



# Deconstructing US News and World Report's 2007 College and University Rankings



## Group 2

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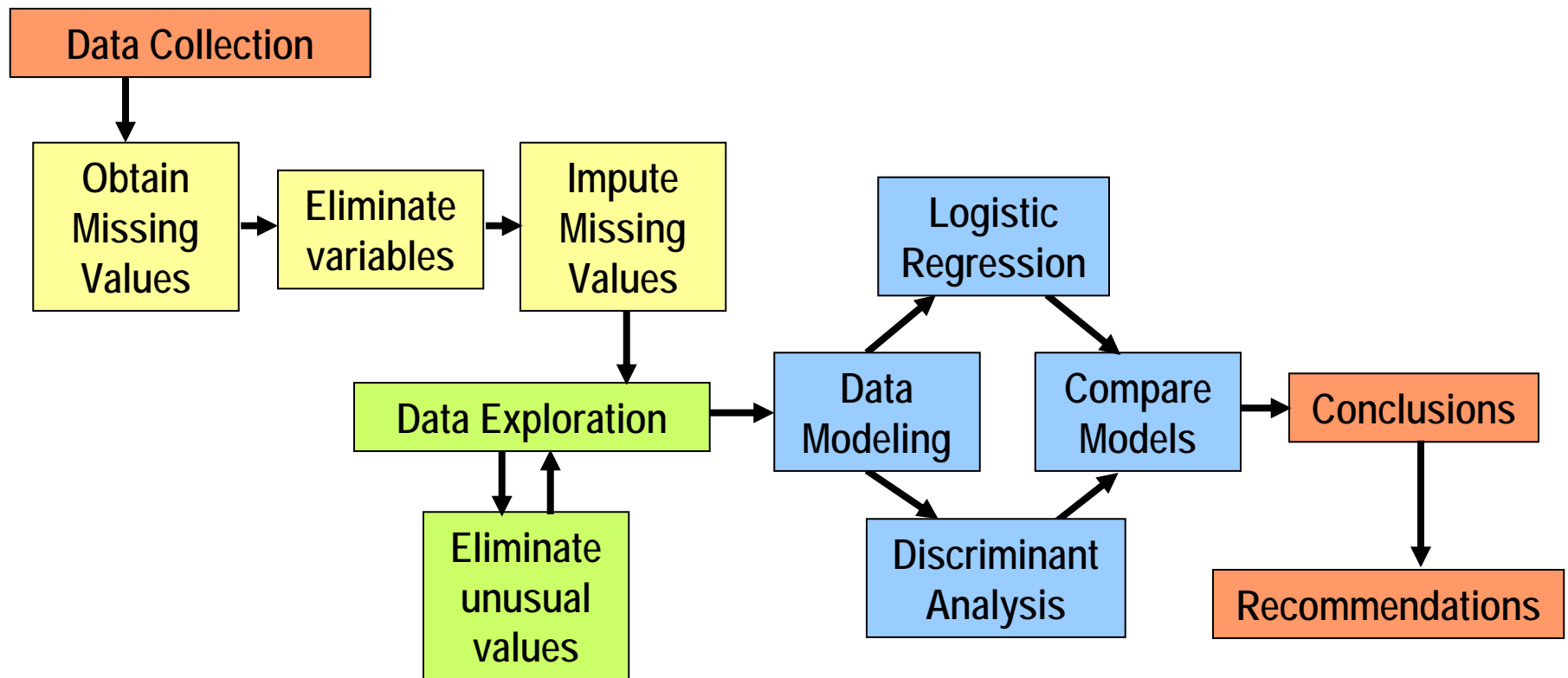
# Primary Goal

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- Purely Explanatory
- To investigate how various factors, such as graduation rate, peer assessment scores, etc. influence the annual ranking methodology
- Make recommendations to ranked schools to improve their ranking and unranked schools to be ranked

# Project Plan

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# Data Collection

- Subscription site for US News rankings
- Missing values obtained through College Opportunities Online Locator (COOL) (US Dept. of Education)

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**National Universities: Top Schools**

Methodology

Rank	Peer assessment score (5.0=highest)	Average freshman retention rate	2005 actual graduation rate	2005 predicted graduation rate	2005 overperf. (+)/underperf.(-)	Faculty resources rank	% of classes w/50 or more ('05)	% faculty who are full time ('05)	SAT/ACT 25th-75th percentile ('05)	Acceptance rate ('05)	Alumni giving rank									
Overall score	Graduation & retention rank	2005 predicted graduation rate	2005 overperf. (+)/underperf.(-)	% of classes w/fewer than 20	Student/faculty ratio ('05)	Selectivity rank	Freshmen in top 10% of HS class	Financial resources rank	Avg. alumni giving rate											
1. Princeton University (NJ)	100	4.9	2	98%	94%	97%	+3	2	74%	10%	5/1	91%	4	1380-1560	94% <sup>5</sup>	11%	13	1	61%	
2. Harvard University (MA)	99	4.9	1	97%	94%	98%	+4	3	69%	13%	7/1	92%	1	1400-1580	96%	9%	8	6	44%	
3. Yale University (CT)	98	4.9	3	98%	95%	96%	+1	6	77%	8%	6/1	89%	2	1400-1580	95% <sup>5</sup>	10%	2	4	45%	
4. California Institute of Technology	94	4.7	20	96%	96%	90%	-6	4	67%	8%	3/1	98%	4	1470-1580	94%	20%	1	25	30%	
4. Stanford University (CA)	94	4.9	7	98%	93%	94%	+1	13	70%	11%	6/1	99%	8	1360-1550	89%	12%	8	8	39%	
4. Massachusetts Inst. of Technology	94	4.9	8	98%	95%	94%	-1	15	68%	11%	8/1	90%	2	1430-1570	97%	14%	5	10	38%	
7. University of Pennsylvania	93	4.5	8	98%	94%	94%	none	1	73%	8%	6/1	87%	8	1340-1520	94%	21%	7	7	40%	
8. Duke University (NC)	92	4.5	8	97%	93%	93%	none	4	71%	5%	8/1	97%	11	1360-1540	88%	24%	12	5	44%	
9. University of Chicago	89	4.7	20	96%	91%	91%	none	6	66%	5%	7/1	85%	22	1350-1530	79%	40%	10	20	33%	
9. Dartmouth College (NH)																				

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 Institution Name  RESULTS >>

SEARCH BY CRITERIA  
 Search by location, program, or both

BY LOCATION - Select up to 12 States or a Geographic Region

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States/Jurisdictions

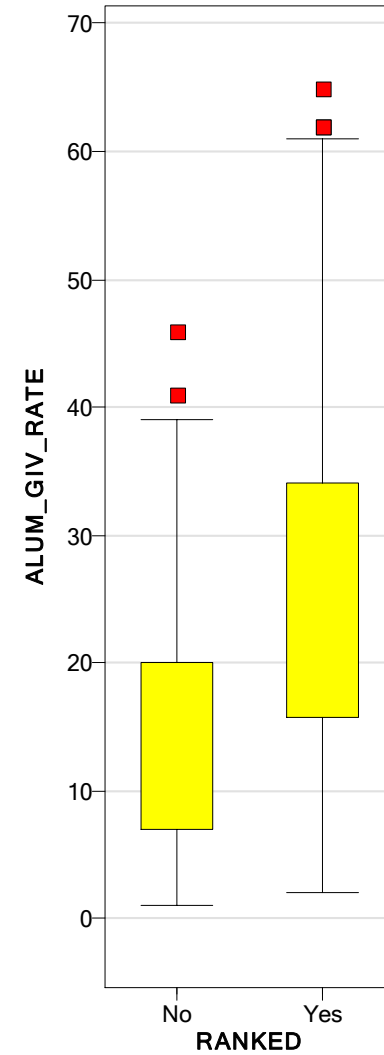
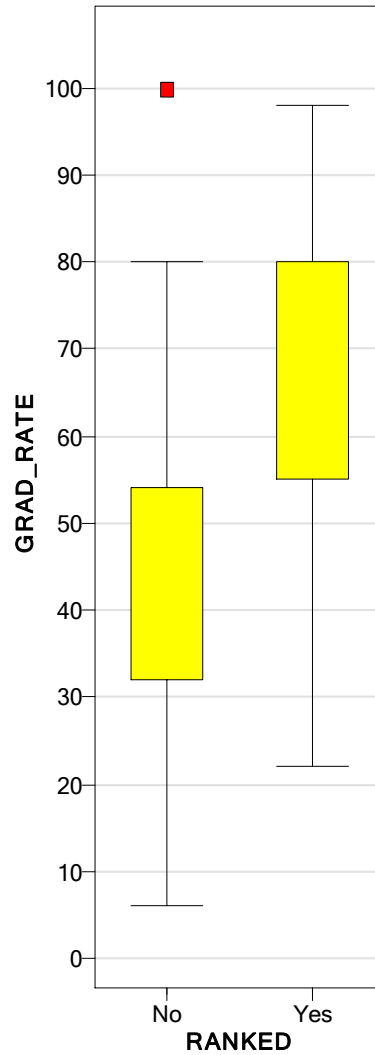
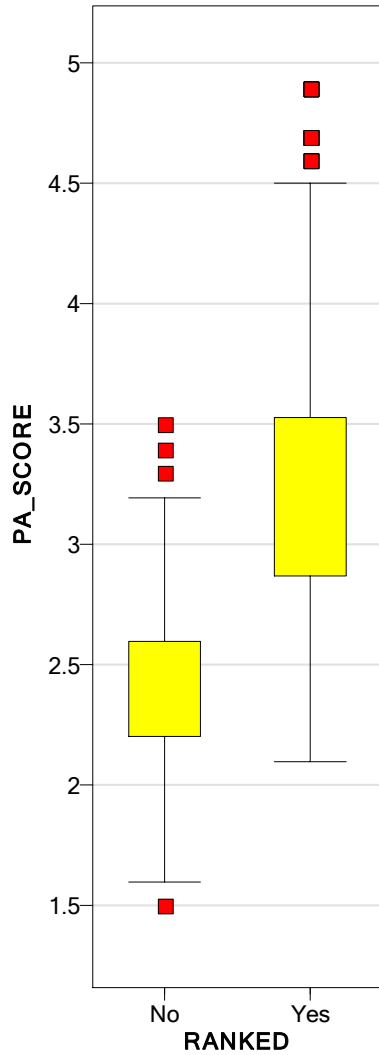
- Alaska
- Alabama
- Arkansas
- American Samoa
- Arizona
- California
- Colorado
- Connecticut
- District of Columbia
- Delaware
- Florida
- Fed. St of Micronesia
- Georgia
- Guam
- Hawaii
- Iowa
- Idaho
- Illinois
- Indiana
- Kansas

# Variables in the Dataset

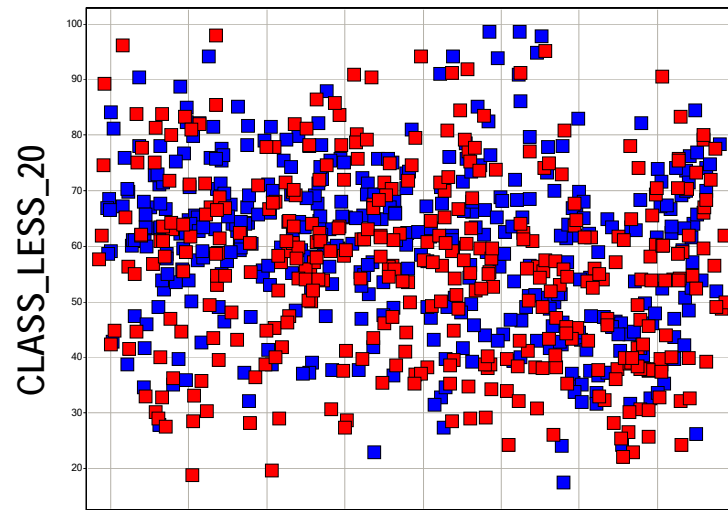
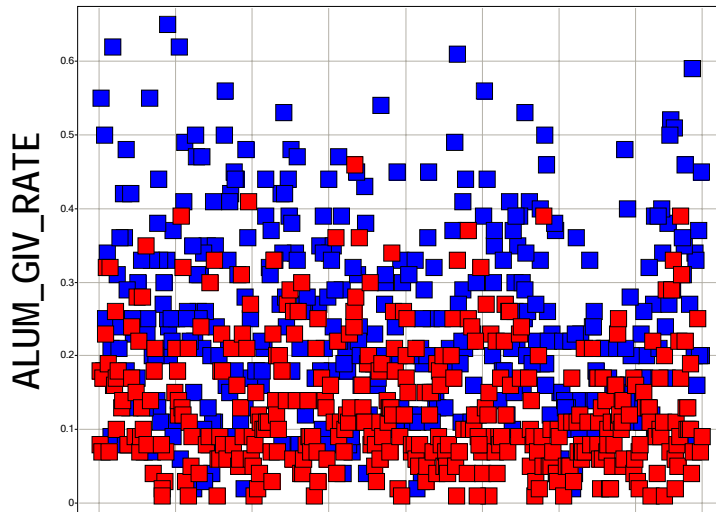
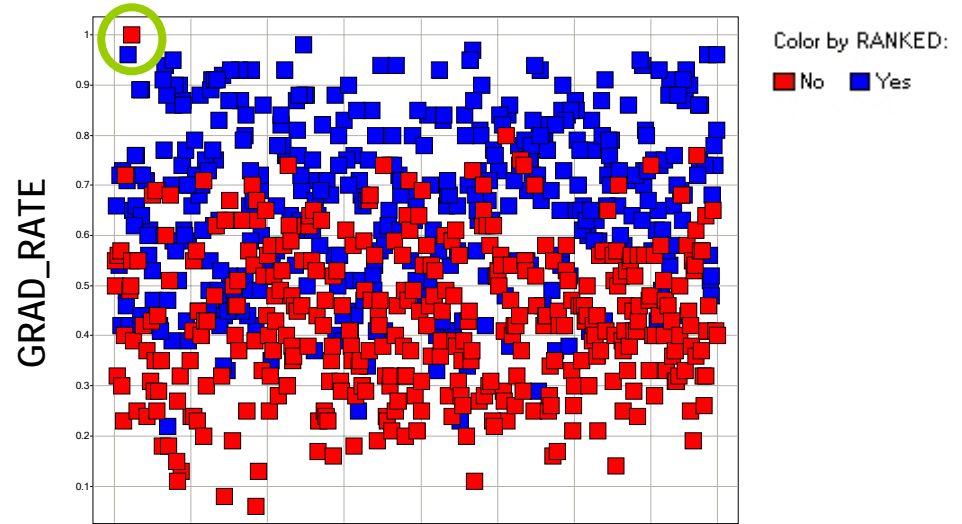
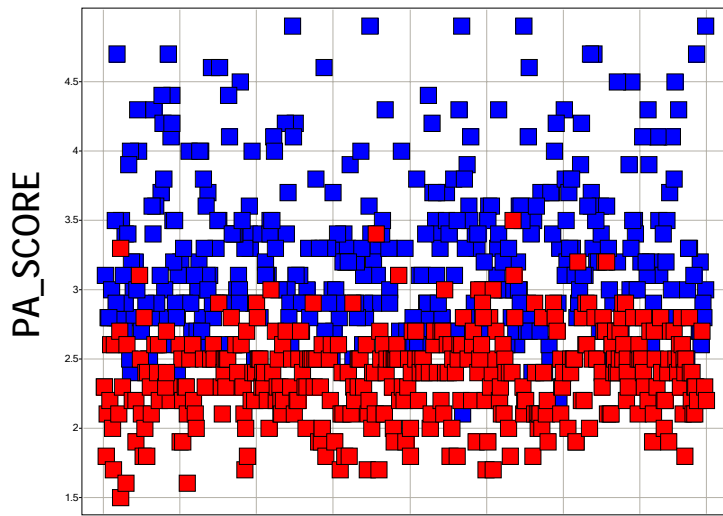
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Field	Description	Type (Units)	Range
RANK	Ranking of the school (if ranked)	Numerical (Units)	1 - 124
NAME	Name of the school	Identifier	
TYPE	National/ Liberal Arts/ Comprehensive/ Region	Categorical	
TIER	Tier to which the school belongs	Qualitative	Top - 4
SCORE	Overall score by U.S. News based on objective measures of academic quality (for ranked schools)	Numerical (Units)	36 - 100
PA_SCORE	Quality of academic programs (rated by president, provost, and dean of admissions for schools in the same category as their own school, including their own)	Numerical (Units)	1.5 - 4.9
FRESH_RET	Students Retained after Freshman Year	Numerical (%)	35 - 99%
GRAD_RATE	Average graduation rate	Numerical (%)	6 - 84%
CLASS_LESS_20	Percentage of classes with less than 20 students	Numerical (%)	16 - 99%
CLASS_MORE_50	Percentage of classes with more than 50 students	Numerical (%)	0 - 96%
STUD_FAC_RATIO	Student to Faculty ratio	Numerical (Ratio)	3:1 - 27:1
FACULTY_FT	Percentage of faculty who are full time	Numerical (%)	29 - 100%
SAT_ACT	25 <sup>th</sup> - 75 <sup>th</sup> percentile of SAT/ACT scores accepted	Qualitative	
FRESH_TOP_10	Freshmen in top 10% of High School class	Numerical (%)	1 - 99%
FRESH_TOP_25	Freshmen in top 25% of High School class	Numerical (%)	1 - 89%
ACCEPT_RATE	Acceptance rate	Numerical (%)	9 - 100%
ALUM_GIV_RATE	Percentage of Alumni contributing financially	Numerical (%)	1 - 65%

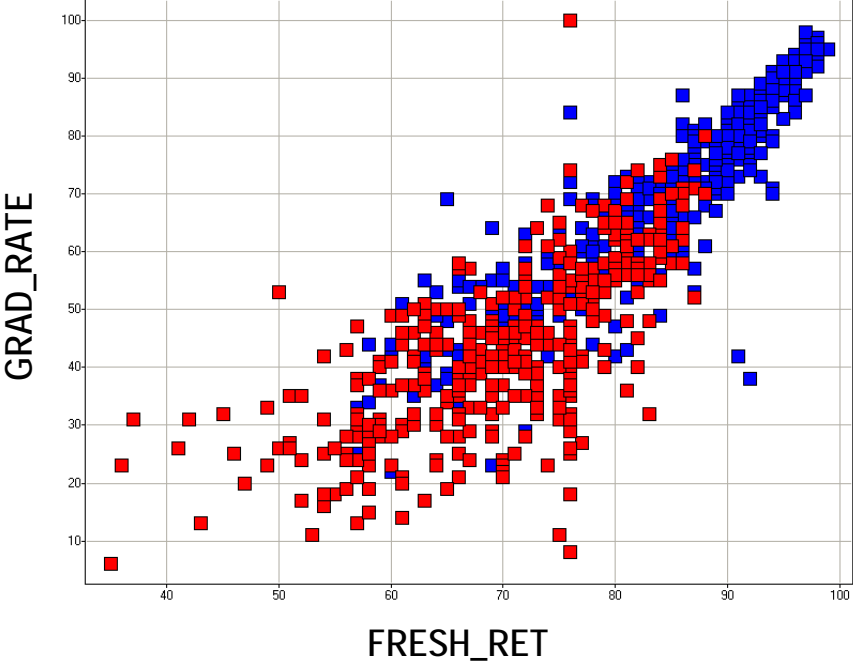
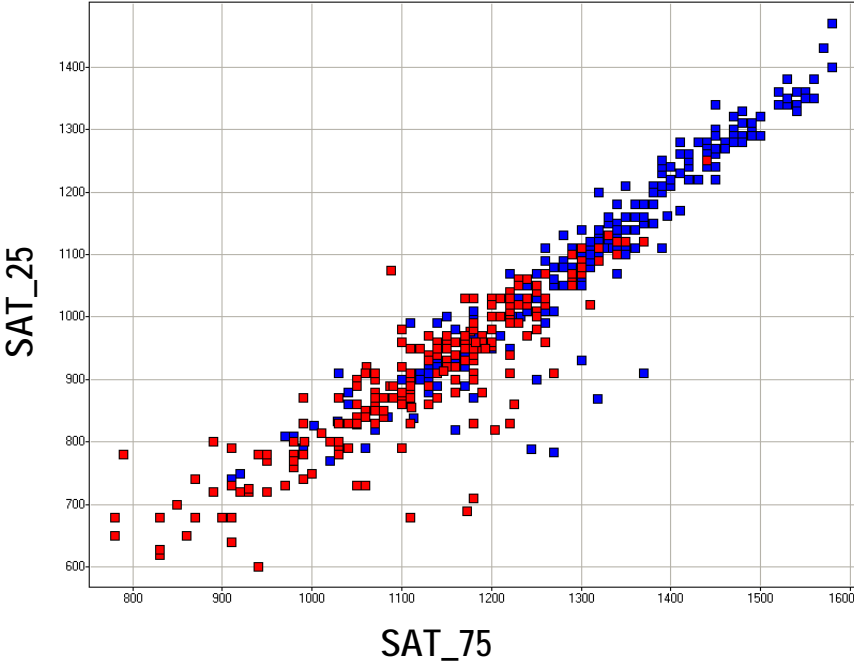
# Data Visualization I: Univariate



# Data Visualization II: Bivariate



# Data Visualization II: Correlations



COLORED BY RANKED

■ No ■ Yes



# Pivot Tables: Important Finding

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## PERCENT PRIVATE

TIER	Comp: Midwest	Comp: North	Comp: South	Comp: West	Liberal Arts	National	Grand Total
Top	100.00%	91.43%	90.74%	95.24%	97.27%	49.21%	81.00%
3	81.48%	68.75%	70.37%	66.67%	94.23%	24.19%	63.21%
4	69.23%	62.50%	84.00%	60.00%	70.59%	15.00%	53.19%
Grand Total	87.85%	79.10%	83.96%	80.00%	90.14%	34.68%	69.91%

# Data Modeling

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The following models were used:

- MODEL 1. Logistic Regression: All relevant variables used.
- MODEL 2. Logistic Regression: All relevant variables plus PRIVATE and interaction terms.
- MODEL 3. Discriminant Analysis: To validate findings from MODEL 1.

# MODEL 1: Logistic Regression

## The Regression Model

Input variables	Coefficient	Std. Error	p-value	Odds
Constant term	5.51837635	0.79671109	0	*
TYPE_Comp: North	1.66730082	0.77735722	0.03196627	5.29784822
TYPE_Comp: South	3.30953193	0.73029858	0.00000585	27.37230873
TYPE_Liberal Arts	-10.98755264	1.5298481	0	0.00001691
TYPE_National	-5.22619295	1.05500388	0.00000073	0.00537394
Z_PA_SCORE	7.40522146	0.89718521	0	1644.548706
Z_FRESH_RET	1.20038128	0.54127574	0.02657604	3.32138324
Z_GRAD_RATE	5.4233036	0.79300135	0	226.6265259
Z_CLASS_LESS_20	2.29067326	0.37634322	0	9.88158798
Z_FACULTY_FT	0.81186247	0.27072099	0.00270965	2.25209856
Z_ALUM_GIV_RATE	1.5737077	0.35562581	0.00000964	4.82450294

Residual df	769
Residual Dev.	171.882721
% Success in training data	51.28205128
# Iterations used	11
Multiple R-squared	0.84096664

Actual Class	Predicted Class	
	Yes	No
Yes	386	14
No	19	361

Class	# Cases	# Errors	% Error
Yes	400	14	3.50
No	380	19	5.00
<b>Overall</b>	<b>780</b>	<b>33</b>	<b>4.23</b>

# MODEL 3: Discriminant Analysis

## Classification Function

Rank	Variables	Classification Function		Abs_Diff
		Yes	No	
1	Z_PA_SCORE	1.42937422	-1.50065541	2.93002963
2	Z_GRAD_RATE	0.83214837	-0.87364656	1.70579493
3	Z_SAT_25	-0.59432709	0.62396586	1.21829295
4	Z_CLASS_LESS_20	0.26585895	-0.27911696	0.54497591
5	Z_ACCEPT_RATE	0.18100505	-0.19003151	0.37103656
6	Z_FRESH_RET	0.15644167	-0.16424319	0.32068486
7	Z_CLASS_MORE_50	-0.1562914	0.16408546	0.32037686
8	Z_ALUM_GIV_RATE	0.04452147	-0.0467418	0.09126327
9	Z_FACULTY_FT	-0.01468757	0.01542001	0.03010758
10	Z_SAT_75	-0.01347257	0.01414406	0.02761663
11	Constant	-1.30558431	-1.36819029	

## Training Data scoring - Summary Report

Cut off Prob.Val. for Success (Updatable)	<b>0.5</b>
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Classification Confusion Matrix		
	Predicted Class	
Actual Class	Yes	No
Yes	326	61
No	27	354

Error Report			
Class	# Cases	# Errors	% Error
Yes	387	61	15.76
No	381	27	7.09
<b>Overall</b>	<b>768</b>	<b>88</b>	<b>11.46</b>

# Model Selection

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- MODEL 1 was selected as the best model on the basis of:
  - Logical and interpretable predictors
  - Overall goodness of fit, Multiple- $R^2 = 84.09\%$
  - Overall error rate = 4.23%
  - Parsimonious

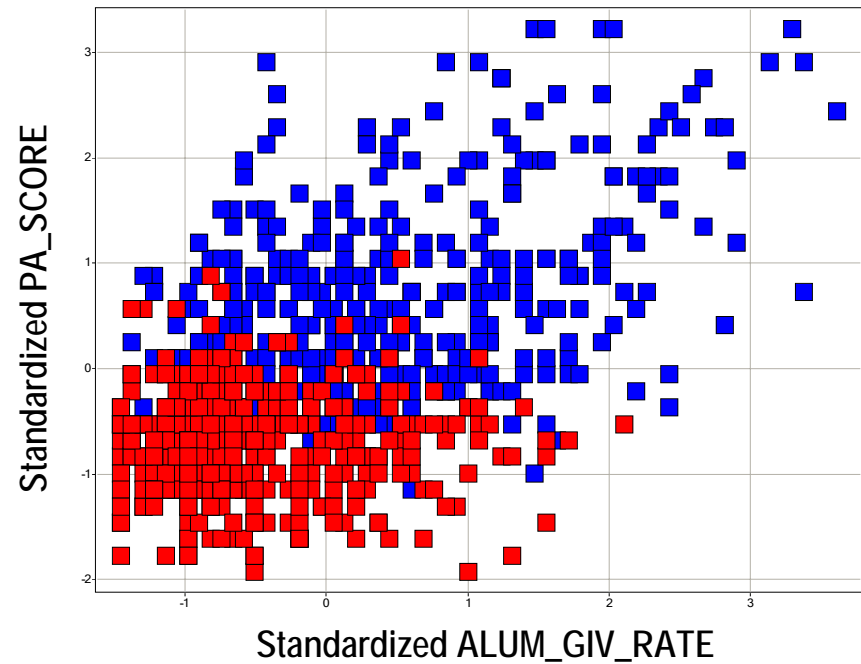
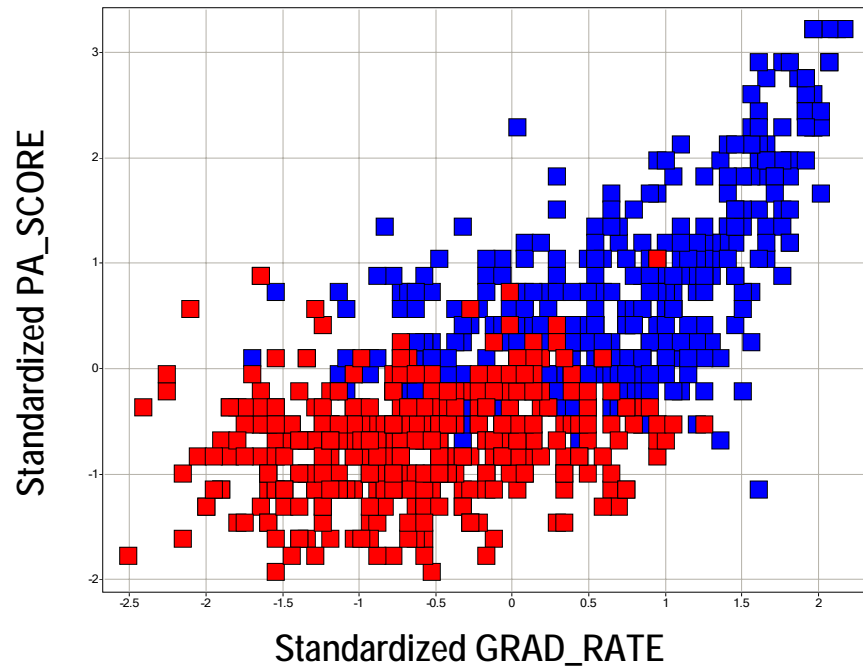
# Conclusions

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- Findings from the model are aligned with those from data exploration phase
- Peer assessment score, graduation rate, smaller class size, percentage of full-time faculty, and contributions from alumni shown to affect ranking
- Limited utility in using PUBLIC/PRIVATE type

# Validating the Conclusions

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# Recommendations

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- Develop programs to increase graduation rate
- Limit class sizes to under 20
- Increase the percentage of full-time faculty
- Bolster alumni giving
- Lobby to achieve higher ratings from peer institutions



# Questions

