How Machine Learning Will Change Graduate Admissions

Exploring the opportunities and risks of data-driven enrollment
Panelists

*How Machine Learning Will Change Graduate Admissions*

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FOUNDER AND CEO  
KIRA TALENT
Machine Learning

- In Data Mining, KDD, and Predictive Analytics.
- Algorithms that essentially look for useful patterns in extensive amounts of data.
- Discovered patterns can be used to forecast future events, predict unknown or unseen characteristics, indicate a good course of action.
- Supervised learning: Learning from labeled data; building a predictive model from a training dataset.
- Unsupervised learning: Learning from unlabeled data; finding useful patterns in sample dataset that could be used as predictive models.
- Reinforcement learning: Learning from trial-and-error; a reward function adjusts a predictive model for good and poor predictions accordingly.
Biases in Machine Learning

- “Amazon Reportedly Killed an AI Recruitment System Because It Couldn't Stop the Tool from Discriminating Against Women” – Fortune Magazine
- “Twitter taught Microsoft’s AI chatbot to be a racist jerk in less than a day” – The Verge

Biases can occur in many ways in machine learning; from the data; from the way the digital world represents the real world; from the way the data is presented to the learning algorithm; from the learning algorithm itself.

- Selection bias; sample bias: garbage-in, garbage-out
- Order bias; stability bias
- Inductive bias
“With great power comes great responsibility”

- Leave it to the experts
- Be vigilant of the data
- Continually validate models
- Be on the lookout for concept shift
Georgia State: Two Examples of Machine Learning
Early Identification System: Identifying High-Potential Students from Diverse Backgrounds to Support in Pathways toward Humanities PhDs
Purpose of the Early Identification System

Comprehensive approach to inviting students into CASA programming, using quantitative and qualitative platforms for identification and tracking.

**Step 1:** Descriptive Statistics on Professional Alumni from Georgia State

**Step 2:** Qualitative Description of Success Predictors by Alumni and Faculty

**Step 3:** **Machine Learning to Identify Factors that Predict Progressions**

**Step 4:** Faculty- and Student-Nomination Platforms, with Faculty Development

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Professional Alumni Profiles  
Experiential Factors

High Academic Performers  
High Potential Talent

Faculty and Student Nominations  
Faculty Development

JD * MD * PhD  
Pro Workforce
## Quantitative Approach

### Step 3: Logistic Regression to Identify Factors that Predict Progressions

- Professional Alumni (n=2,606)
- Counterfactual Sample matched on GPA (n=5,300)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pro Alumni</th>
<th>Matched</th>
<th>Test Statistic</th>
<th>p value</th>
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<tr>
<td>Avg Course Load</td>
<td>13.60*</td>
<td>13.14*</td>
<td>9.03</td>
<td>&lt;0.001</td>
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<tr>
<td>Honors College</td>
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<td>5.86</td>
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<td>0.03</td>
<td>4.21</td>
<td>&lt;0.001</td>
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<td>Pell Eligible</td>
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<td>0.53</td>
<td>2.97</td>
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<td>Study Abroad</td>
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<td>0.07</td>
<td>-0.60</td>
<td>0.540</td>
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</table>
### Machine Learning Algorithms

<table>
<thead>
<tr>
<th>Model</th>
<th>Accuracy</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Precision</th>
<th>F1 Score</th>
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<tbody>
<tr>
<td>Decision Trees</td>
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<td>0.52</td>
<td>0.81</td>
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<tr>
<td>Bagging Trees</td>
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<td>0.53</td>
<td>0.90</td>
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<tr>
<td>Random Forest</td>
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<td>0.55</td>
<td>0.92</td>
<td>0.78</td>
<td>0.64</td>
</tr>
</tbody>
</table>

Important Predictors: First4_GPA; Field_BIOS; Last4_GPA; First4_Load; AVGLOAD; HOPE_NUM; First4_DFW; Math_NUM; Major_DEG1_POL
Data Science Informs Entire Campaign Strategy

Unlock the Power of Your School’s Specific Consumer Data

**Historical Student Data**
- Student and applicant records
- SIS and CRM data sources
- FERPA-compliant storage, use, and data exchange

**EAB Data Science**
Specialized higher education data scientists formulate an in-depth understanding of your unique consumer base

**National Consumer Database**
- 200+ million U.S. consumers
- Up to 115 variables per consumer

**Develop Affinity Models**
Append your historical student data with known consumer variables from our database

**Generate Audience List**
Identify and locate your highest-affinity prospects for targeted campaign outreach

**Construct Student Marketing Personas**
Isolate the consumer variables that best characterize your high-affinity prospects

**Leverage Data Insights**
Use affinity-modeling insights to inform your campaign strategies throughout the funnel
Student Profiles

Health Science

NOTABLE TRENDS

Experience Seekers
*Travel*, *Travel Vacation*, and *Food* suggest an audience that is cultured, but also values time to explore and disconnect.

Bookworms with a Cause
“Avid readers,” “Contributors,” and “Politically” suggest that this audience is interested in staying informed and contributing their time and effort for the things they are passionate about.

Millennial Parent
“As part of the young millennial generation, this audience values flexibility and balance. “Arts and Crafts” and “Children’s interests” are common interests of parents.

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Hobbyists
“Hobbyist,” and “Contributors” signal outcomes-focused prospects who are passionate about charitable causes they are involved in.

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Fitness Gurus
Caring a great deal about a healthy and active lifestyle, this audience likely seeks community in exercise and sports. They are also likely competitive and goal-oriented.

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ESFs
14% OF CURRENT STUDENT BODY

ISFs
19% OF CURRENT STUDENT BODY

ISTJs
14% OF CURRENT STUDENT BODY

ISFs
13% OF CURRENT STUDENT BODY

ISTJs
13% OF CURRENT STUDENT BODY

Robinson

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Commitment to Serving Others Drives Engagement

Health Science

**Top Performing Ads**
Average click rate 1.00%

**Lesson Learned:** Audience’s desire to help others resonates.
Commitment to service messaging outperforms career advancement copy.

**Lowest Performing Ad**
Average click rate .46%
# 2018 & 19 Affinity Marketing Results

## 2018 or 19 Entry Year

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<th>Applications</th>
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<th>Deposit</th>
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<tr>
<td>Health Science Digital + Email</td>
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<td>Data Sciences All Channels</td>
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<tr>
<td>Business All Channels</td>
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<td><strong>124</strong></td>
<td><strong>49</strong></td>
<td><strong>39</strong></td>
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