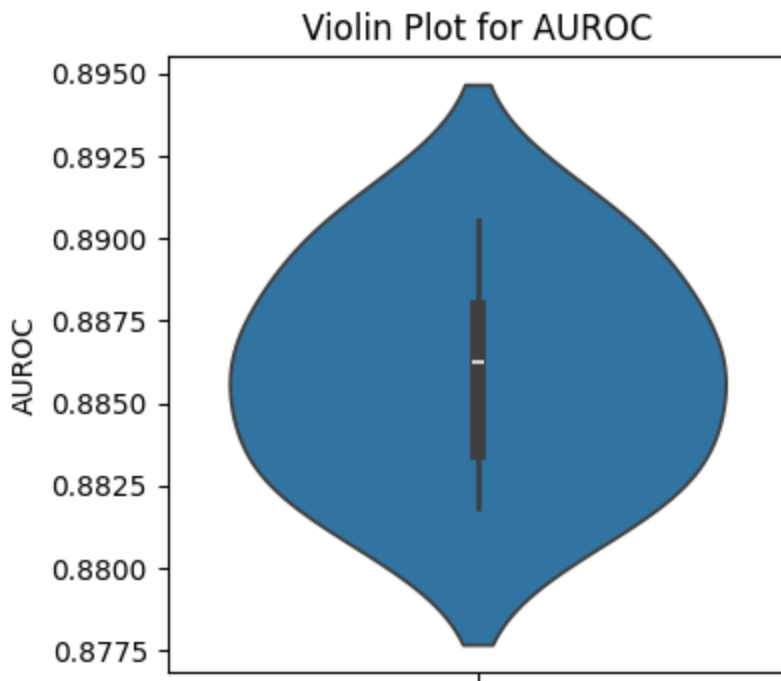


Violin Plot for Precision



Violin Plot for F1-score





Observations:

1. For my specific implementation $\alpha = 0.09$ and $\text{epoch} = 10000$ worked better
2. Regularization does not affect that much in these specific datasets