

GRAMMATICAL FACIAL EXPRESSIONS

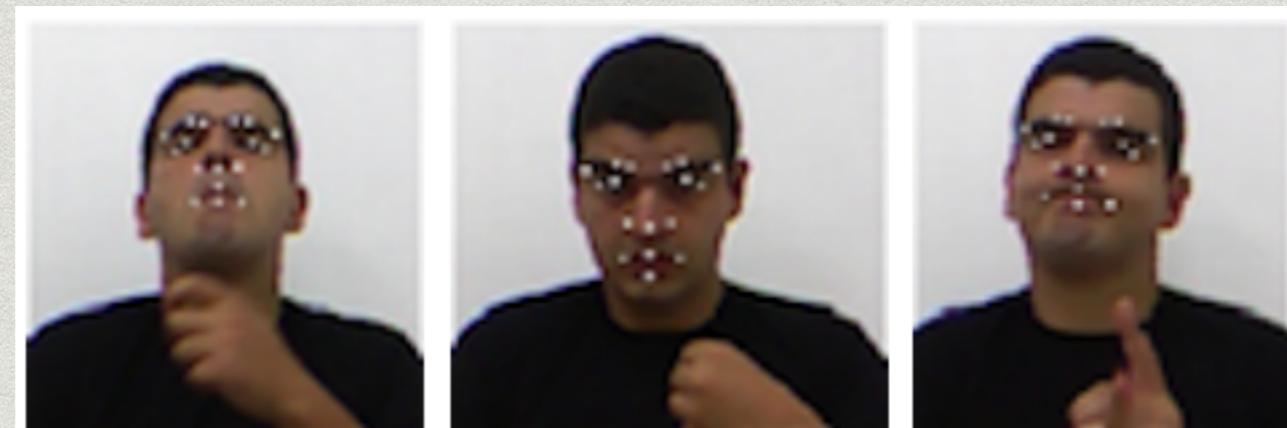
PREETI DASARI

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Introduction

Data Overview:

- Data was collected to conduct automated analysis of facial expressions when users spoke in the Brazilian sign language (Libras).
- Facial Expressions are essential for forming grammatical structure and language disambiguation in sign language.
- Users were recorded performing five Yes or No questions in Libras using Microsoft Kinect sensor.
- X and Y coordinates for each point are in pixels and Z coordinates are in millimeters.
- There are 300 predictors in this data set. The label is whether or not a GFE was present in a frame.



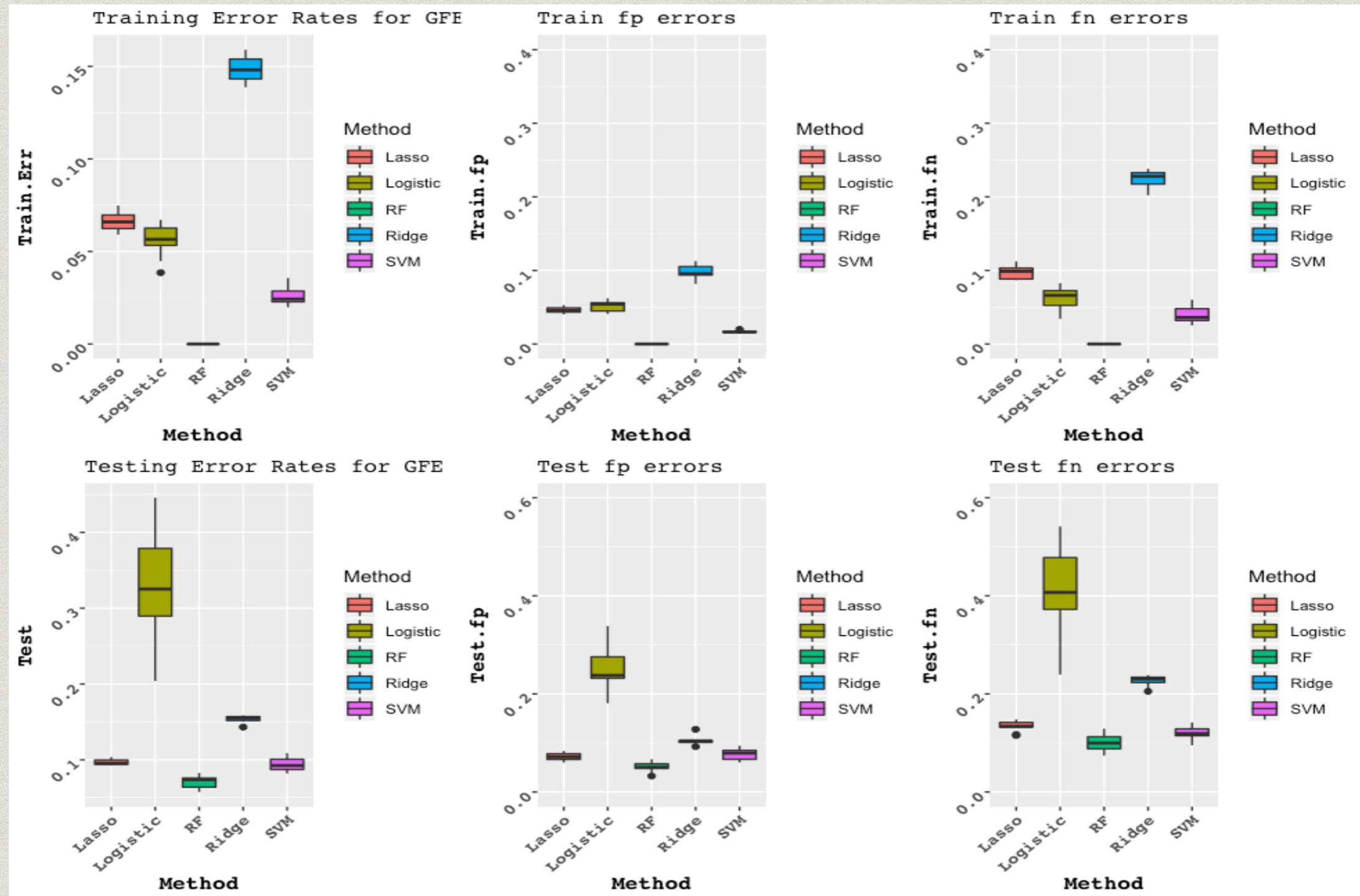
Data Imbalance:

- Total number of observations for the Yes and No Questions Dataset: 3128 observations
- N of observations when a GFE was present in a frame: 1247 (40%)
- No of observations when a GFE was not present in a frame: 1881 (60%)

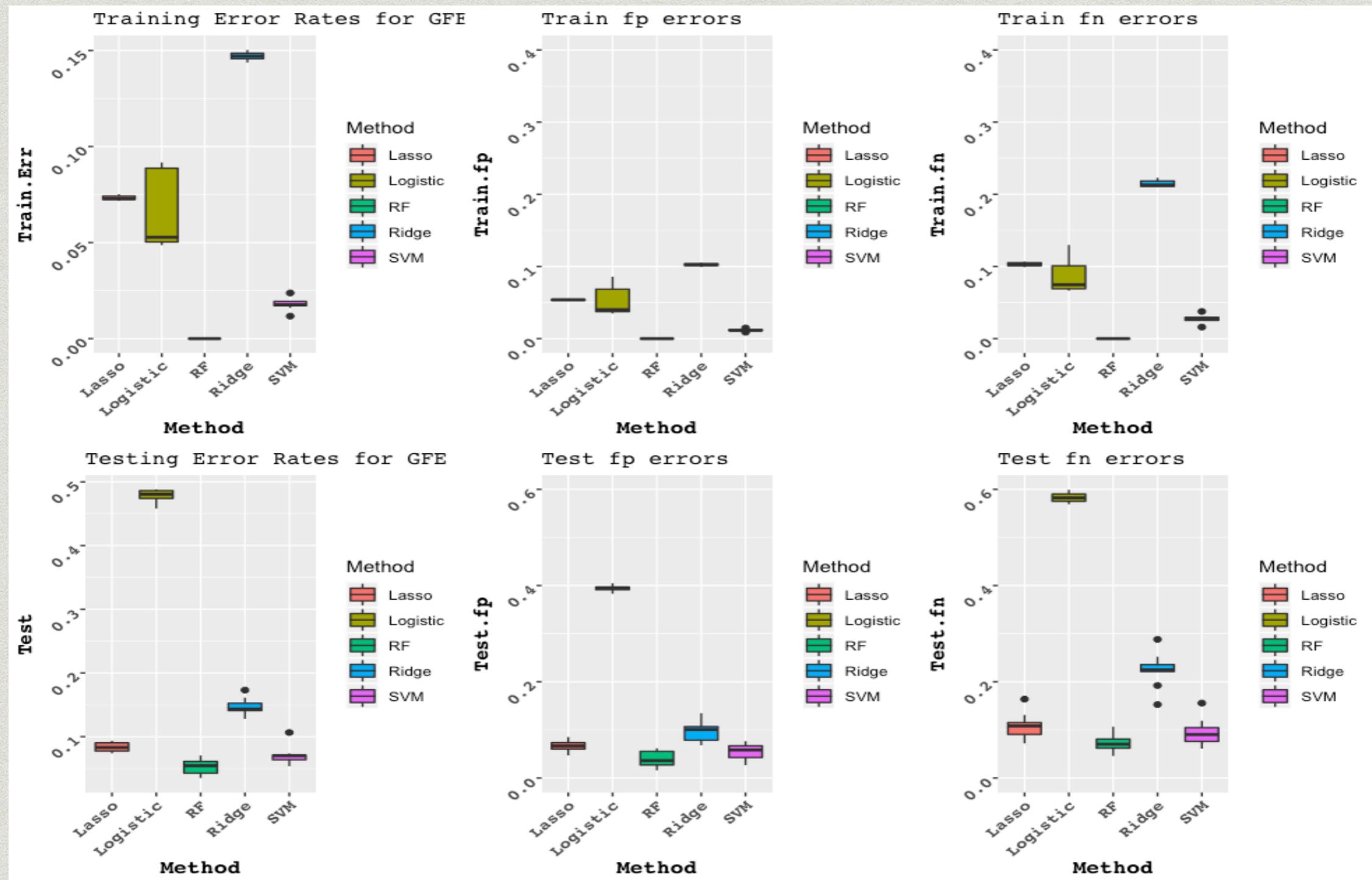
Implications:

- This data can be used to understand how facial expressions impact communication in sign languages; boost models that automate emotional analysis; can be incorporated into sign language training to improve performance

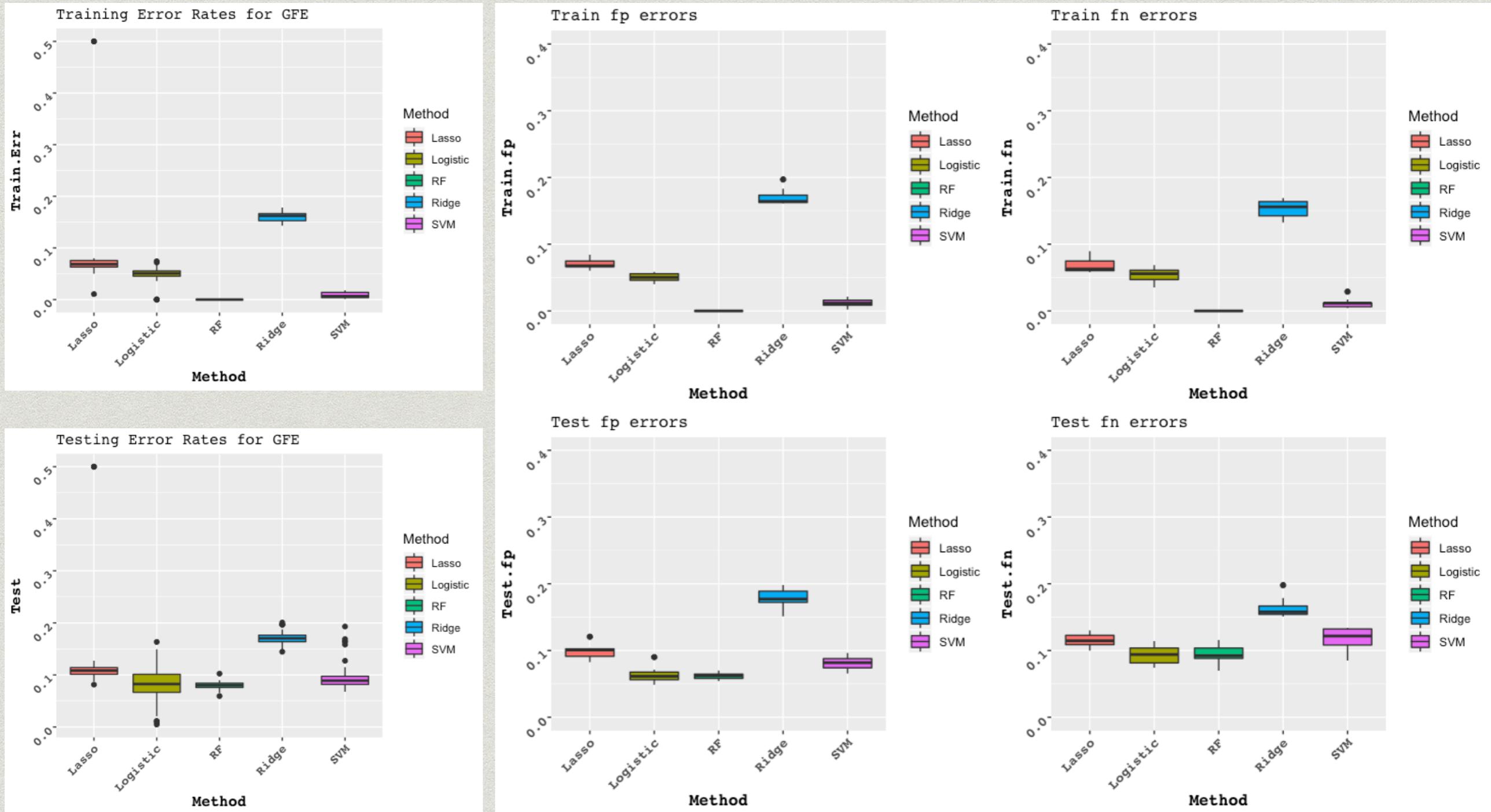
Training and Testing Error Rates (Imbalanced, 0.5n)



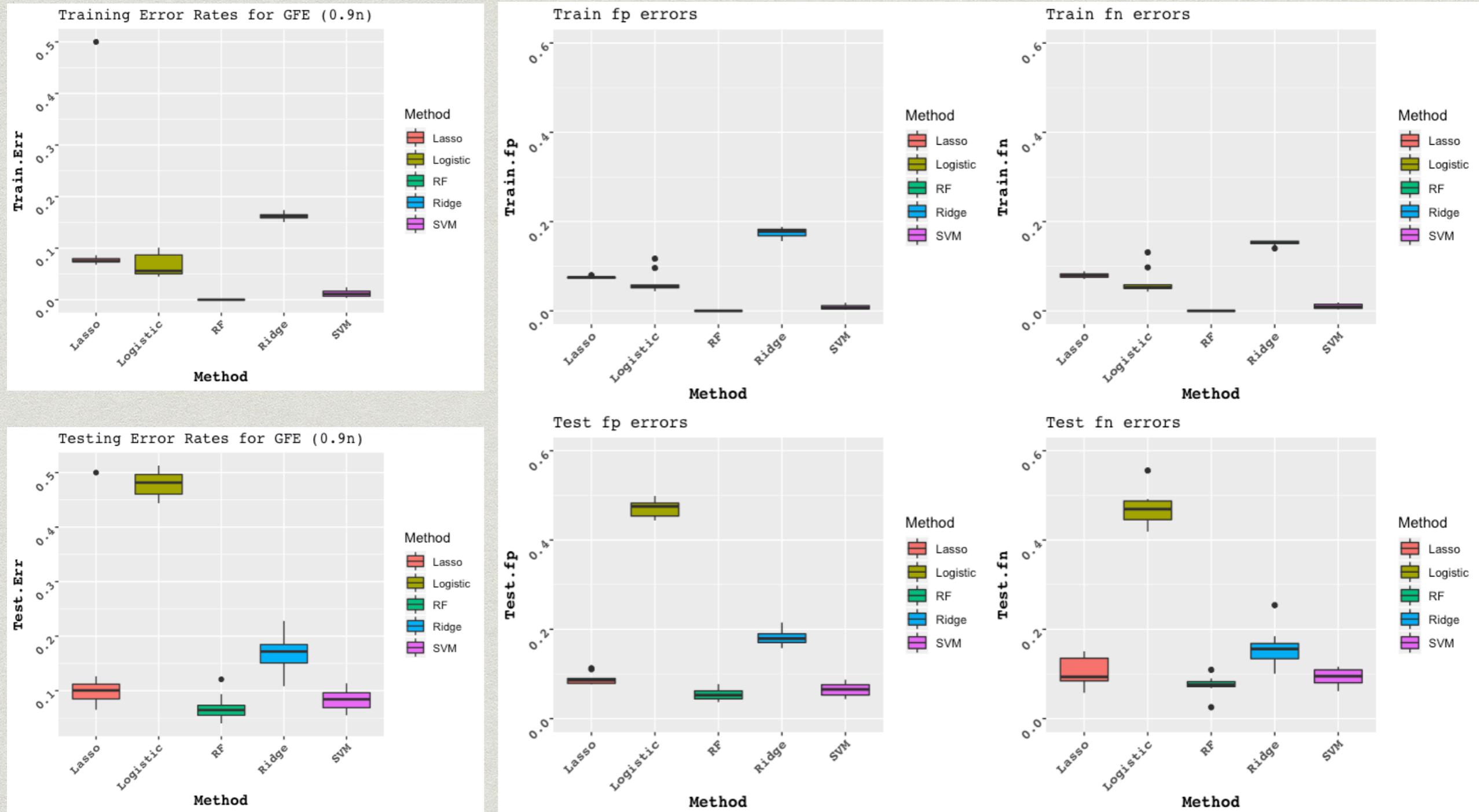
Training and Testing Error Rates (Imbalanced, 0.9n)



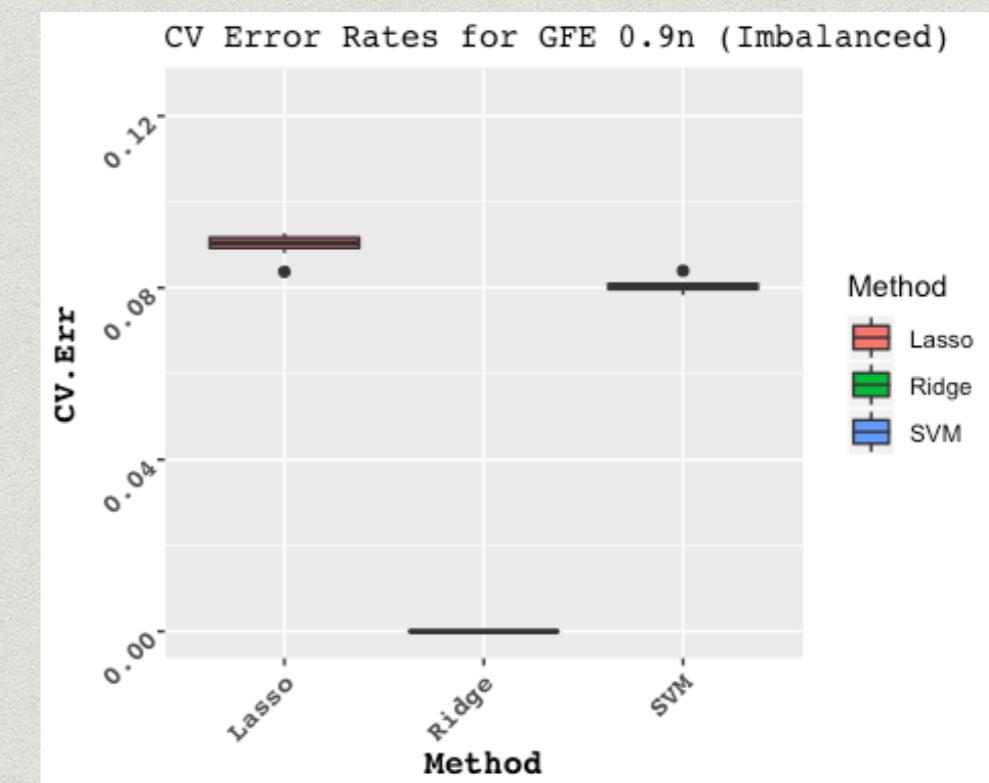
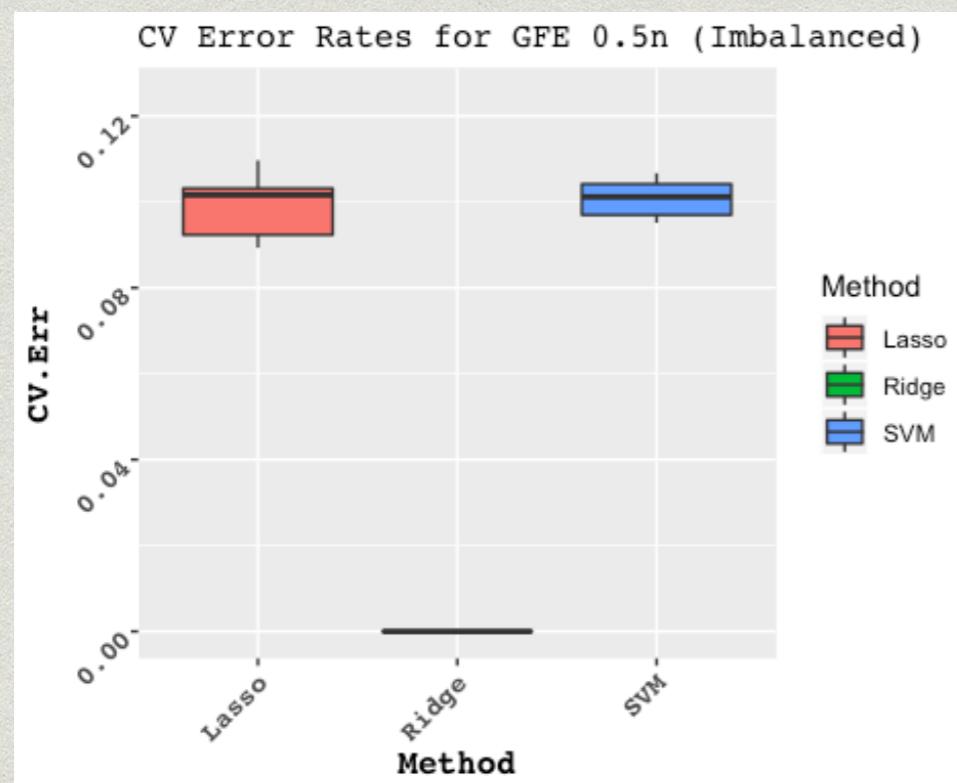
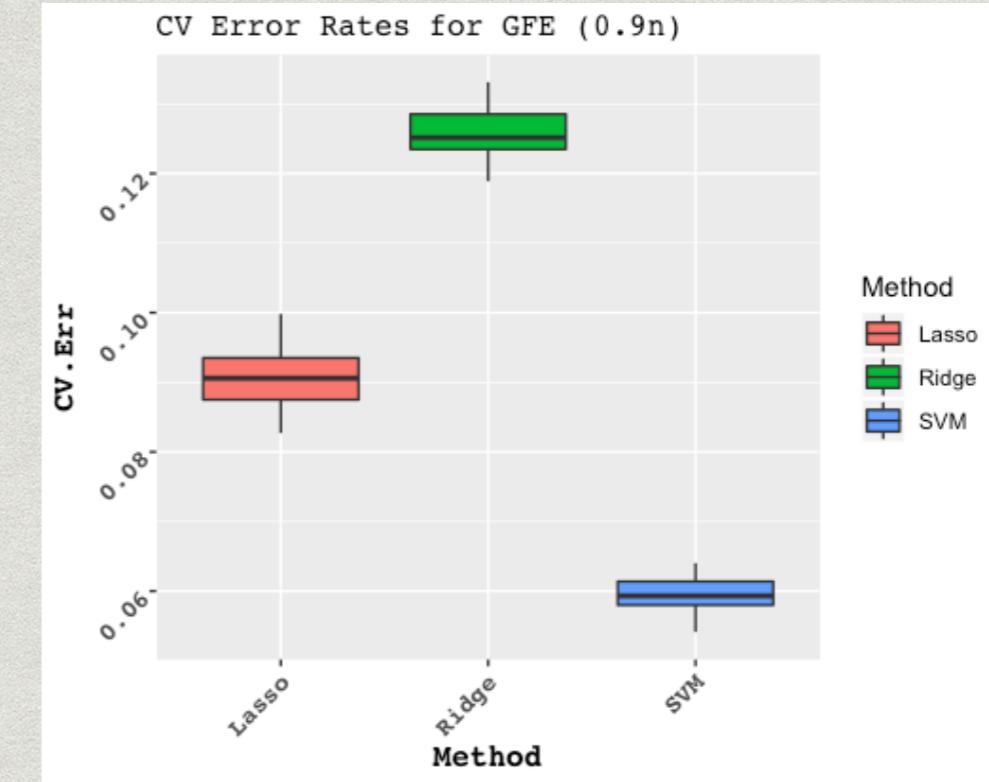
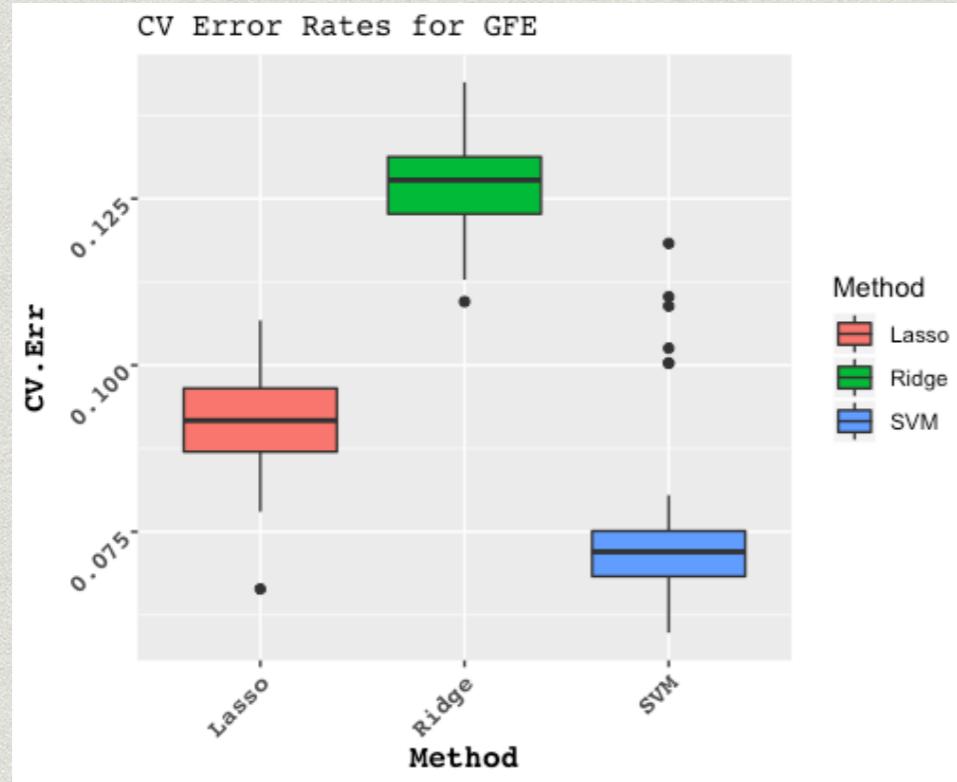
Training and Testing Error Rates (Balanced, 0.5n)



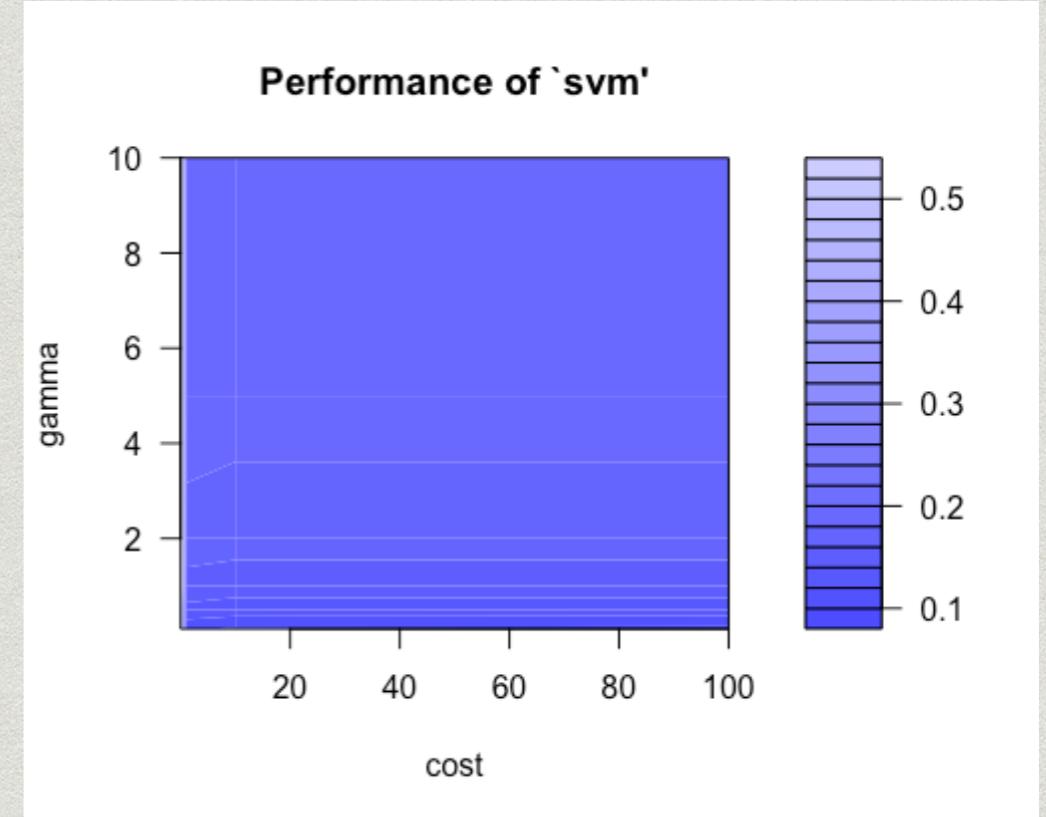
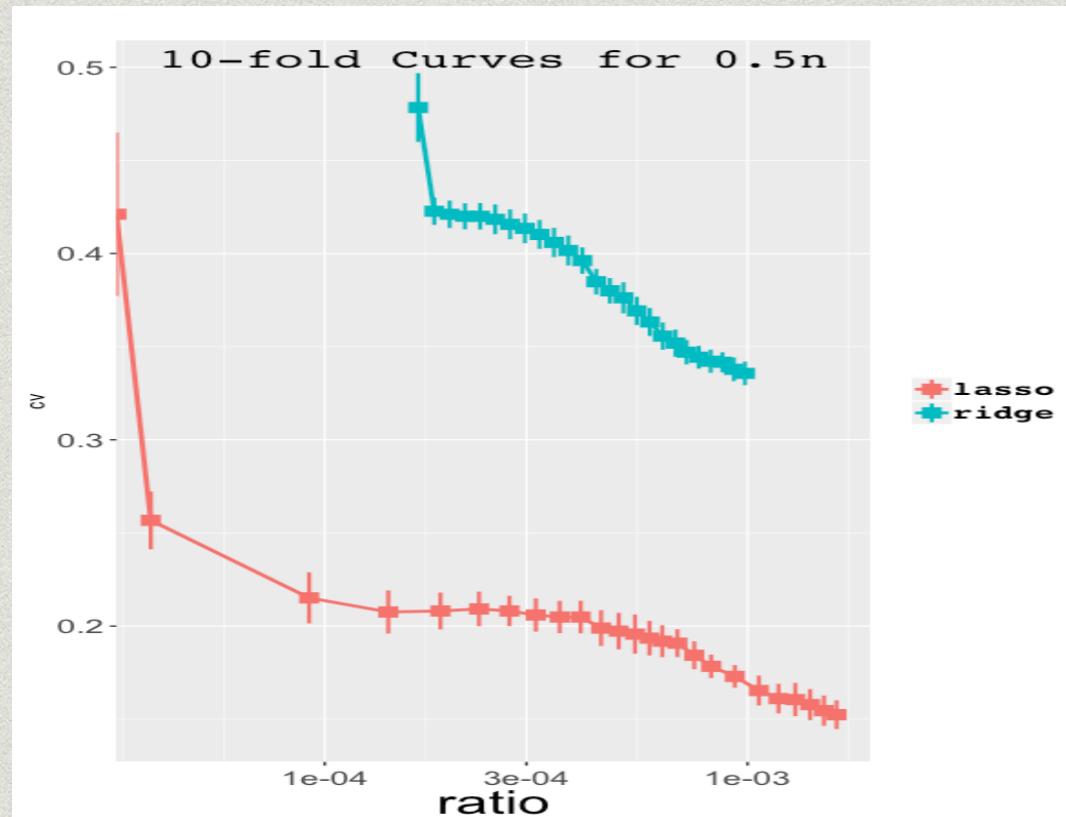
Training and Testing Error Rates (Balanced, 0.9n)



Cross Validation Error Rates (Balanced and Imbalanced)

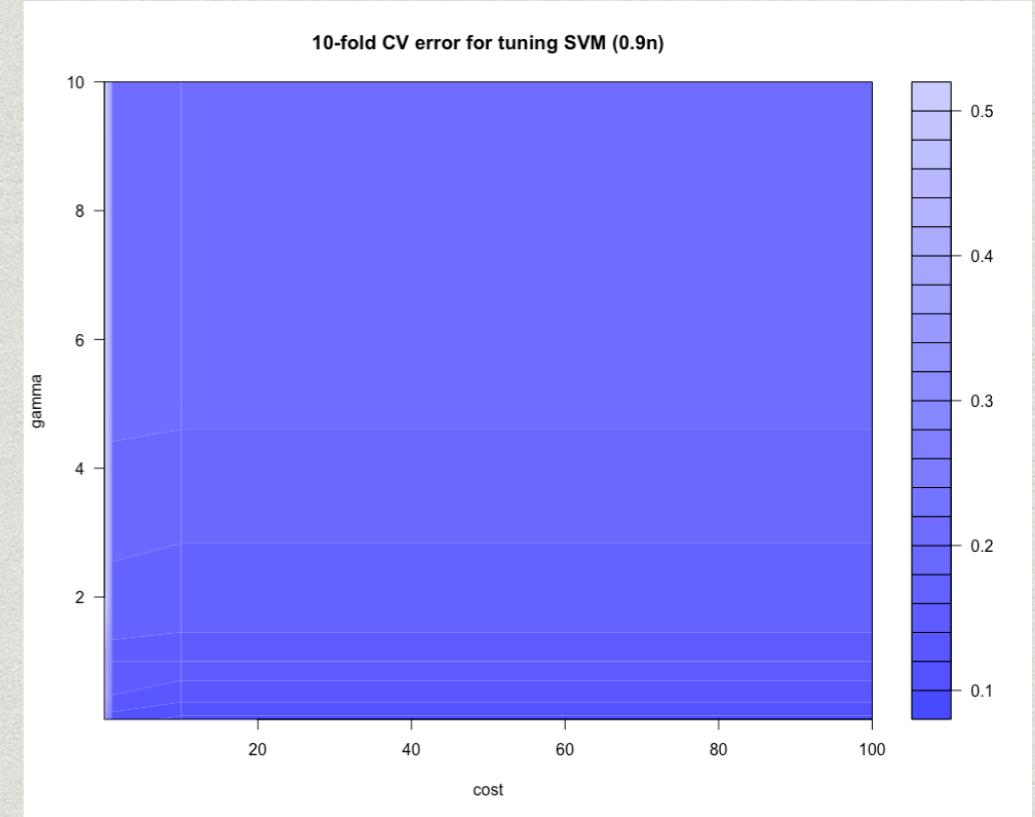
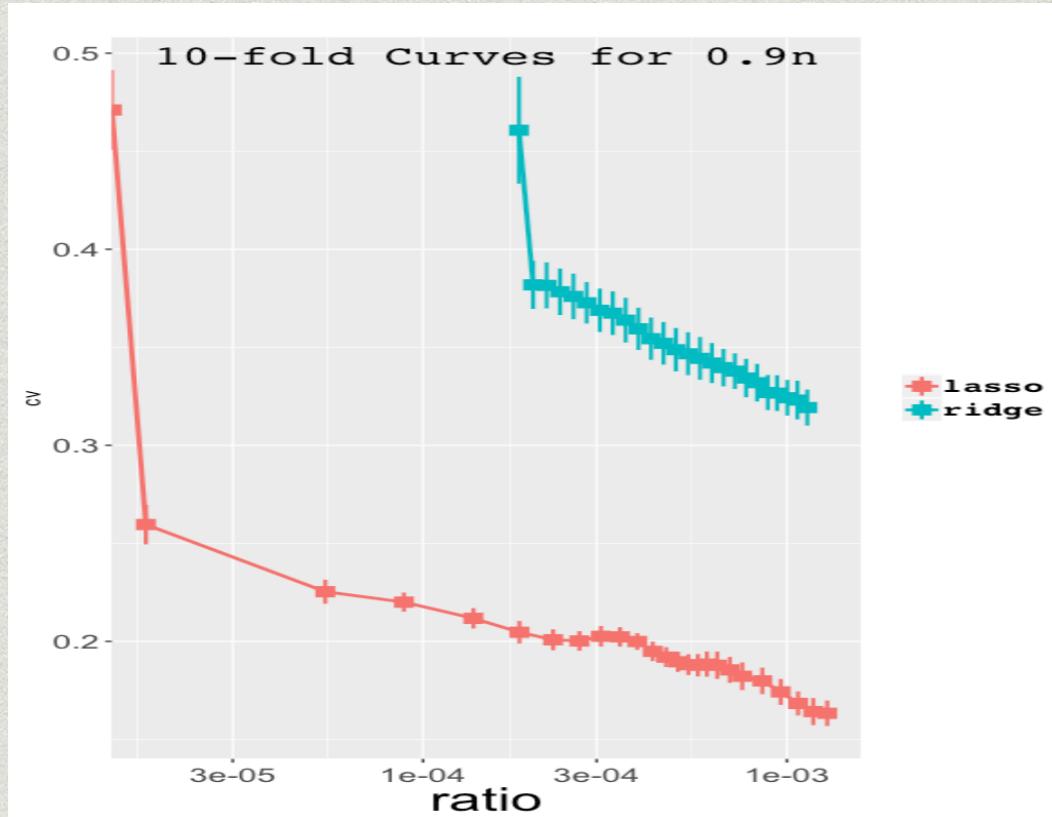


10-fold CV Performance (Lasso, Ridge and SVM for 0.5n)



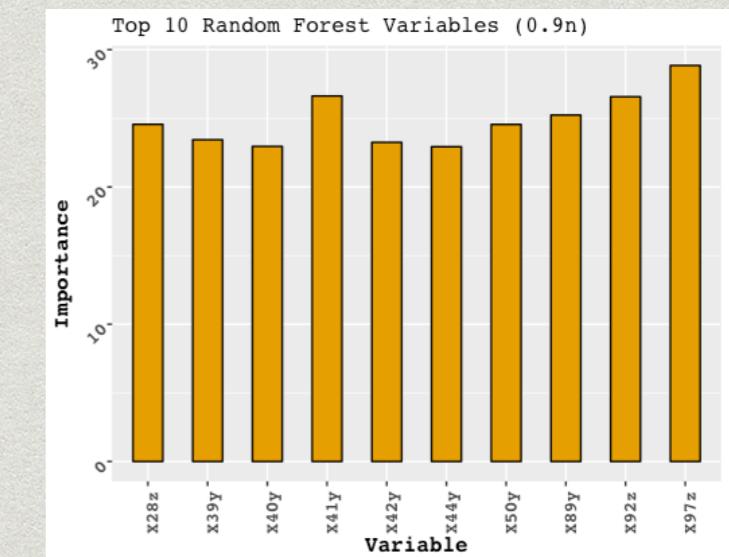
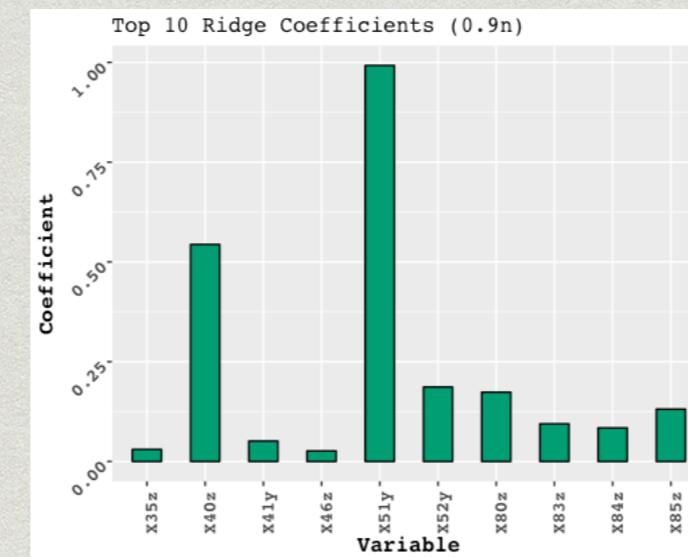
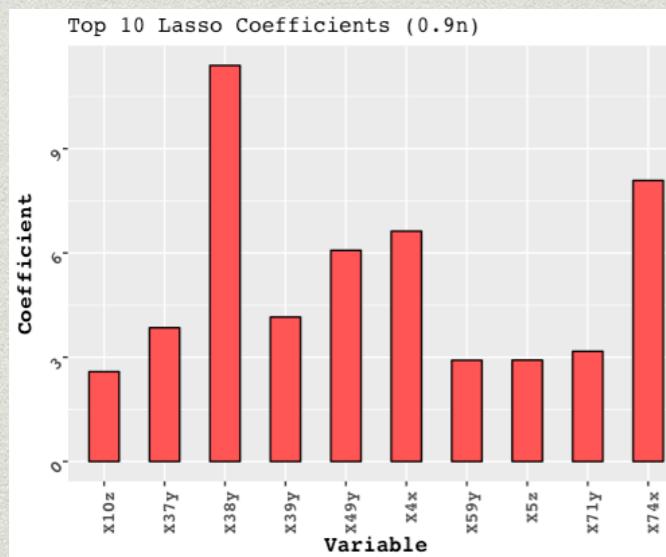
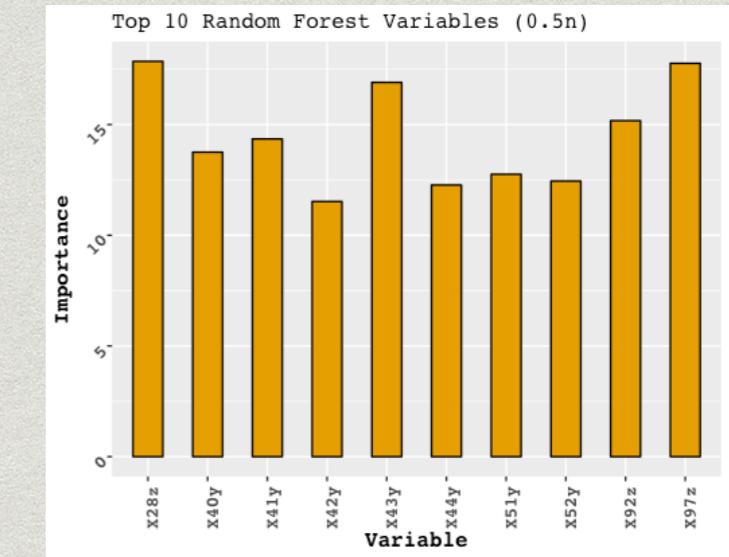
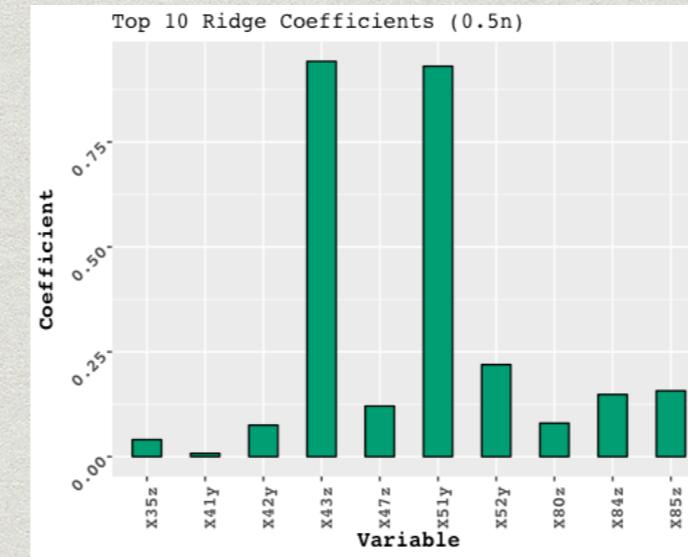
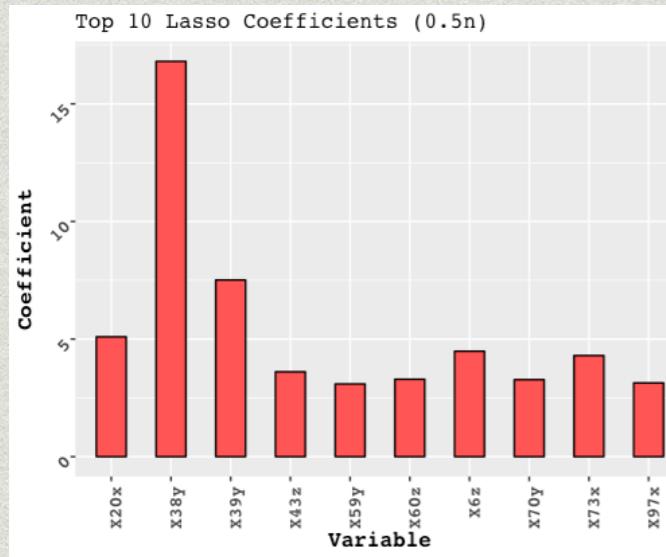
0.5N (IN SECS)	SINGLE FIT	10-fold CV
Lasso	24.361	172.352
Ridge	1.339	16.403
Random Forest	15.438	—
SVM	8.518	2373.88

10-fold CV Performance (Lasso, Ridge and SVM for 0.9n)



0.9N (IN SECS)	SINGLE FIT	10-FOLD CV
Lasso	27.43	335.142
Ridge	2.703	31.62
Random Forest	32.465	—
SVM	11.518	5274.63

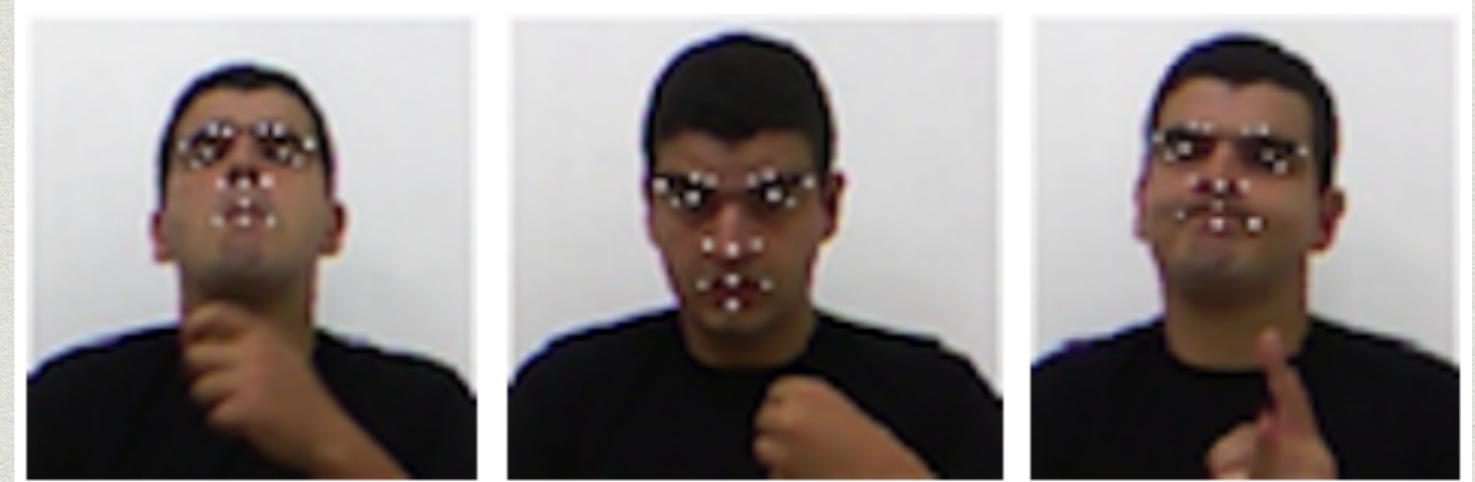
Top 10 Variables (Lasso, Ridge and Random Forest)



Conclusion

Top 10 Variables (0.5n)

Lasso	Ridge	RF
X43z	X38y	X28z
X51y	X39y	X97z
X52y	X20x	X43y
X85z	X6z	X92z
X84z	X73x	X41y
X47z	X43z	X40y
X80z	X60z	X51y
X42y	X70y	X52y
X35z	X97x	X44y
X41y	X59y	X42y



Top 10 Variables (0.9n)

Lasso	Ridge	RF
X38y	X51y	X97z
X74x	X40z	X41y
X4x	X52y	X92z
X49y	X80z	X89y
X39y	X85z	X28z
X37y	X83z	X50y
X71y	X84z	X39y
X5z	X41y	X42y
X59y	X35z	X40y
X10z	X46z	X44y

Labels of frame:

- | | | |
|-----------------|---|---------------------------------|
| 0 - 7 (x,y,z) | - | left eye |
| 8 - 15 (x,y,z) | - | right eye |
| 16 - 25 (x,y,z) | - | left eyebrow |
| 26 - 35 (x,y,z) | - | right eyebrow |
| 36 - 47 (x,y,z) | - | nose |
| 48 - 67 (x,y,z) | - | mouth |
| 68 - 86 (x,y,z) | - | face contour |
| 87 (x,y,z) | - | left iris |
| 88 (x,y,z) | - | right iris |
| 89 (x,y,z) | - | nose tip |
| 90 - 94 (x,y,z) | - | line above left eyebrow |
| 95 - 99 (x,y,z) | - | line above right eyebrow |