Can NFL QB Success be Predicted?

Brian Cocolicchio- August 5, 2016

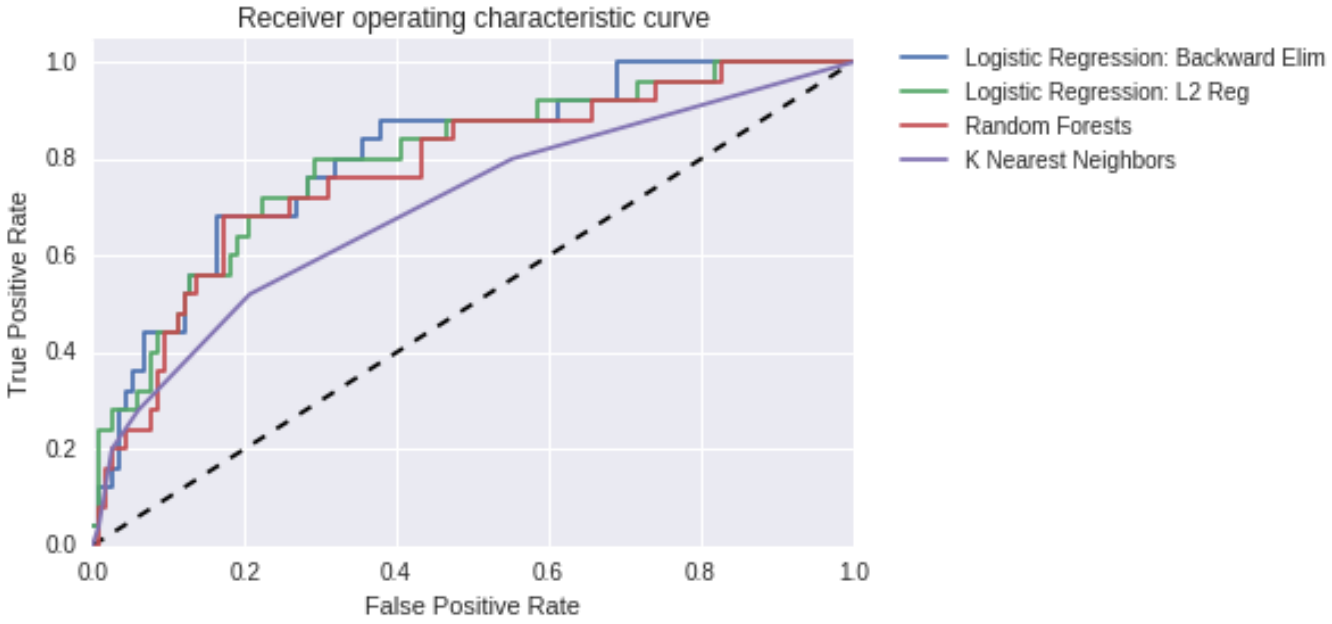
What is the Quarterback Success Prediction Problem?

- “There are certain jobs where almost nothing you can learn about candidates before they start predicts how they’ll do once they’re hired. So how do we know whom to choose in cases like that?” Malcolm Gladwell, “Most Likely to Succeed”, The New Yorker Magazine, 15 Dec 2008
- Other Attempts:
  - Lewin Career Forecast v 1.0
    - Career Starts, Career Completion Rate, Size, Run-Pass Ratio, Rushing Yards
  - Quarterback Adjusted Stats and Experience (QBASE)
    - Completion Rate, Adjusted Yards Passing/Attempt, Team Passing Efficiency, Number of Successful Games Played, Projected Draft Slot
  - Both are Proprietary, Linear Models.

What am I Doing?

- Determine the probability of having a successful tenure in the NFL.
  - Defined as 3 or more years on an NFL Roster
- Using College Statistics of Division I QB's from 2000-2011 (703 QB's)
- Initial Predictors:
  - Games, Total Attempts, Total Completions, Total Passing Yards, Total TD's, Total Int's, Passer Rating, Completion Percent, Yards/Attempt, TD/Attempt, Int/Attempt, Passing Yards/Game, TD/Int
  - Response:
    - $t \geq 3$ yrs. = 1, $t < 3$ yrs. = 0
- Methods Used:
  - Logistic Regression (Backwards Elimination-AIC), Logistic Regression (L2 Regularization)
  - Random Forests, K-Nearest Neighbors
  - Grid Search used for parameter tuning w/ 5-fold Cross Validation

Model Comparison



Method	AUC
Logistic Regression-Backward Elimination	0.806
Logistic Regression-L2 Regularization	0.796
Random Forests	0.765
K-Nearest Neighbors	0.700

Final Model Results

- Based on AUC, Logistic Regression w/ Backward Elimination was the best model
- Using this model:
  - For every additional game in college a QB plays, he is 3.9% more likely to succeed in the NFL controlling for all other factors.
  - For a one unit increase in percent pass completions, a QB is 1.7% more likely to succeed in the NFL
  - For a one unit increase in the Touchdown to Interception Ratio, a QB is 63.7% more likely to succeed in the NFL
  - For a one unit increase in Passing Yards/Game, a QB is 0.87% more likely to succeed in the NFL
- Caveats: The model seems to better predict negative results
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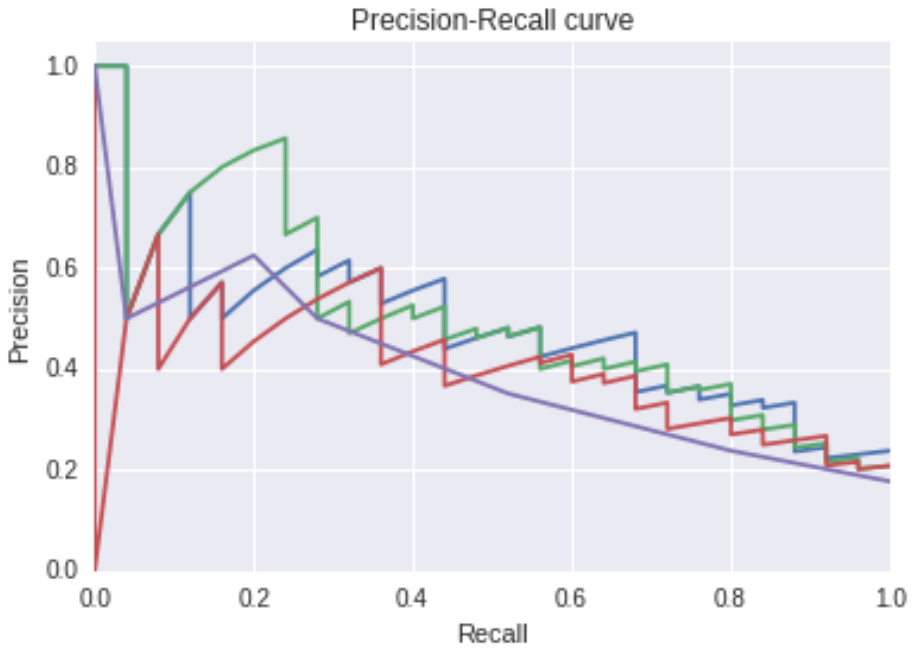
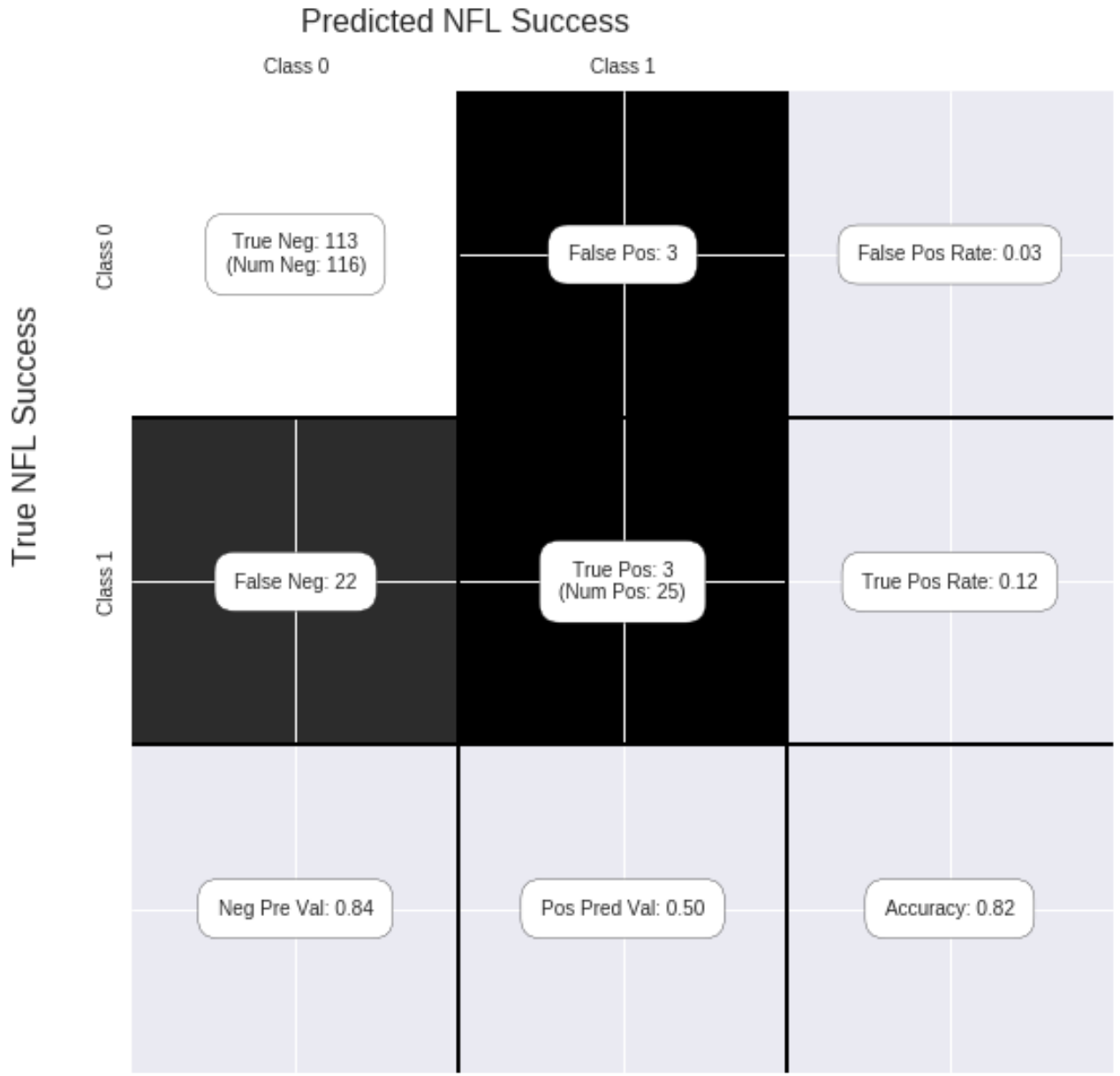
Thank You!

Other Results

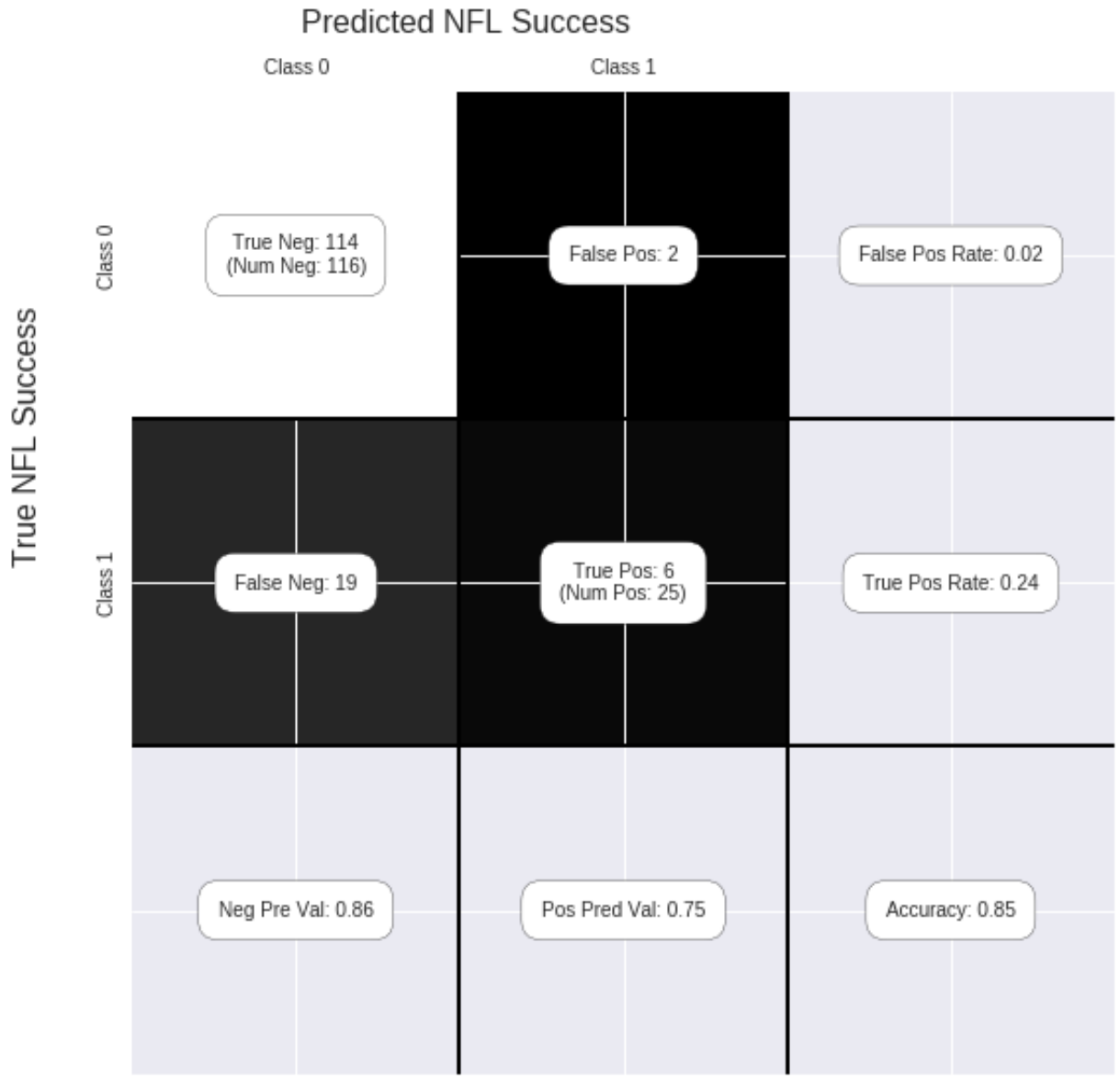


Method	Average Precision Score	Precision	Recall
Logistic Regression-Backward Elimination	0.388	0.50	0.12
Logistic Regression-L2 Regularization	0.562	0.75	0.24
Random Forests	0.321	0.40	0.08
K-Nearest Neighbors	0.454	0.50	0.28

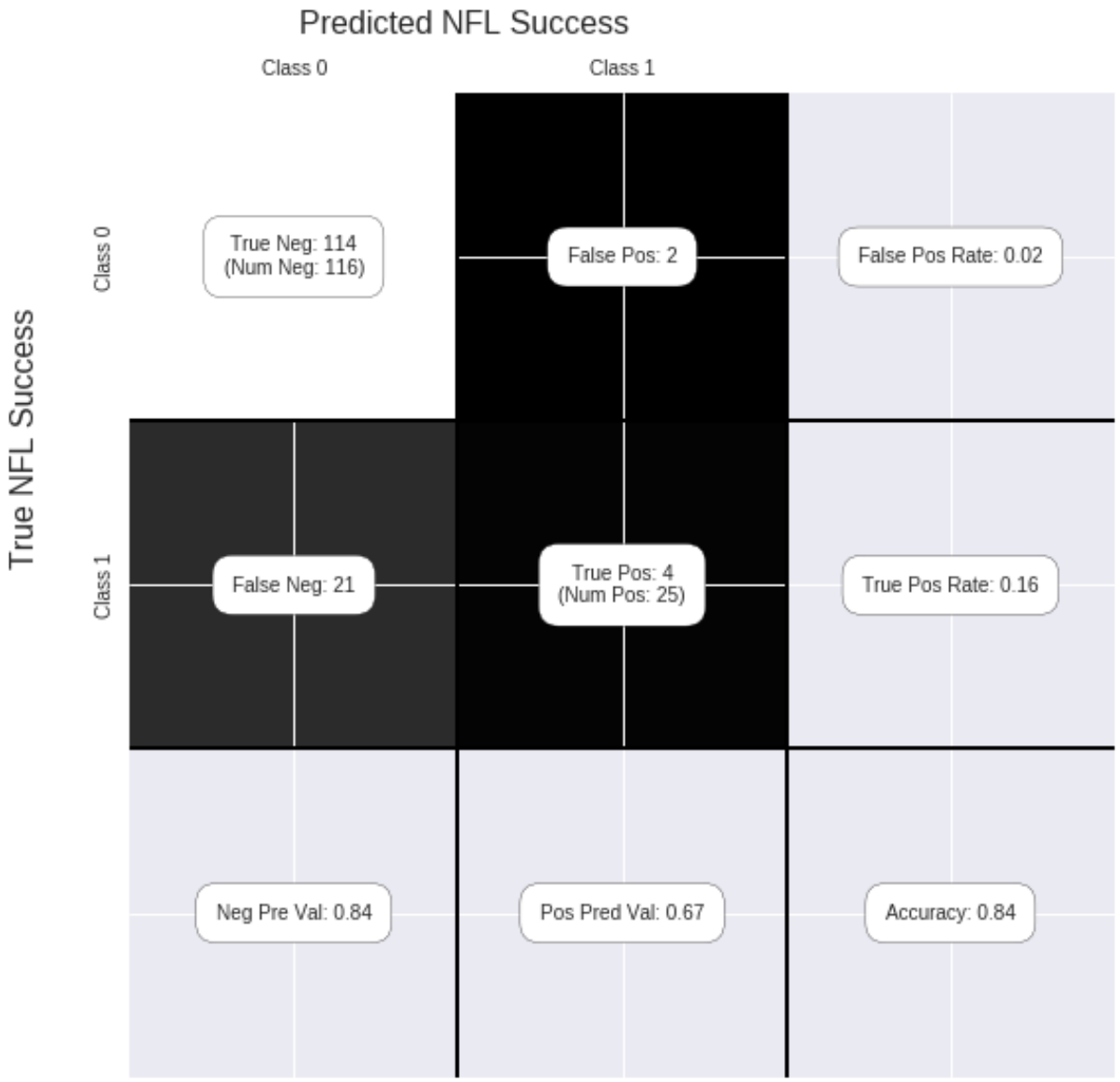
Logistic Regression-BE Confusion Matrix



Logistic Regression-L2 Confusion Matrix



Random Forest Confusion Matrix



Random Forest Confusion Matrix