

#CGS58

How Machine Learning Will Change Graduate Admissions

Exploring the opportunities and risks of data-driven enrollment



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Panelists

How Machine Learning Will Change Graduate Admissions



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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.



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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



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“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



The Center for the Advancement of Students & Alumni (CASA)

Early Identification System: **Identifying High-Potential Students from Diverse Backgrounds to** **Support in Pathways toward Humanities PhDs**

Overview



Purpose of the Early Identification System

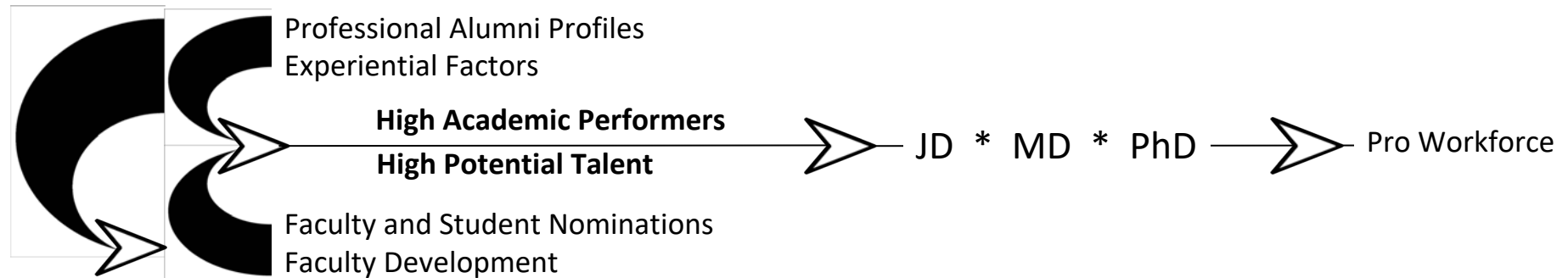
Comprehensive approach to inviting students into CASA programming, using quantitative and qualitative platforms for identification and tracking.

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



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)

Variable	Pro Alumni	Matched	Test Statistic	p value
Avg Course Load	13.60*	13.14*	9.03	<0.001
Honors College	0.18	0.12	7.69	<0.001
Internship	0.20	0.14	7.02	<0.001
Signature Experience Course	0.71	0.64	5.86	<0.001
Work Study	0.05	0.03	4.21	<0.001
Pell Eligible	0.57	0.53	2.97	0.003
Study Abroad	0.08	0.07	-0.60	0.540

Variable	Est Coeff	Marg Eff
Gender	0.350*	0.07*
Pell eligible	0.085	0.02
DFW_2	3.132*	0.02*
Signature Exp	0.183*	0.04*
Honors College	0.500*	0.11*
Work Study	0.332*	0.07*
Study Abroad	-0.187	-0.04
Internship	0.353*	0.07*
Average Load	0.115*	0.02*

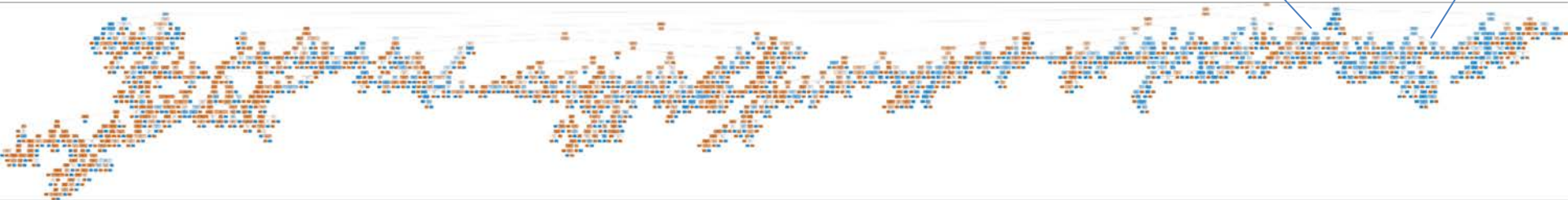
Quantitative Approach



Machine Learning Algorithms

Model	Accuracy	Sensitivity	Specificity	Precision	F1 Score
Decision Trees	0.72	0.52	0.81	0.57	0.54
Bagging Trees	0.78	0.53	0.90	0.73	0.61
Random Forest	0.80	0.55	0.92	0.78	0.64

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



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 "Contributes 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.

ESTJs

14%

OF CURRENT STUDENT BODY

The "Defender Personality" are true altruists, meeting kindness with kindness-in-excess. Prefer to be rewarded by seeing first-hand the positive impact of their efforts.

ISFJs

13%

OF CURRENT STUDENT BODY

The "Executive Personality" loves tradition and order, utilizing their understanding of what is right, wrong, and socially acceptable to bring people together. Valued for clear advice and guidance.

Data Science

NOTABLE TRENDS



Experience Seekers

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



Hobbyists

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



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.

ISFJs

19%

OF CURRENT STUDENT BODY

The "Defender Personality" are true altruists, meeting kindness with kindness-in-excess. Prefer to be rewarded by seeing first-hand the positive impact of their efforts.

ISTJs

14%

OF CURRENT STUDENT BODY

The "Executive Personality" loves tradition and order, utilizing their understanding of what is right, wrong, and socially acceptable to bring people together. Valued for clear advice and guidance.

Robinson

NOTABLE TRENDS



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.



Parents

"Children Interests" but also "Arts and Crafts" are often popular with parents. And the age of these students indicates a millennial parent population looking for flexibility and work-life-balance



Hobbyists

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

ISFJs

17%

OF CURRENT STUDENT BODY

The "Defender Personality" are true altruists, meeting kindness with kindness-in-excess. Prefer to be rewarded by seeing first-hand the positive impact of their efforts.

ESFJs

13%

OF CURRENT STUDENT BODY


The "Executive Personality" loves tradition and order, utilizing their understanding of what is right, wrong, and socially acceptable to bring people together. Valued for clear advice and guidance.

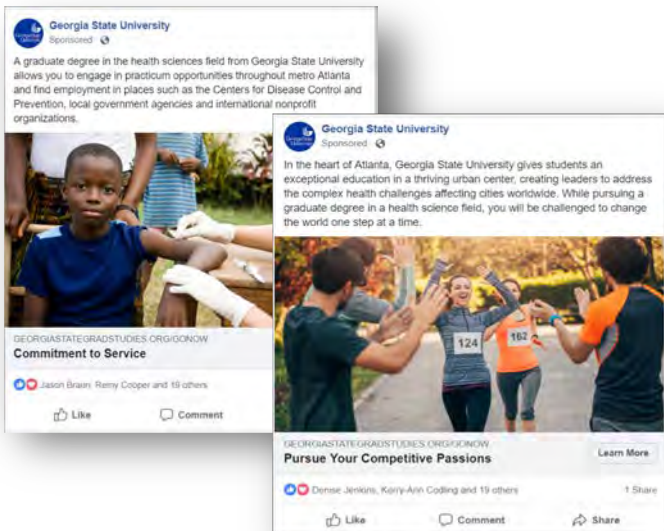


Commitment to Serving Others Drives Engagement



Health Science

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



Georgia State University
Sponsored

A graduate degree in the health sciences field from Georgia State University allows you to engage in practicum opportunities throughout metro Atlanta and find employment in places such as the Centers for Disease Control and Prevention, local government agencies and international nonprofit organizations.

Georgia State University
Sponsored

In the heart of Atlanta, Georgia State University gives students an exceptional education in a thriving urban center, creating leaders to address the complex health challenges affecting cities worldwide. While pursuing a graduate degree in a health science field, you will be challenged to change the world one step at a time.

Georgia State University
Sponsored

Build a better you. Earning a graduate degree in the health sciences from Georgia State University prepares you for a lifetime of self-fulfillment in a variety of ever-growing industries. We provide an outstanding graduate education and exceptional support for students from all backgrounds. Taking the next step to advance your career can begin today!

 **Lowest Performing Ad**
Average click rate .46%



Georgia State University
Sponsored

Build a better you. Earning a graduate degree in the health sciences from Georgia State University prepares you for a lifetime of self-fulfillment in a variety of ever-growing industries. We provide an outstanding graduate education and exceptional support for students from all backgrounds. Taking the next step to advance your career can begin today!

Health Sciences Graduate Degrees

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




2018 & 19 Affinity Marketing Results



2018 or 19 Entry Year

 **124**
Applications
Submitted Total

 **49**
Acceptances Total

 **39**
Deposit Total

 **29**
Enrollment Total

Source	Applications	Admits	Deposit	Enrollment
Health Science Display Only	14	5	5	5
Health Science Digital + Email	54	18	15	9
Data Sciences All Channels	21	8	5	3
Business All Channels	35	18	14	12
Total	124	49	39	29



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