Optimizing Financial Aid Packaging Through Data Science/Variables, Probabilities, and Enrollment Likelihood

Using Predictive Modeling in your Enrollment Strategy

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Agenda

The Science	• Econometric Modeling • Prioritization and Scoring Based on Predictive Analytics
The Application	• Recruitment + Retention = Enrollment • Applications and Use Cases

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Econometric Modeling – Prioritization and Scoring Based on Predictive Analytics

Econometric Modeling

Modeling Price Sensitivity and Student Enrollment Behavior

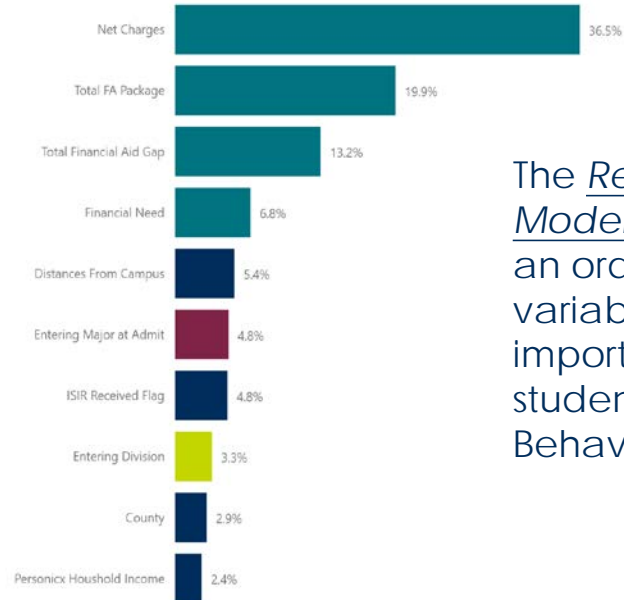- Advanced Machine Learning Models
- Two years of Historical Data
- Measure the impact of aid on student's ability to enroll
- Determine other factors predictive of enrollment

Relative Strength of Model Feature

Feature	Value
Net Charges	36.5%
Total FA Package	19.9%
Total Financial Aid Gap	13.2%
Financial Need	6.8%
Distances From Campus	5.4%
Entering Major at Admit	4.8%
ISIR Received Flag	4.8%
Entering Division	3.3%
County	2.9%
Personicx Houshold Income	2.4%

The *Relative Strength of Model Features* provides an ordered list of the input variables that are most important in determining a student's Enrollment Behavior.
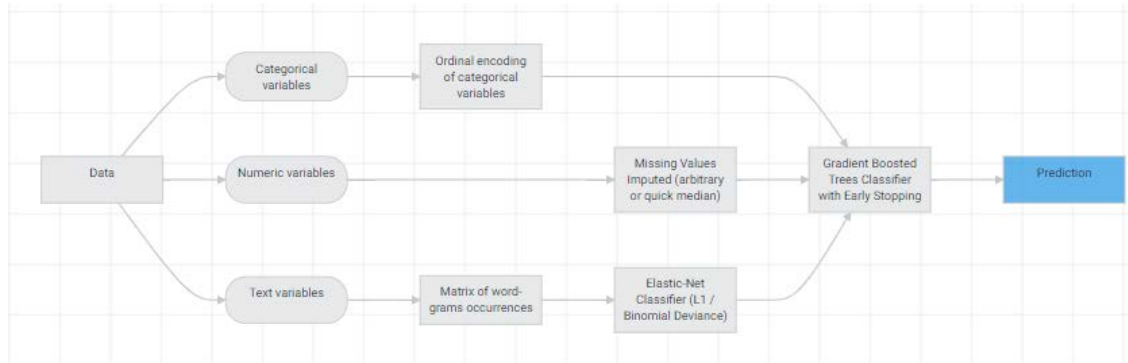
Modeling Process
Feature Associations
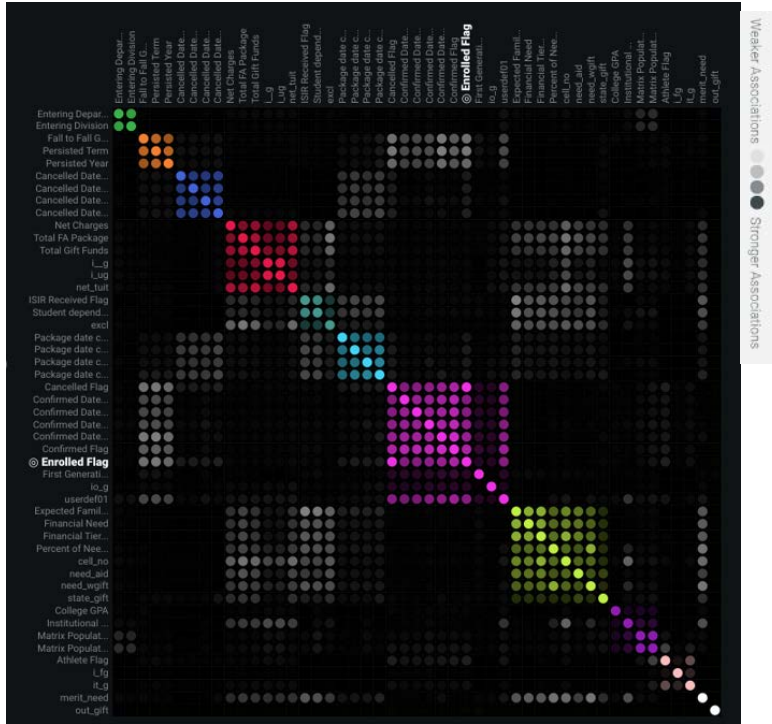
- Data is cleaned and processed for modeling.

- Features are analyzed, selected, and removed based on importance, feature associations, scaling etc.

- Hundreds of AI/ML-generated models are created and evaluated against each other in the model tournament.

- The best model is chosen based on accuracy metrics. (Often, blenders are used to create even more accurate models from a selection of top models.)

- This top model is used to score data.

Blueprints

## Gradient Boosted Trees Classifier with Early Stopping

Building predictive models, We run several different versions of each algorithm and test thousands of possible combinations of data preprocessing and parameter settings. The result of this testing is provided in the **Blueprints** tab.

Blueprints are ML pipelines containing preprocessing steps, modeling algorithms, and post-processing steps.
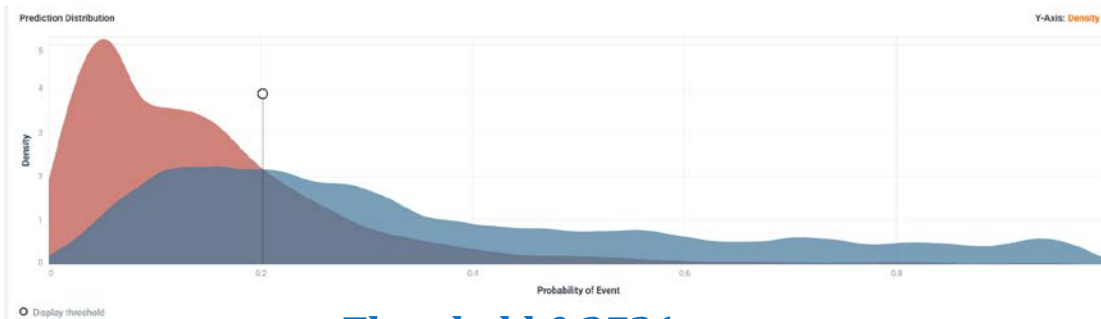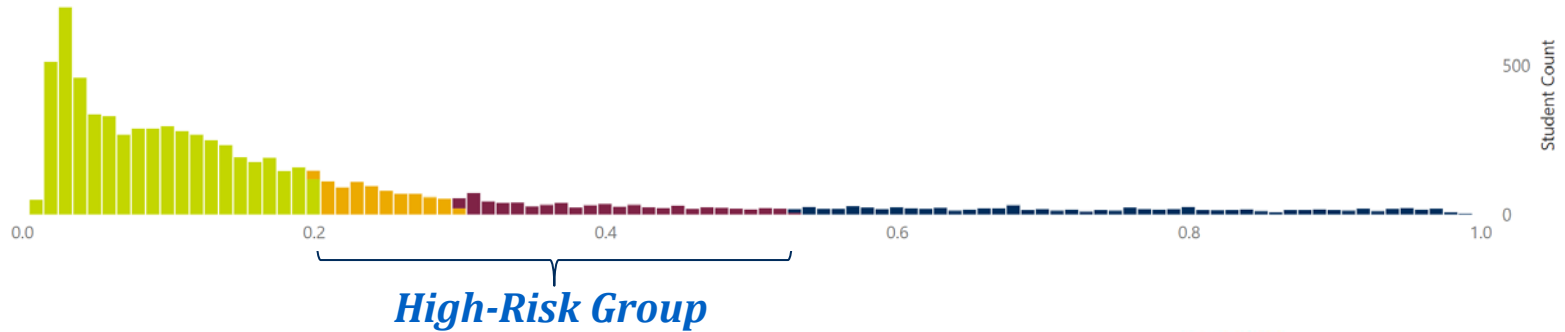
Best Model

AUC
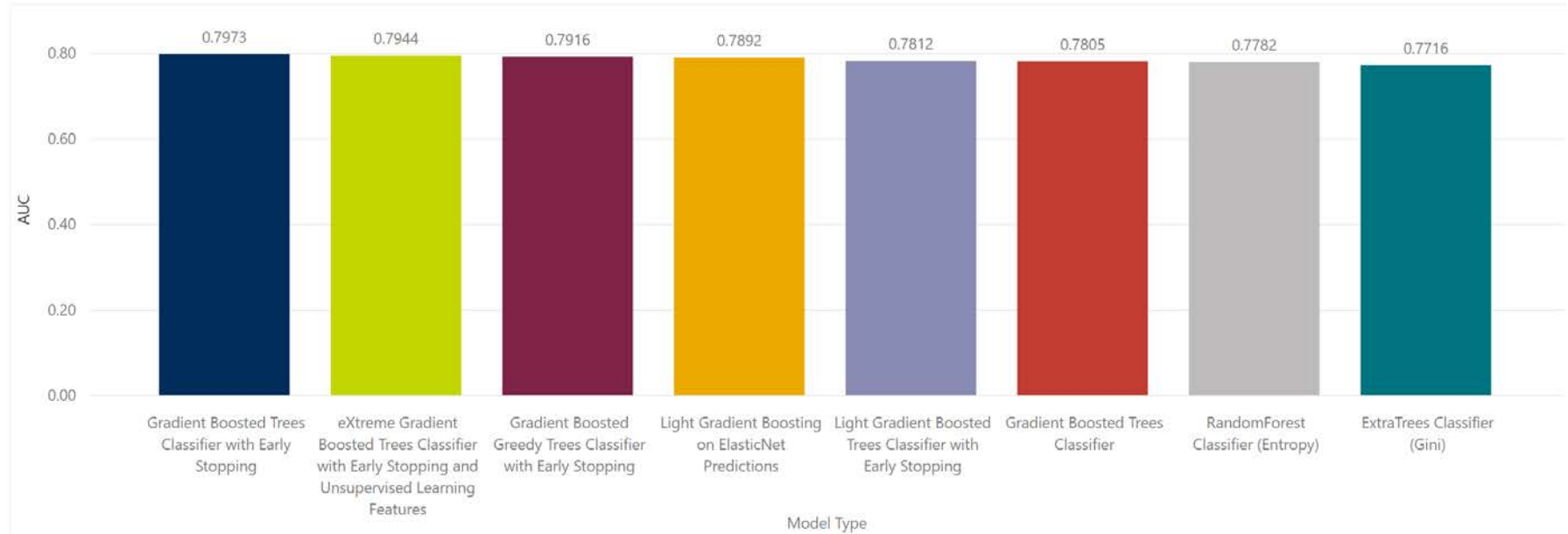
Scoring Distribution

● 1- High Not Enrolled ● 2- Low Not Enrolled ● 3- Low Enrolled ● 4- High Enrolled
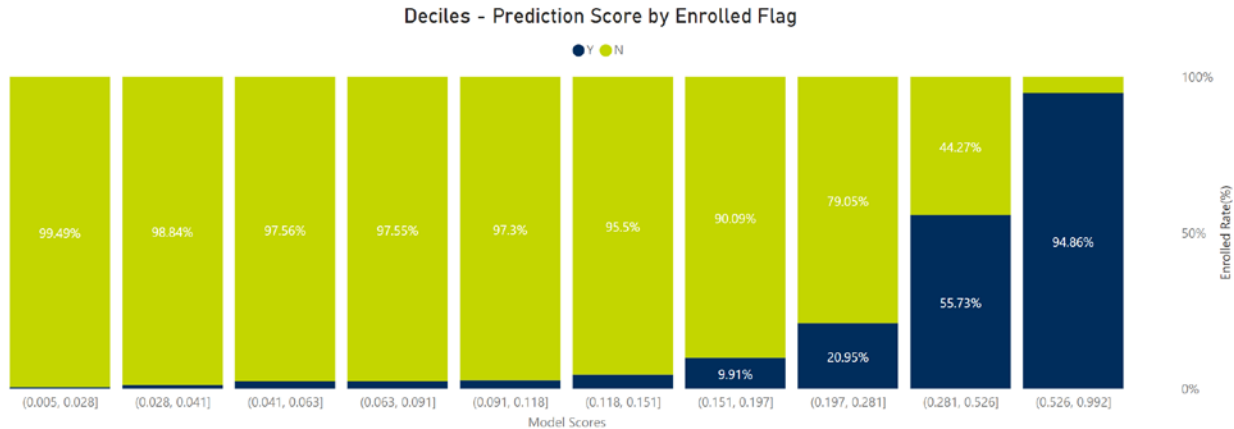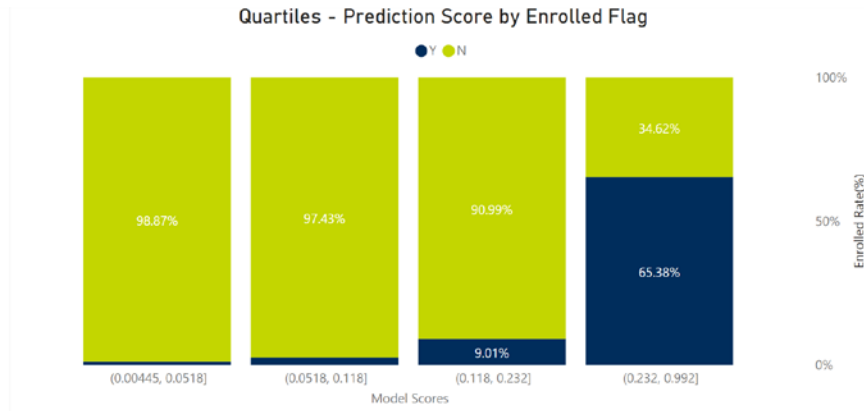
High-Risk Group

Threshold:0.2721

Confusion Matrix

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Model Score Distribution

Quartiles - Prediction Score by Enrolled Flag

Deciles - Prediction Score by Enrolled Flag

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Prediction Explanations - Net Charges
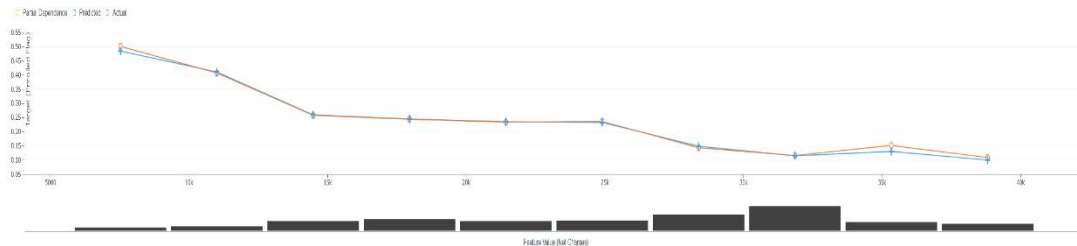
Deciles - Enrolled Rate(%) by Net Charges
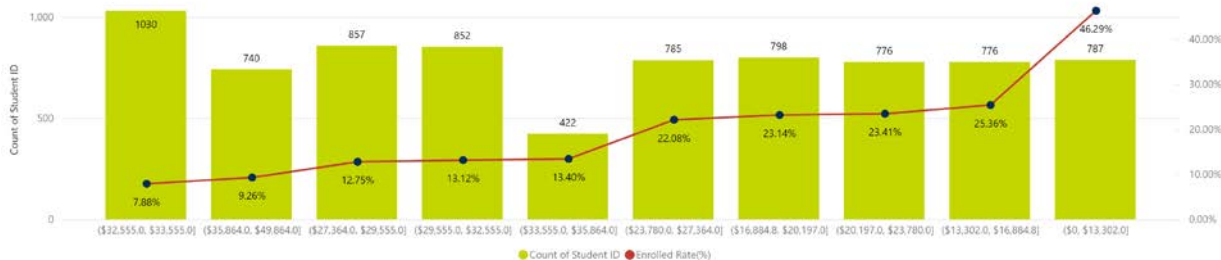
Prediction	Average of Net Charges
(0.005, 0.028]	$32,883.99
(0.028, 0.041]	$32,780.72
(0.041, 0.063]	$30,069.10
(0.063, 0.091]	$27,173.30
(0.091, 0.118]	$25,249.00
(0.118, 0.151]	$24,304.75
(0.151, 0.197]	$23,440.25
(0.197, 0.281]	$22,685.90
(0.281, 0.526]	$21,275.27
(0.526, 0.992]	$16,043.39
Total	$25,590.44

Enrolled Rate(%) by Net Charges

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Prediction Explanations-Total FA Package

Predicted & Actual Score
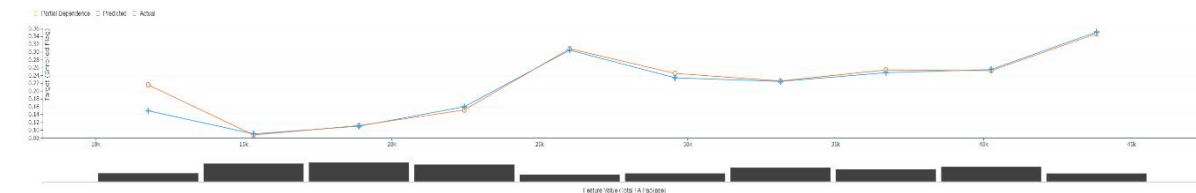
Prediction Distribution

Prediction	Average of Total FA Package
(0.005, 0.028]	$18,166.17
(0.028, 0.041]	$18,179.19
(0.041, 0.063]	$21,995.80
(0.063, 0.091]	$25,833.44
(0.091, 0.118]	$28,626.79
(0.118, 0.151]	$29,587.58
(0.151, 0.197]	$30,558.90
(0.197, 0.281]	$31,139.38
(0.281, 0.526]	$32,245.59
(0.526, 0.992]	$34,853.48
Total	$27,118.53

Deciles - Enrolled Rate(%) by Total FA Package

Enrolled Rate(%) by Total FA Package

Prediction Explanations-Total Financial Aid Gap

Predicted & Actual Score
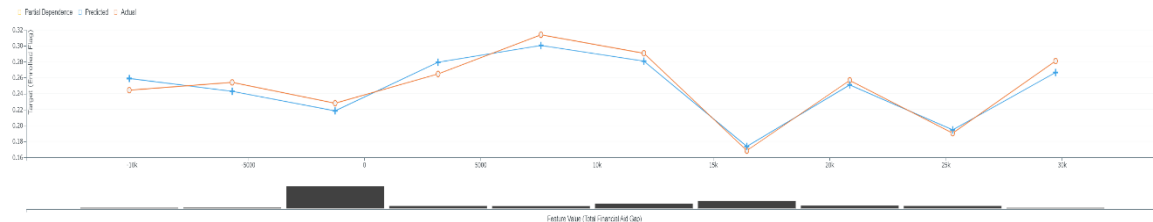
Deciles – Enrolled Rate(%) by Total Financial Aid Gap

Prediction Distribution

Prediction	Average of Total Financial Aid Gap
(0.005, 0.028]	$124.71
(0.028, 0.041]	$1,536.67
(0.041, 0.063]	$5,435.99
(0.063, 0.091]	$8,230.09
(0.091, 0.118]	$9,991.21
(0.118, 0.151]	$10,356.96
(0.151, 0.197]	$10,935.52
(0.197, 0.281]	$10,740.98
(0.281, 0.526]	$8,627.66
(0.526, 0.992]	$6,273.54
Total	$7,201.94

Enrolled Rate(%) by Total Financial Aid Gap

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Prediction Explanations-Financial Need

Predicted & Actual Score

Prediction Distribution

Prediction	Average of Total Financial Aid Gap
(0.005, 0.028]	$124.71
(0.028, 0.041]	$1,536.67
(0.041, 0.063]	$5,435.99
(0.063, 0.091]	$8,230.09
(0.091, 0.118]	$9,991.21
(0.118, 0.151]	$10,356.96
(0.151, 0.197]	$10,935.52
(0.197, 0.281]	$10,740.98
(0.281, 0.526]	$8,627.66
(0.526, 0.992]	$6,273.54
Total	$7,201.94

Deciles - Enrolled Rate(%) by Total Financial Aid Gap

Enrolled Rate(%) by Total Financial Aid Gap

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Prediction Explanations-Financial Need

Predicted & Actual Score
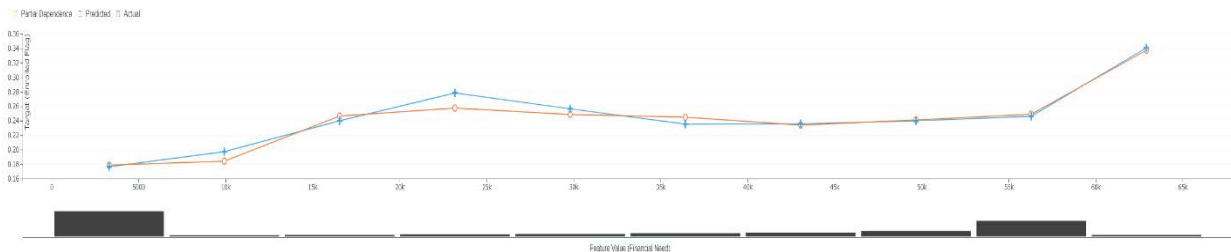
Prediction Distribution

Prediction	Average of Financial Need
(0.005, 0.028]	$686.04
(0.028, 0.041]	$4,638.72
(0.041, 0.063]	$18,200.08
(0.063, 0.091]	$28,047.19
(0.091, 0.118]	$35,014.16
(0.118, 0.151]	$36,243.60
(0.151, 0.197]	$39,032.44
(0.197, 0.281]	$39,045.53
(0.281, 0.526]	$37,611.43
(0.526, 0.992]	$35,918.34
Total	$27,403.28

Deciles - Enrolled Rate(%) by Financial Need

Enrolled Rate(%) by Financial Need

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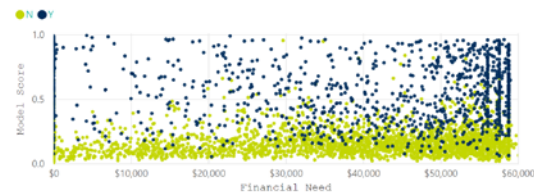
Prediction Explanations-Distance From Campus
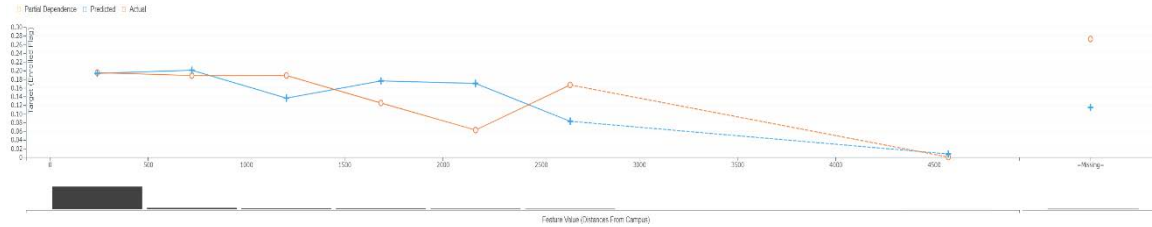
Deciles - Enrolled Rate(%) by Distances From Campus

Prediction	Average of Distances From Campus
(0.005, 0.028]	287.06
(0.028, 0.041]	294.81
(0.041, 0.063]	366.93
(0.063, 0.091]	314.59
(0.091, 0.118]	270.08
(0.118, 0.151]	218.48
(0.151, 0.197]	208.03
(0.197, 0.281]	198.57
(0.281, 0.526]	231.25
(0.526, 0.992]	278.15
Total	265.73

Enrolled Rate(%) by Distances From Campus

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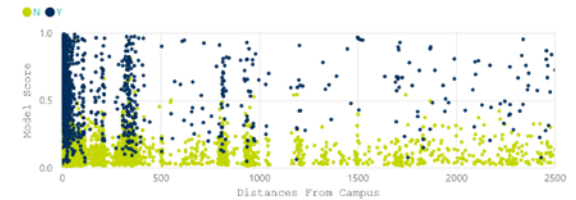
Prediction Explanations-Entering Major at Admit

Predicted & Actual Score
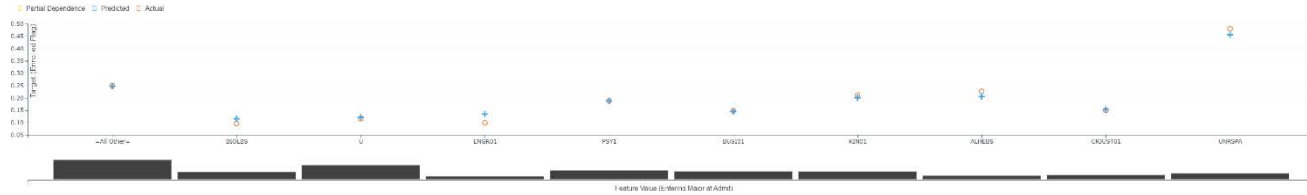
Enrolled Rate(%) by Entering Major at Admit

The Application

Now what?

You have constructed your model. What comes next?
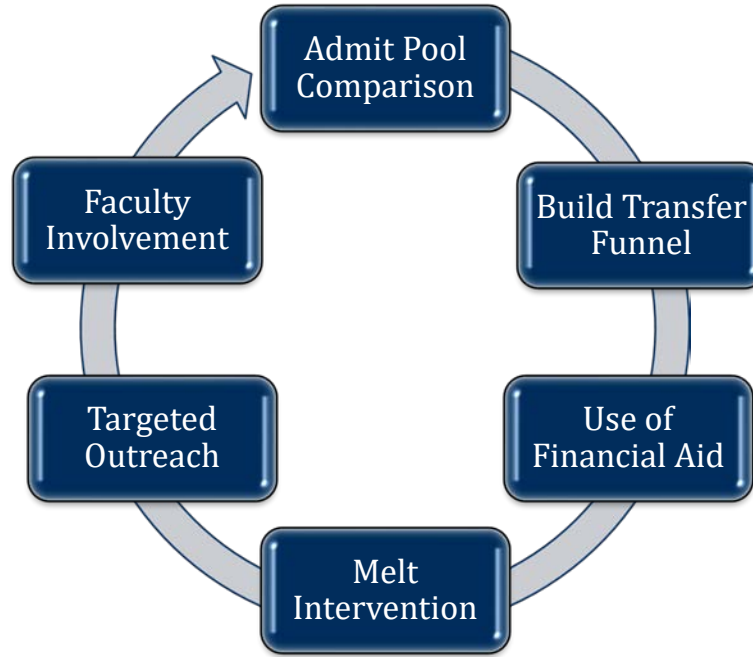
Admit Pool Comparison

Build Transfer Funnel

Use of Financial Aid

Melt Intervention

Targeted Outreach

Faculty Involvement

Admit Pool Comparison and Potential Impact on Yield

What variables influence your students?

Relative Importance of Variables

Net Charges (NETCH)
ISIR - Not Pell Eligible...
First Major as Admit...
Personicx Cluster Code...
State/City Combination...
First Extracurricular...
High School GPA (HSGPA)

0.00   0.25   0.50   0.75   1.00

Enrollment Likelihood Score
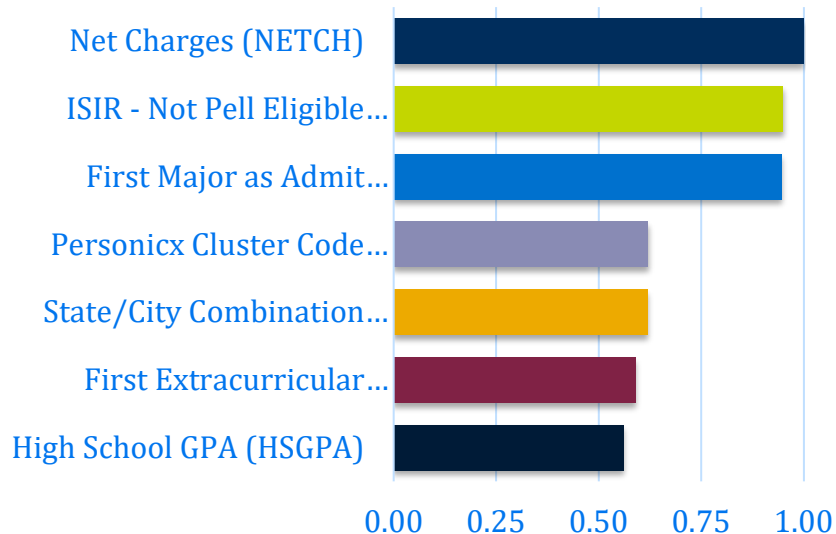
Distribution of Model Scores			
2020 Final			
Model Score	Admitted	Enrolled	Yield Rate
0.91-1.00	104	68	65.4%
0.81-0.90	102	38	37.3%
0.71-0.80	102	36	35.3%
0.61-0.70	103	31	30.1%
0.51-0.60	102	31	30.4%
0.41-0.50	103	25	24.3%
0.31-0.40	103	16	15.5%
0.21-0.30	102	8	7.8%
0.11-0.20	102	6	5.9%
0.01-0.10	102	3	2.9%
Totals:	1025	262	25.6%

Admit Pool Comparison and Potential Impact on Yield
What variables influence <u>your</u> students?

Model Score	Model Data (2 Years)				Actual Result			
	Admitted	% Admit Pool	Enrolled	Yield Rate	Admitted	% Admit Pool	Enrolled	Yield Rate
0.91-1.00	442	10%	251	56.8%	193	9%	110	57.0%
0.81-0.90	440	10%	173	39.3%	176	8%	65	36.9%
0.71-0.80	440	10%	113	25.7%	245	12%	71	29.0%
0.61-0.70	440	10%	80	18.2%	226	11%	50	22.1%
0.51-0.60	440	10%	66	15.0%	188	9%	34	18.1%
0.41-0.50	440	10%	48	10.9%	212	10%	28	13.2%
0.31-0.40	440	10%	32	7.3%	186	9%	7	3.8%
0.21-0.30	440	10%	19	4.3%	235	11%	4	1.7%
0.11-0.20	440	10%	8	1.8%	239	11%	3	1.3%
0.01-0.10	440	10%	5	1.1%	200	10%	3	1.5%
Totals:	**4402**		**795**	**18.1%**	**2100**		**375**	**17.9%**

Building a Transfer Funnel

- Not every high-scoring student will enroll at your institution…at least not the 1st time.

- Fold high-scoring non-enrolled students into your transfer funnel and comm flow.

- Do you know the historical percent of your TR students that were in your FY funnel?

| | Full Data | |
Model Score	Count Non-Enrolled	Percent Non-Enrolled
0.01-0.10	99	13.0%
0.11-0.20	96	12.6%
0.21-0.30	94	12.3%
0.31-0.40	87	11.4%
0.41-0.50	78	10.2%
0.51-0.60	71	9.3%
0.61-0.70	72	9.4%
0.71-0.80	66	8.7%
0.81-0.90	64	8.4%
0.91-1.00	36	4.7%
Totals:	763	

Building a Transfer Funnel

- Students interested in prior years may still have a connection to your institution.

- Periodic communication may resonate best with students that statistically "resemble" current enrollments.

Name	Model Score	Major	FAFSA	Distance (Miles)
Wes	.9	Nursing	Yes	5
John	.8	Engineering	Yes	15
Lisa	.7	Music	Yes	25
Todd	.6	Business	Yes	100
Sylvia	.5	Comm	No	250
Roberto	.4	English	No	500
Jen	.3	Undecided	No	1000

Use of Financial Aid

How much is too much, or not enough?

Relative Importance of Variables

Relative Importance of Variables

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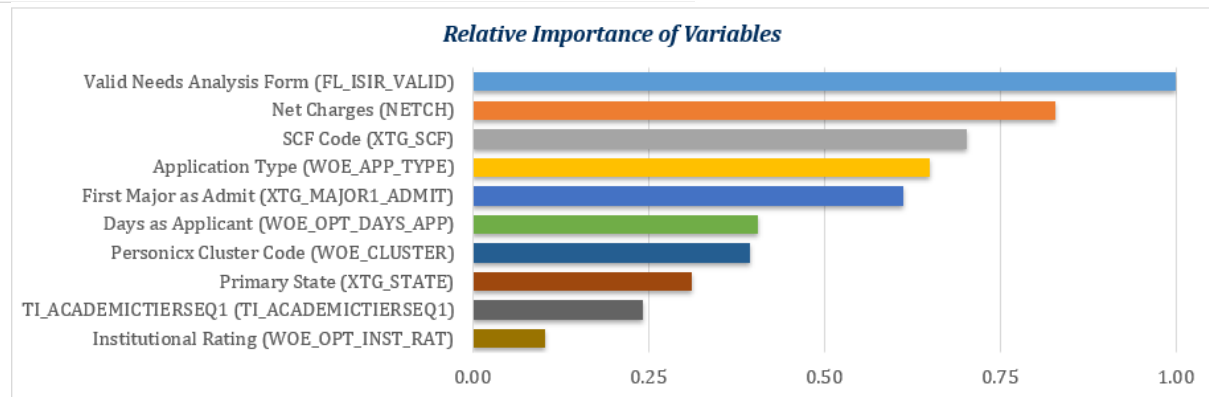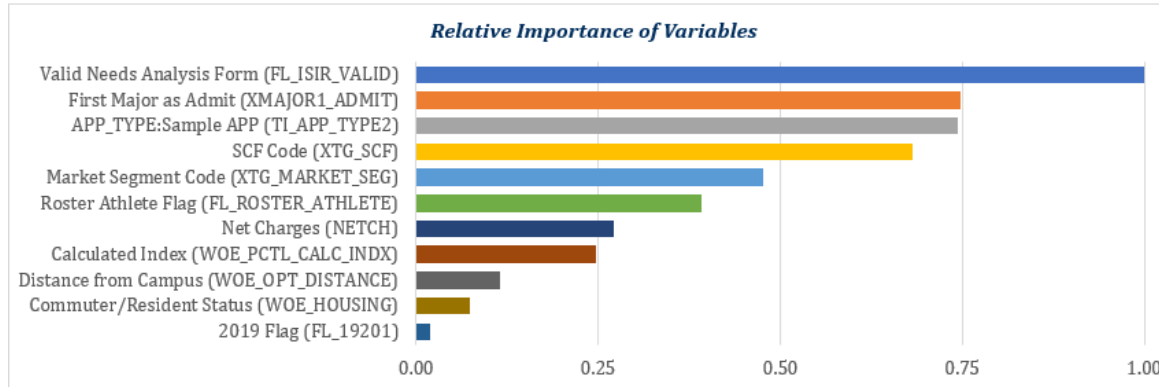
Will financial aid move the needle on its own?

2.7%

An aggregate and student level change in probability allows for the understanding of price sensitivity.

Enrollment Likelihood	Probability of Enrollment	Change in Probability
0.91 - 1.00	68.1%	3.9%
0.81 - 0.90	47.8%	4.8%
0.71 - 0.80	36.1%	4.6%
0.61 - 0.70	24.9%	3.8%
0.51 - 0.60	16.8%	2.9%
0.41 - 0.50	11.3%	2.1%
0.31 - 0.40	7.5%	1.5%
0.21 - 0.30	4.5%	0.9%
0.11 - 0.20	2.3%	0.5%
0.01 - 0.10	0.9%	0.2%
	23.1%	**2.7%**

Measuring the Impact of Aid Changes

"The foundation just gave us $500K…"

| Determine the students you want to impact yield. | Simulate the amount of aid you would give pending students. | See real time results if the increase would benefit your campus. |

| Increase Aid: | 1,000 | ⌄ | Model Score Bin: | All | ⌄ | Receptivity Bin: | All | ⌄ |

Current Projected Enrollment	Current Projected Net Tuition Revenue	Change	New Projected Enrollment	New Projected Net Tuition Revenue
192	$3,059,222	17 Enr $81,273 NTR	209	$3,140,495

CURRENT PROJECTED INSTITUTIONAL AID	NEW PROJECTED INSTITUTIONAL AID
$4,575,506	$5,173,669

Melt Intervention/Prevention

Model Construction

Distribution of Model Scores

| Model Score | Previous 2 Years of Data | | | | |
	Admitted	% Admitted	Enrolled	% Enrolled	Yield
0.01-0.10	270	10.0%	6	1.1%	2.2%
0.11-0.20	270	10.0%	8	1.5%	3.0%
0.21-0.30	270	10.0%	24	4.4%	8.9%
0.31-0.40	270	10.0%	34	6.3%	12.6%
0.41-0.50	270	10.0%	53	9.8%	19.6%
0.51-0.60	270	10.0%	53	9.8%	19.6%
0.61-0.70	270	10.0%	68	12.6%	25.2%
0.71-0.80	270	10.0%	69	12.8%	25.6%
0.81-0.90	270	10.0%	91	16.8%	33.7%
0.91-1.00	271	10.0%	135	25.0%	49.8%
Totals:	2701		541		20.0%

Current State

Distribution of Model Scores

| Model Score | 2021 | | | | |
	Admitted	% Admitted	Enrolled	% Enrolled	Yield
0.01-0.10	257	17.4%	8	5.0%	3.1%
0.11-0.20	186	12.6%	11	6.8%	5.9%
0.21-0.30	182	12.3%	15	9.3%	8.2%
0.31-0.40	176	11.9%	14	8.7%	8.0%
0.41-0.50	214	14.4%	29	18.0%	13.6%
0.51-0.60	121	8.2%	14	8.7%	11.6%
0.61-0.70	114	7.7%	24	14.9%	21.1%
0.71-0.80	84	5.7%	14	8.7%	16.7%
0.81-0.90	82	5.5%	16	9.9%	19.5%
0.91-1.00	65	4.4%	16	9.9%	24.6%
Totals:	1481		161		10.9%

Targeted Outreach

- FAFSA completion

- Visit promotion

- Programmatic push

- Phone/email prioritization

- Regional communication

Enrollment Likelihood	Probability of Enrollment
0.91 - 1.00	68.1%
0.81 - 0.90	47.8%
0.71 - 0.80	36.1%
0.61 - 0.70	24.9%
0.51 - 0.60	16.8%
0.41 - 0.50	11.3%
0.31 - 0.40	7.5%
0.21 - 0.30	4.5%
0.11 - 0.20	2.3%
0.01 - 0.10	0.9%
	23.1%

Faculty Communication

Faculty wake up thinking about how to best educate students. Enrollment managers wake up thinking about how best to enroll a class. Both are critically important.

Using a model score allows the ability to prioritize faculty outreach by identifying students whose characteristics most resemble those students that have previously enrolled.

Faculty enjoy participating in the recruitment process. Ensuring you provide strong prospects will keep them coming back next time.

RNL

Thank you!

Please reach for further discussion.

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