

BADGES + BIG DATA

AN ANALYSIS OF THE SMMC DIGITAL BADGES PROGRAM

05/07/2020

THE DATA ANALYSTS



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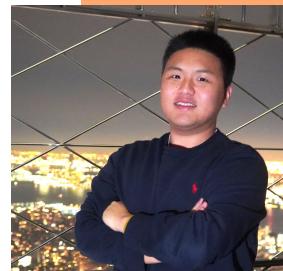
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Junior, Mathematics

SMMC

"The Student Money Management Center, a division of University Bursar, empowers students to make positive behavioral changes associated with their finances by providing financial education to students, parents, employees, and alumni for all universities in the University of Illinois System - Urbana, Chicago, and Springfield."

- (Student Money Management Center, 2020)



DIGITAL BADGES



The Student Money Management Center developed and maintains a digital badges program through the Moodle Learning Management System for all students in the University of Illinois System. Its goal is to improve financial skills and knowledge of the 5 core competencies in alignment with the financial capability standards laid out by the Department of Treasury: Borrow, Earn, Protect, Save, and Spend. Participants get recognition for enhancing their financial knowledge and skills by earning digital badges for different categories. A digital badge is earned by completing 3 activities.

PROJECT GOALS



Participate in the Badges Program to understand the program better and provide feedback on the content and organization of the modules



Identify key differences in participant demographics that may impact participation and need for financial literacy



Analyze the breakdown of participation in different modules and identify badges with the highest engagement over time



Create 3 predictive models to provide insight on important factors that impact participation in the badges program



Suggest meaningful ways to reach populations with a higher need for financial literacy



Outline

1

User Experience Analysis

Overview of Borrow Badge
Analysis of Feedback Surveys

2

Descriptive Analysis

Demographics & College Info of Participants
Breakdown of Participation by Module

3

Predictive Analysis

Analysis of Significant Variables from Models
Drawing Insight from Significant Variables

SECTION 1

USER EXPERIENCE ANALYSIS

FEEDBACK SURVEY ANALYSIS ON
ORGANIZATION AND USEFULNESS



BORROW

Comprises the majority of feedback surveys, enrollees, participants, and page views

contains information on credit-based products and objectives such as

- how to establish and maintain a good credit score
- tips and cautions on looking for financial aids
- organizing student loans to avoid overwhelming loan debt
- ways to reduce debt.



EARN

4 responses (avg = "Agree")



PROTECT

0 responses



SAVE

1 response (avg = "Agree")

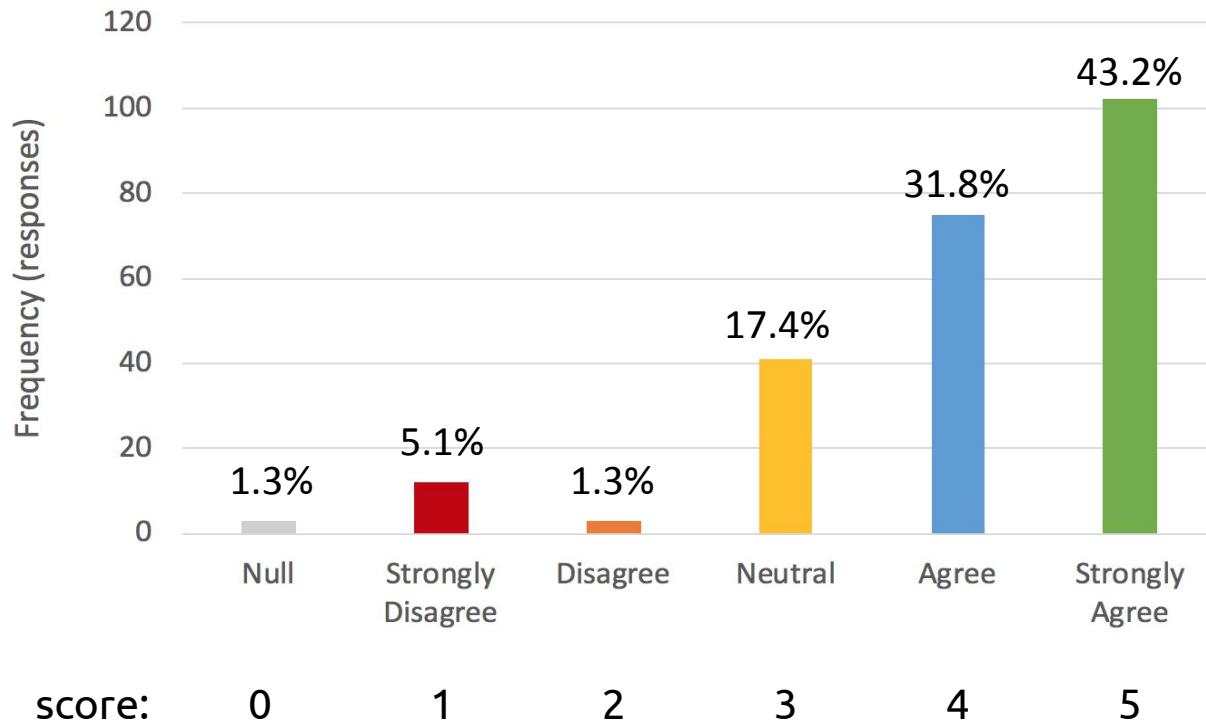


SPEND

1 response (avg = "Strongly Agree")

118 surveys
236 questions

Overall Borrow Badge Responses



avg. "organized"
"Agree" (4.0)

avg. "useful"
"Agree" (4.1)

avg. overall
"Agree" (4.0)

SECTION 1 TAKEAWAYS

1. The borrow badge accounts for the majority of enrollee engagement and participation out of all 5 badges.
2. Feedback surveys show that $\frac{3}{4}$ of students “Agree” that the content is useful and the modules are organized.

SECTION 2

DESCRIPTIVE ANALYSIS

BREAKDOWN OF PARTICIPATION DISTRIBUTION
BY MODULE AND BY INSTITUTION

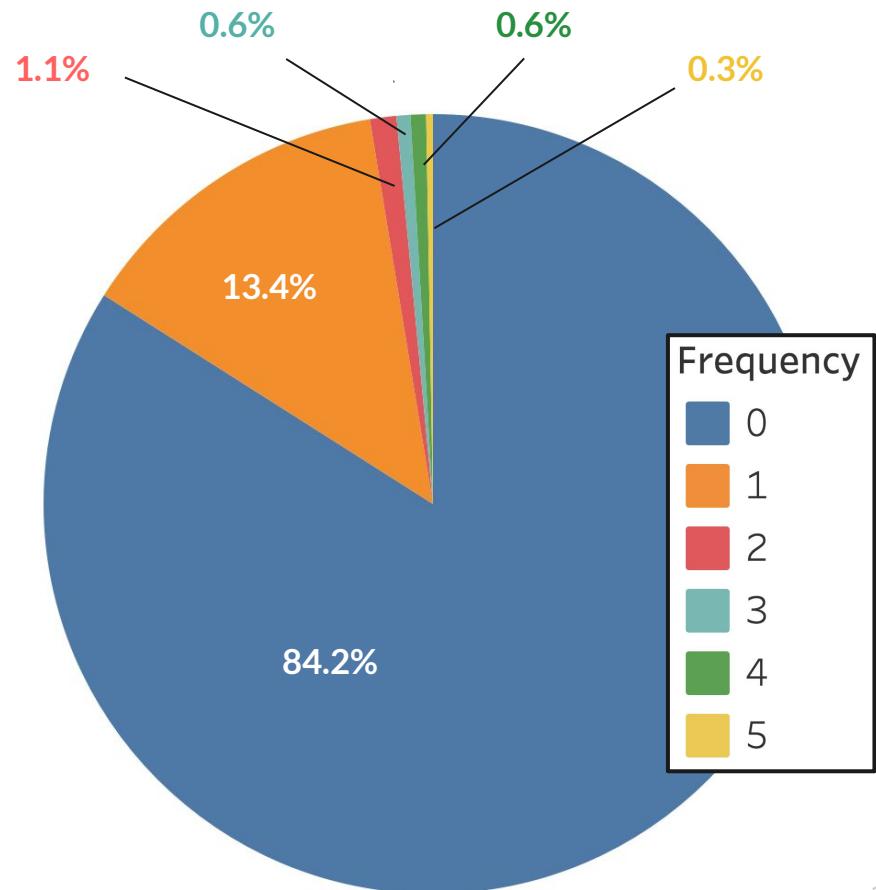
NUMBER OF QUIZZES PER PARTICIPANT

REMINDERS:

1. students enrolled in the program are not required to participate in quizzes
2. completing 3 quizzes will result in earning a digital badge

18,150 enrollees in the Borrow Badge

3,854 unique participants in Badges Quizzes



Participants are 6x more likely to only participate in 1 activity.

AT LEAST 1 ACTIVITY: **16%**



$$\frac{2,953}{18,353}$$

MORE THAN 1 ACTIVITY: **3%**



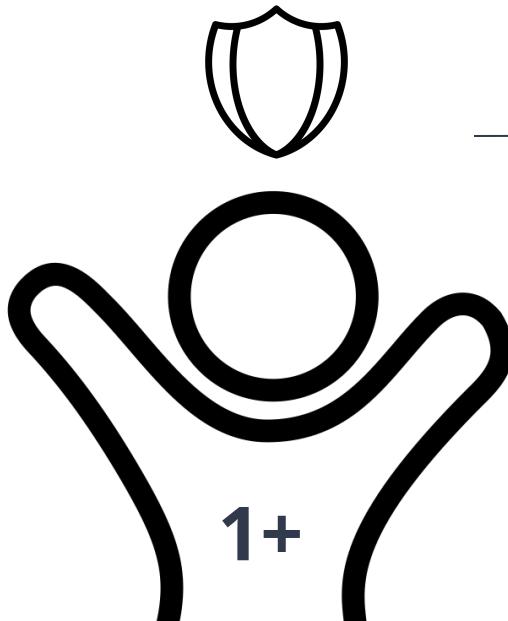
$$\frac{493}{18,353}$$



Participants that take more than 1 quiz are 6x more likely to earn a badge.

EARN BADGE GIVEN
AT LEAST 1 ACTIVITY:

$$10\% \downarrow \\ \frac{286}{2,953}$$

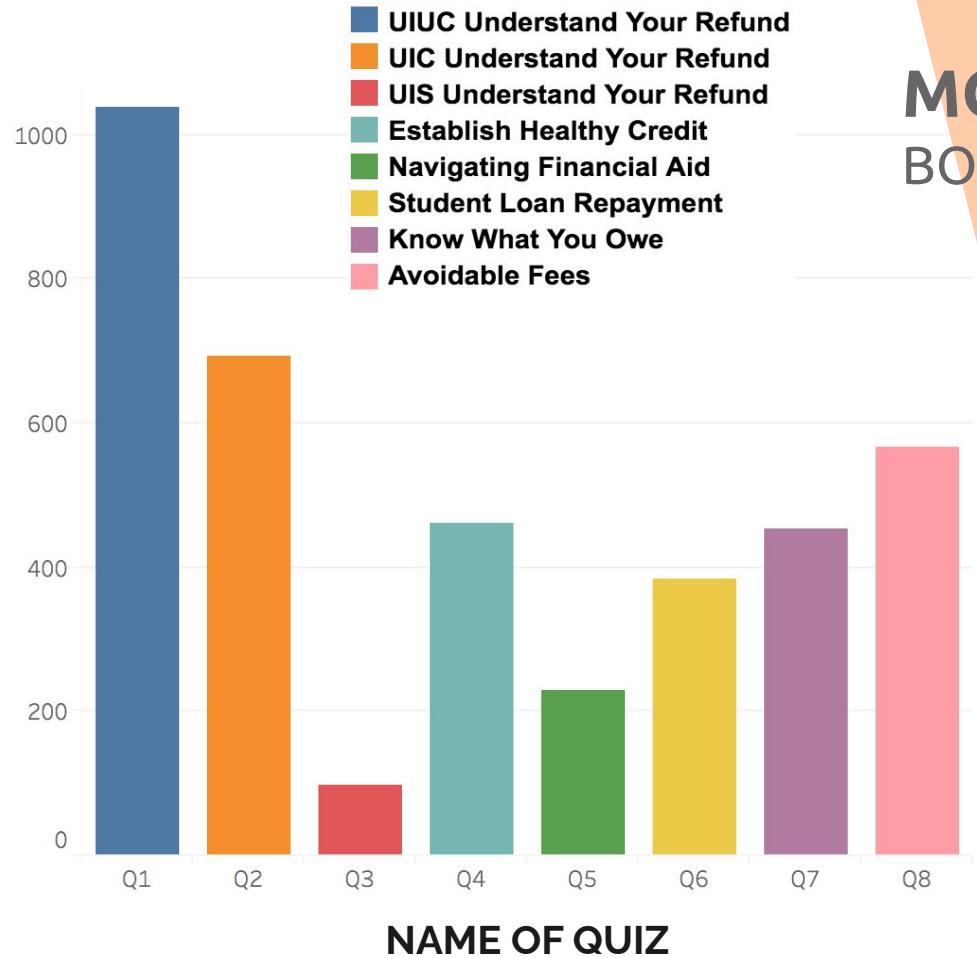


EARN BADGE GIVEN
MORE THAN 1 ACTIVITY:

$$58\% \downarrow \\ \frac{286}{493}$$



COMPLETED QUIZZES



MOST POPULAR MODULES BORROW BADGE

Of the 3,854 Borrow Badge participants...

MOST POPULAR

Urbana: Understand Your Refund (1,037)

LEAST POPULAR

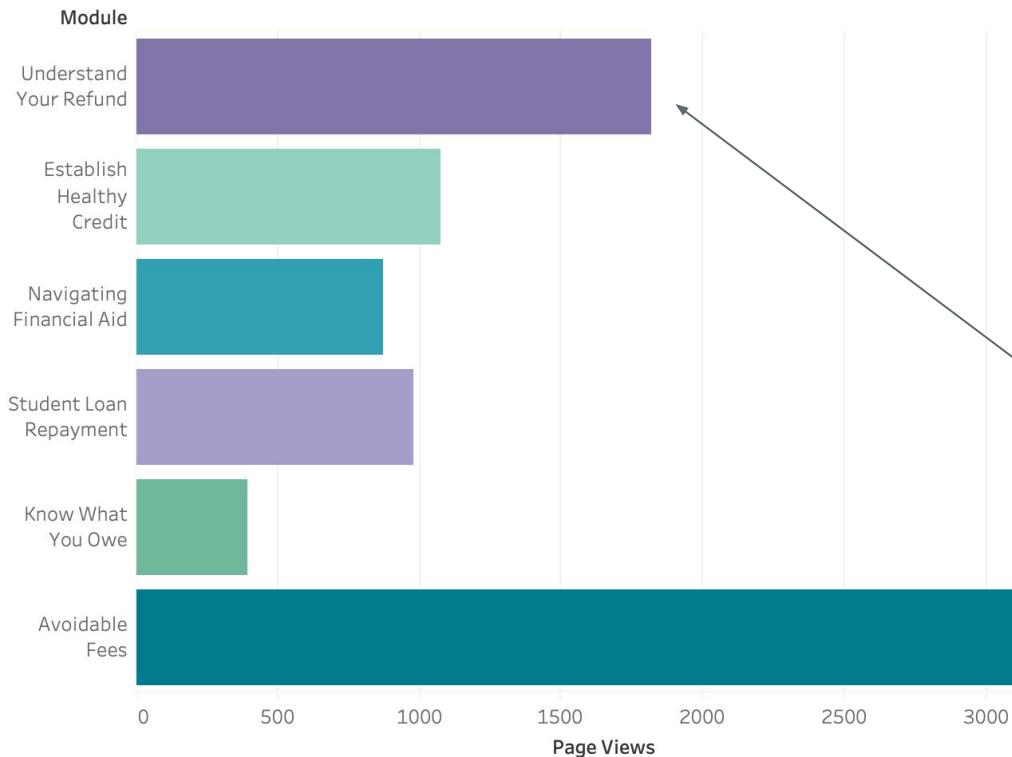
Springfield: Understand Your Refund (99)

note: take into account school population

MOST POPULAR PAGE VIEW

FOR BORROW BADGE

Views by Module



Total Views: 8,292

Most Popular Modules:
Avoidable Fees
(3,149 views)

Understand Your Refund
(1,818 views)

Even through Understand Your Refund had the highest participation, Avoidable Fees had the highest page view engagement.

MOST POPULAR MONTH

FOR BORROW BADGE PARTICIPATION

3,854 completed Badges Quizzes

MOST POPULAR: FALL SEMESTER

September: Understand Your Refund

October: Avoidable Fees

November-January: Know What You Owe

*note: campaign availability
less students in summer*

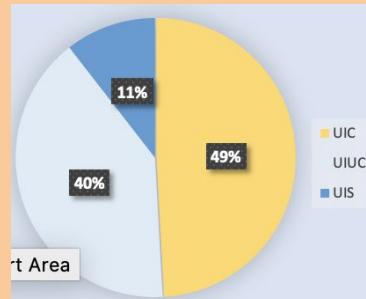
COMPLETED QUIZZES

- UIUC Understand Your Refund
- UIC Understand Your Refund
- UIS Understand Your Refund
- Establish Healthy Credit
- Navigating Financial Aid
- Student Loan Repayment
- Know What You Owe
- Avoidable Fees



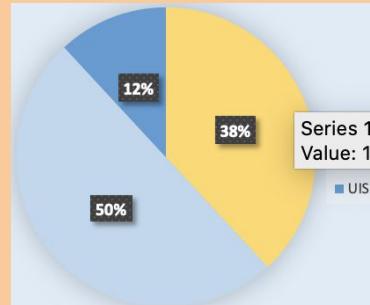
Badges that UIC students are more/less likely to Participate

- 1.) Students from Chicago are more likely to participate in the “Earn” Badge program.



	Parti Amount	Percentage
UIC	28	0.49122807
UIUC	23	0.40350877
UIUC	6	0.10526316

- 2.) Students from Chicago are less likely to participate in the “Save” Badge program.

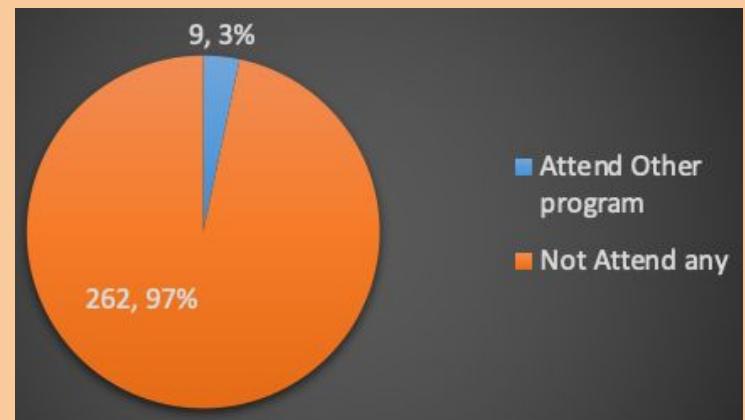
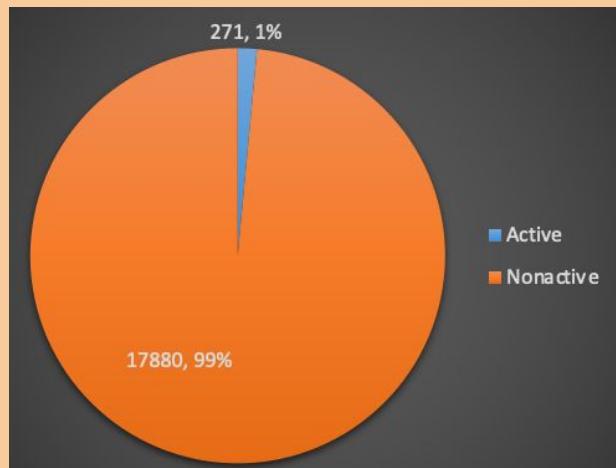


	Parti Amount	Percentage
UIC	16	0.38095238
UIUC	21	0.5
UIS	5	0.11904762

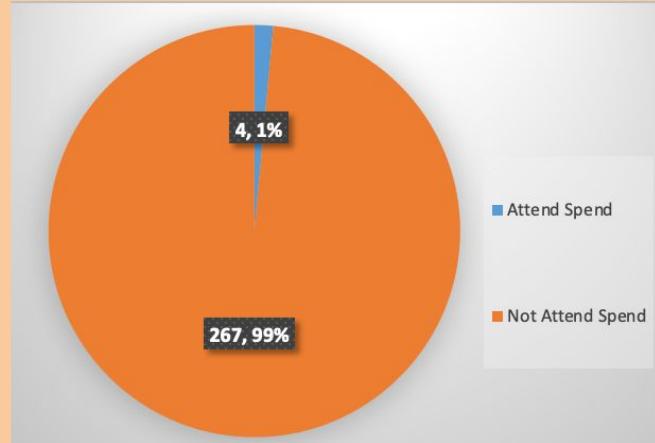
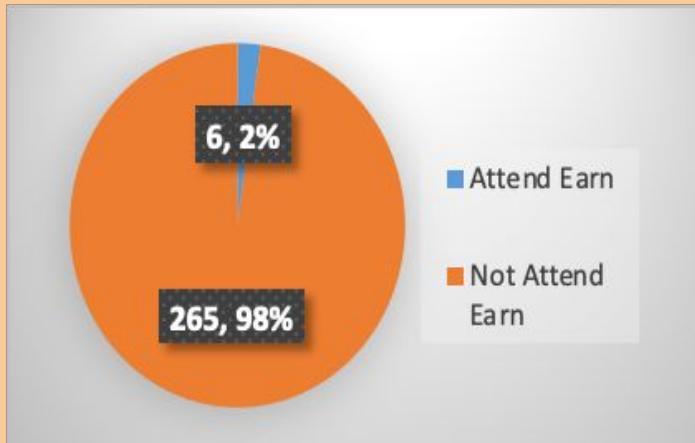
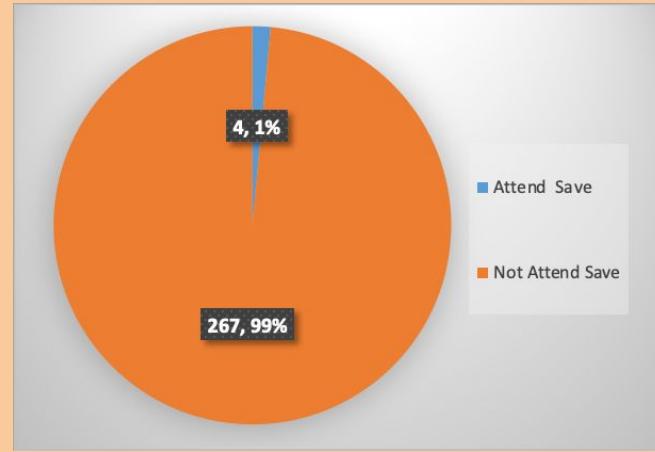
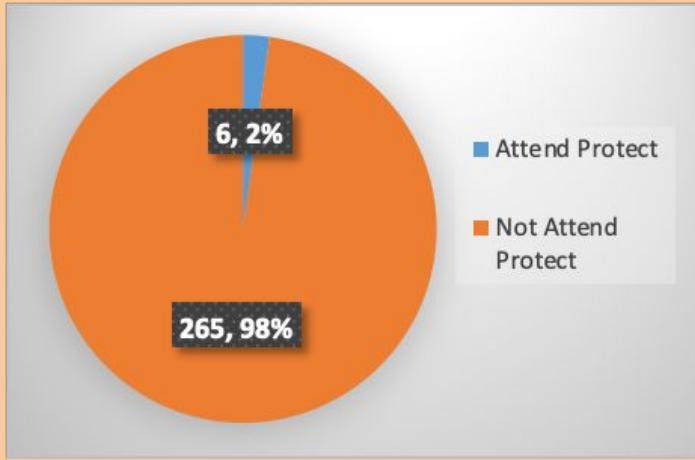
Cross-Participation in Multiple Badges

Active participants: those finish at least 3 activities in the Borrow Badge

Percentage of Active participants in Borrow Badge attending other badges



Likelihood of active borrow badge participants to attend other badges

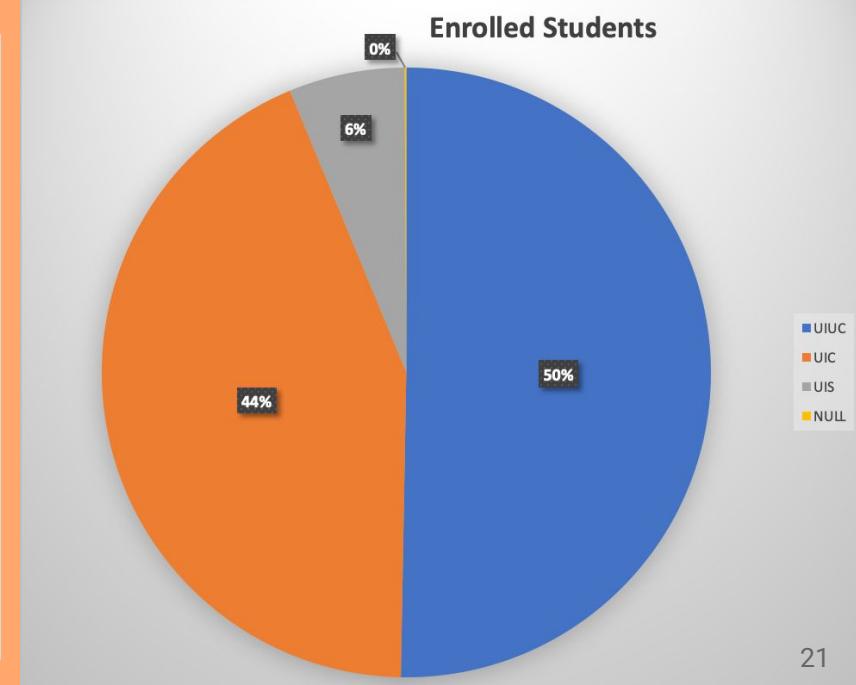
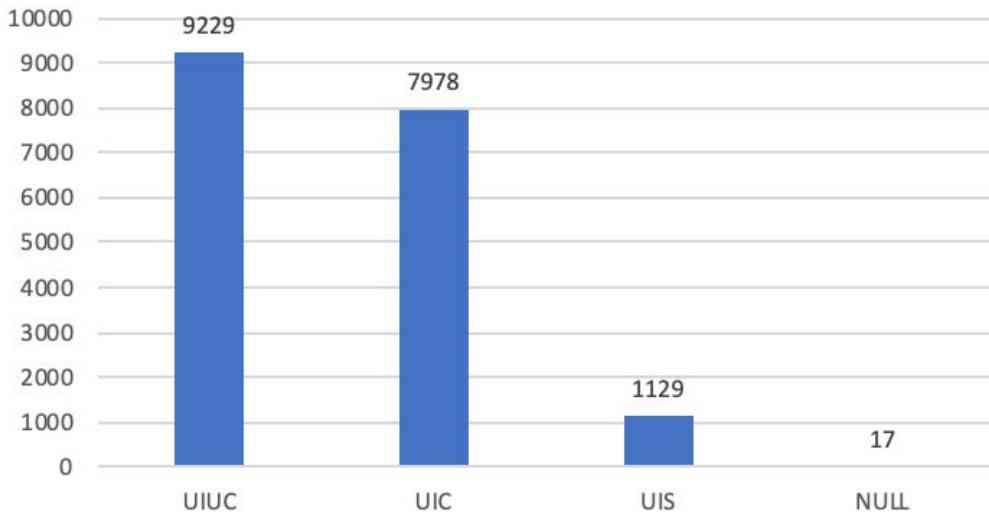


Total Enrollments Banner Data



Total:
18,353

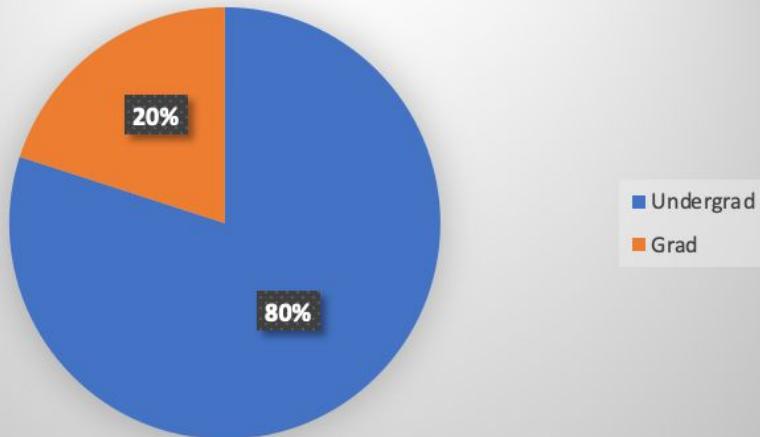
Enrolled Students



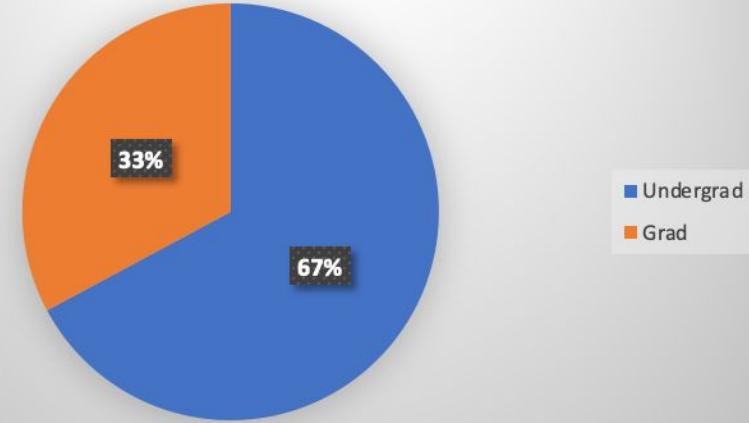
UIUC Enrollments Comparison



UIUC Banner Data



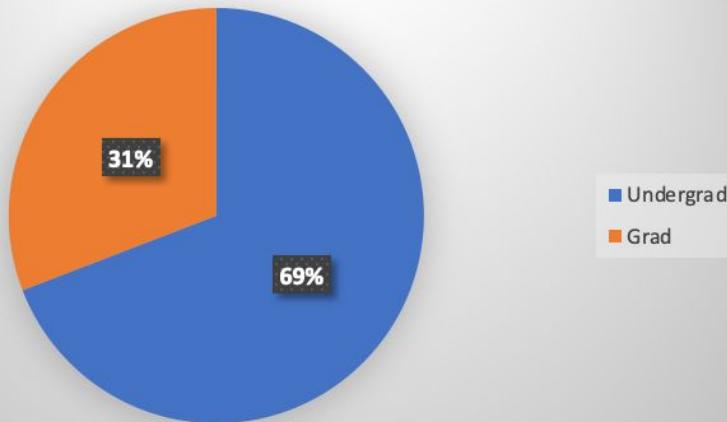
UIUC UIllinois Data



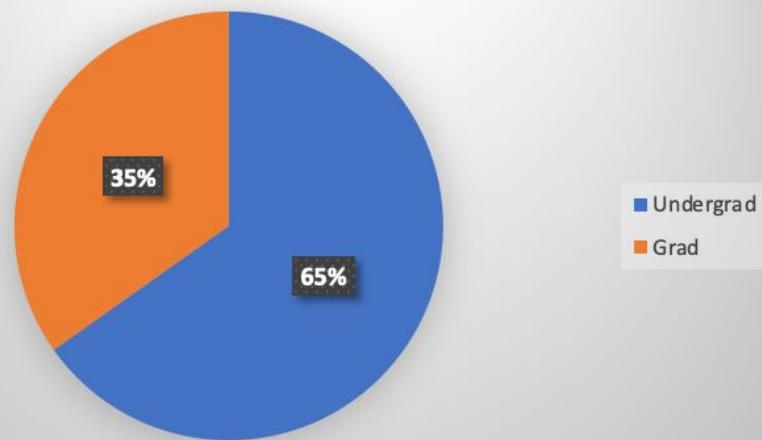
UIC Enrollments Comparison



UIC Banner Data



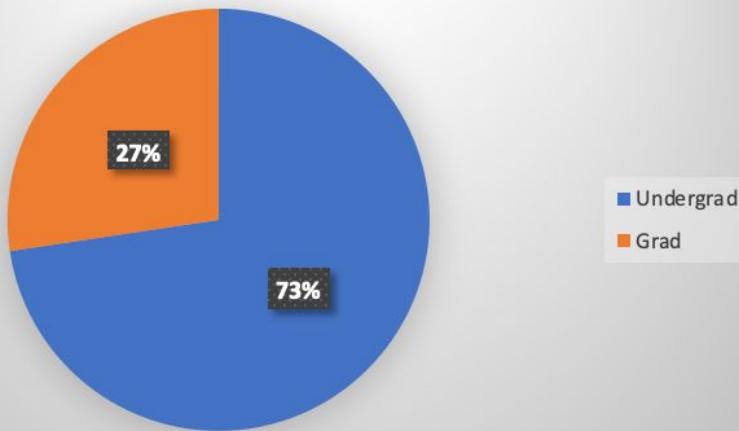
UIC Ullinois Data



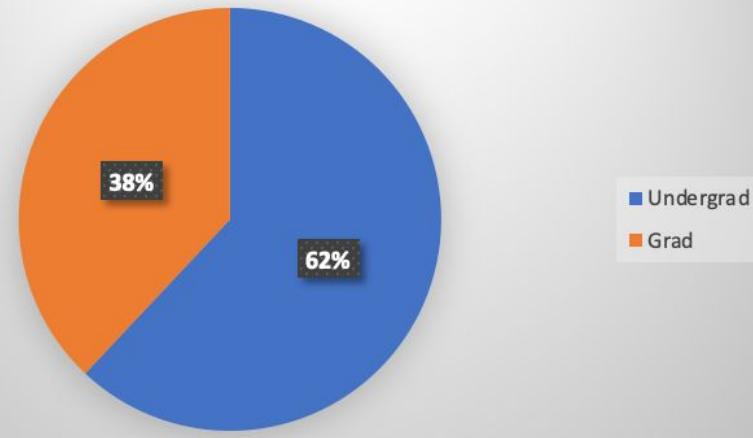
UIS Enrollments Comparison



UIS Banner Data



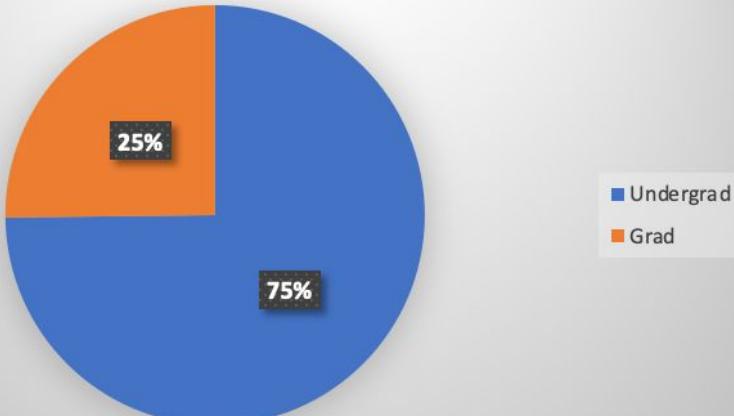
UIS UIllinois Data



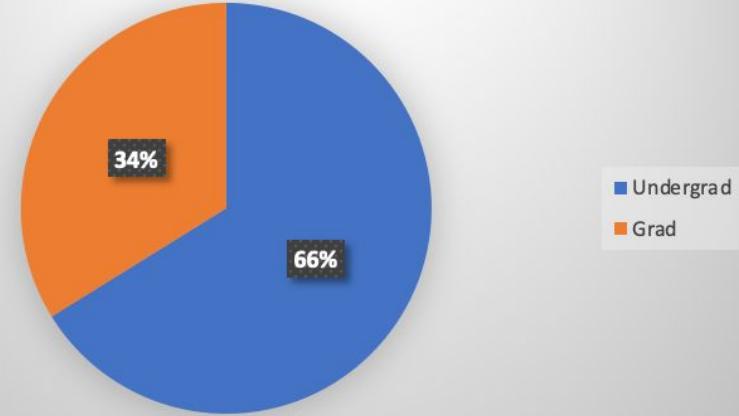
Total Enrollments Comparison



Total Banner Data



Total UIllinois Data



SECTION 2 CONTINUED

DESCRIPTIVE ANALYSIS

**PARTICIPANT DEMOGRAPHICS
AND COLLEGE INFORMATION**

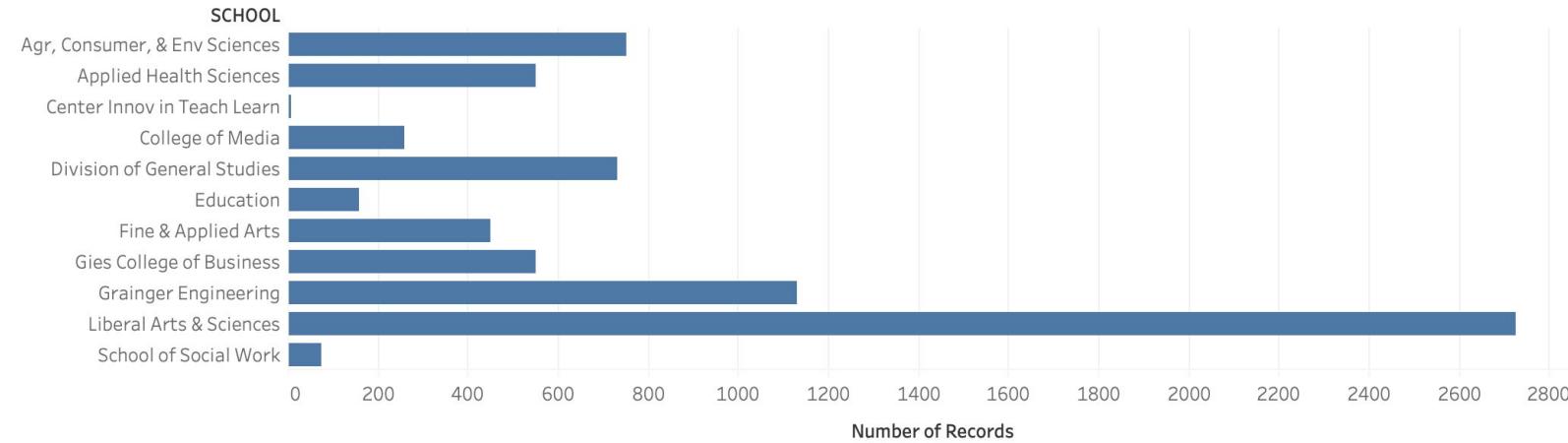
College Information Analysis: By institution, college, and major

n = 16,006



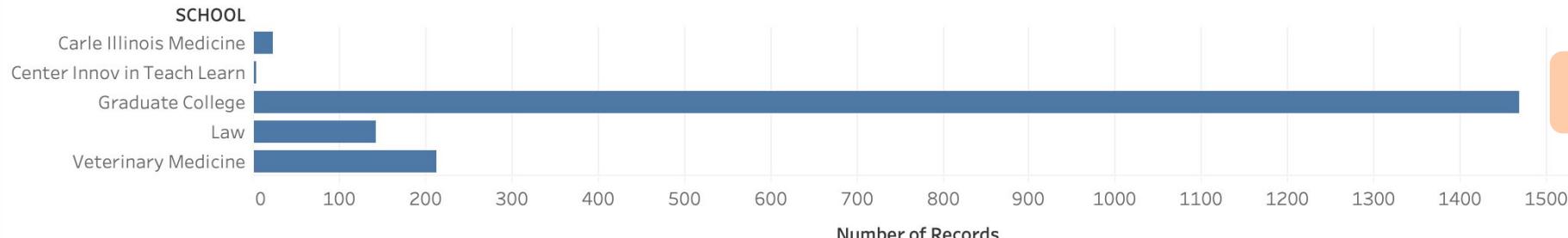
Urbana Undergrad and Grad Majors

UIUC Undergraduate



46.1%

UIUC Masters

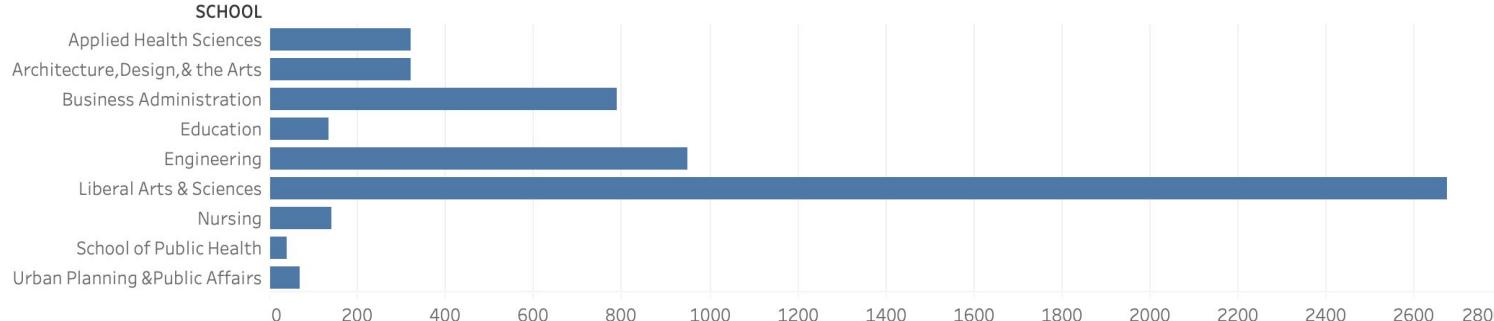


2.4%

Chicago Undergrad and Grad Majors

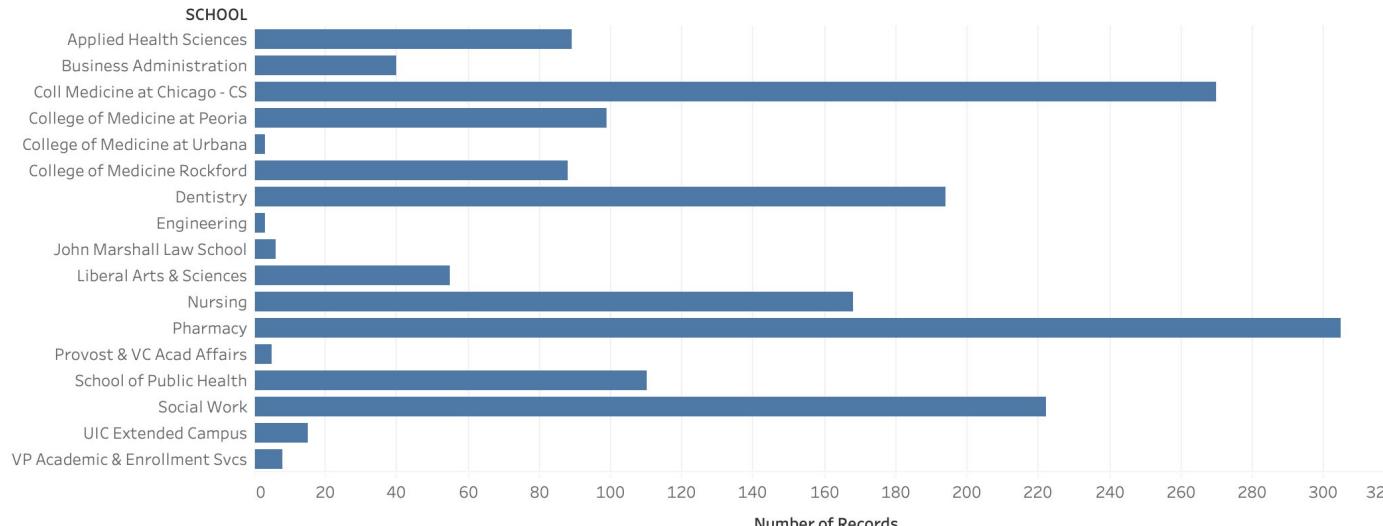


UIC Undergraduate



33.9%

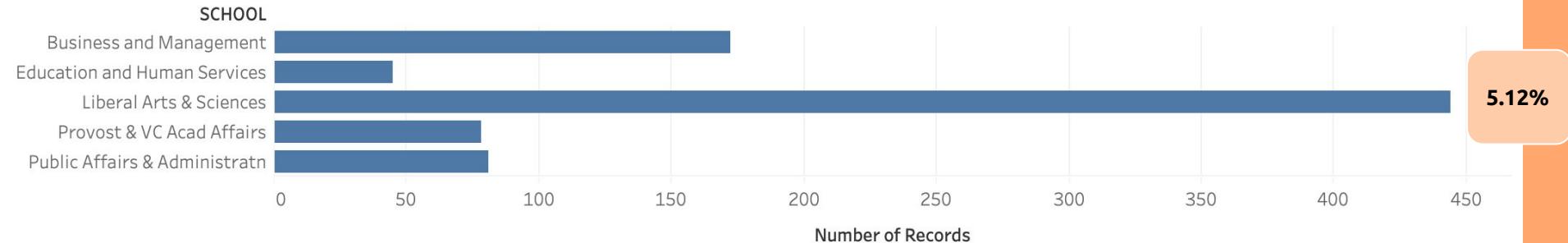
UIC Masters



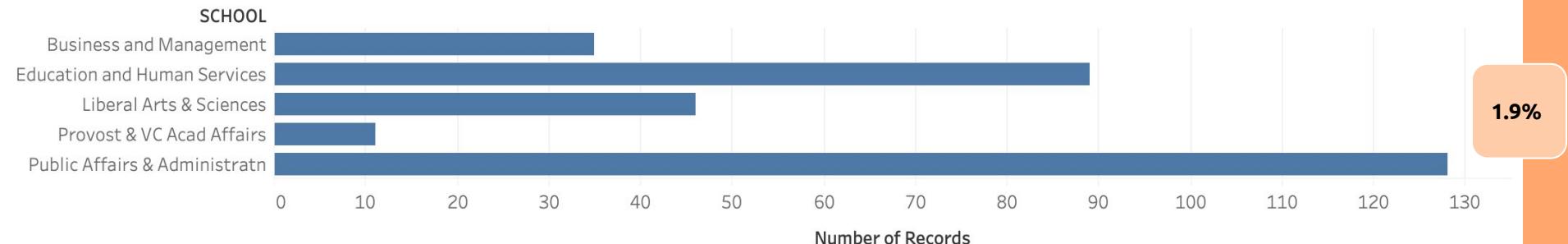
10.5%

Springfield Undergrad and Grad Majors

UIS Undergraduate



UIS Masters





College Information Analysis: By institution, college, and major

- 
1. Majority of the participants are from UIUC
 2. There are more undergraduates in the program than graduates (85.11%)
 3. Most undergraduates come from the schools of Liberal Arts and Sciences, and Engineering

FINANCIAL HOLDS AND CAMPAIGN PARTICIPATION

9R hold is placed for past due amounts of \$25 - \$199.99 - stops release of transcripts.

9H hold is placed for past due amounts of \$200 or more - stops release of transcripts, diploma, and blocks registration.

Financial Hold Impact on Future Participation in "Avoidable Fees"

	QUIZ	NO QUIZ
HOLD	366	5235
NO HOLD	167	12585

X² (df=1, N=18,353)
= 376.7733
p-value < .00001

Students with a hold have a 6.5% participation rate.
Students without a hold have a 1.3% participation rate.

Those with holds are more likely to participate in "Avoidable Fees." This makes sense because they are the students that are targeted to participate in this module.

"Understand Your Refund" Participation Impact on Incurring Future Financial Holds

	QUIZ	NO QUIZ
HOLD	296	5305
NO HOLD	1532	11220

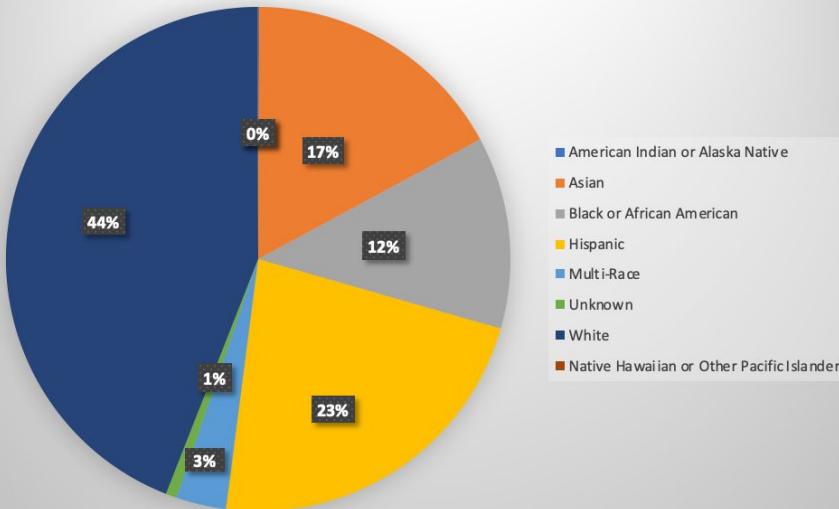
X² (df=1, N=18,353)
= 196.4891
p-value < .00001

Students that participated have a 16.2% proportion with holds.
Students that did not participate have a 32.1% proportion with holds.

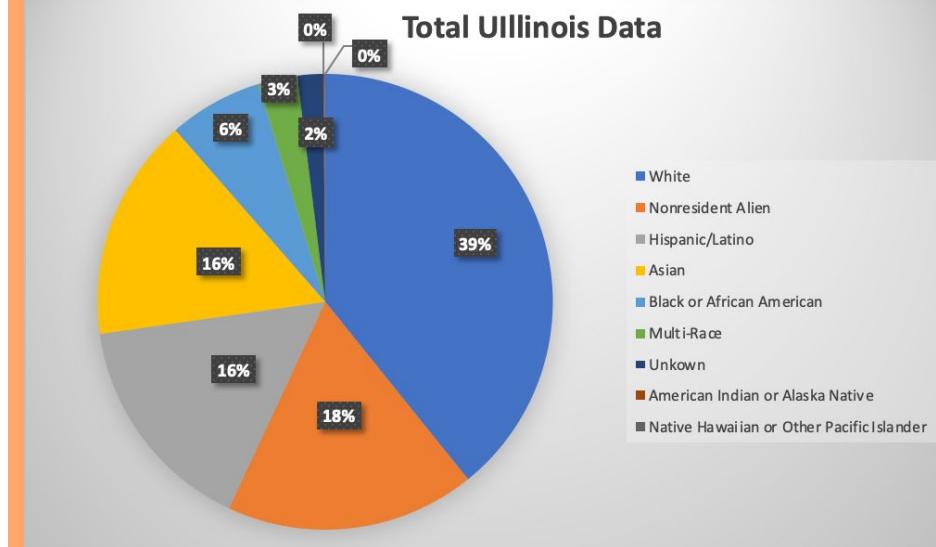
Those who participate in "Understand Your Refund" incur less holds. This makes sense because the module is meant to work as a preventative measure to incur less holds after participation.

Comparing Total Ethnicity with Ullinois Data

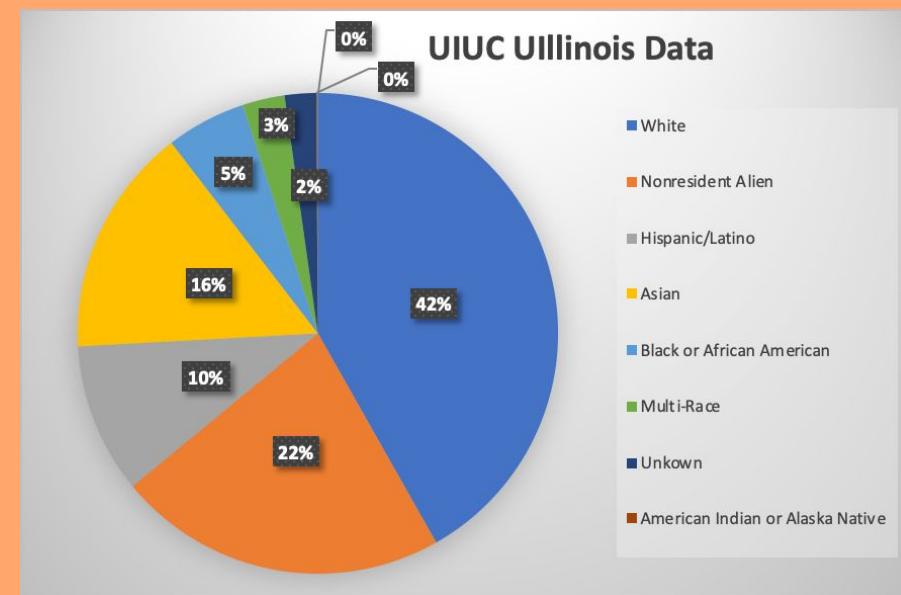
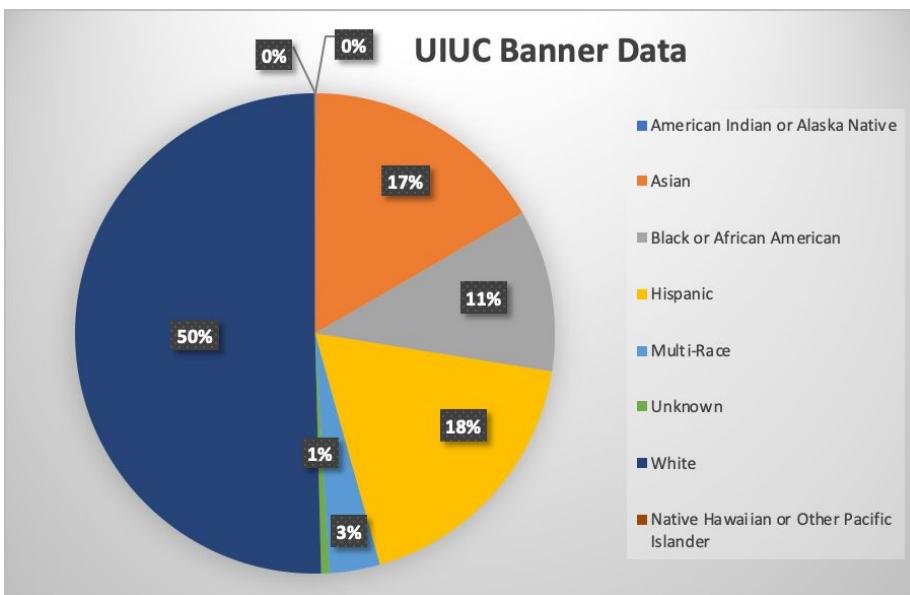
Total Banner Data



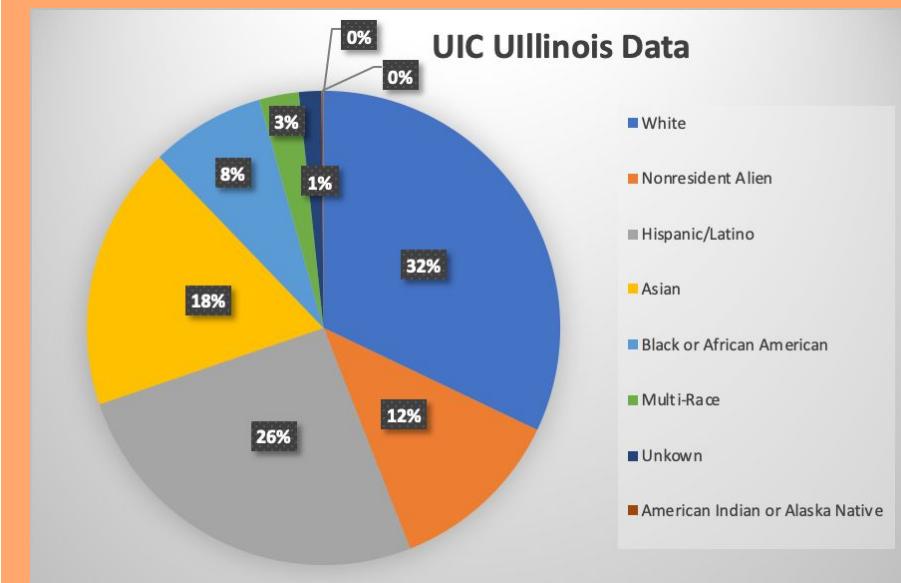
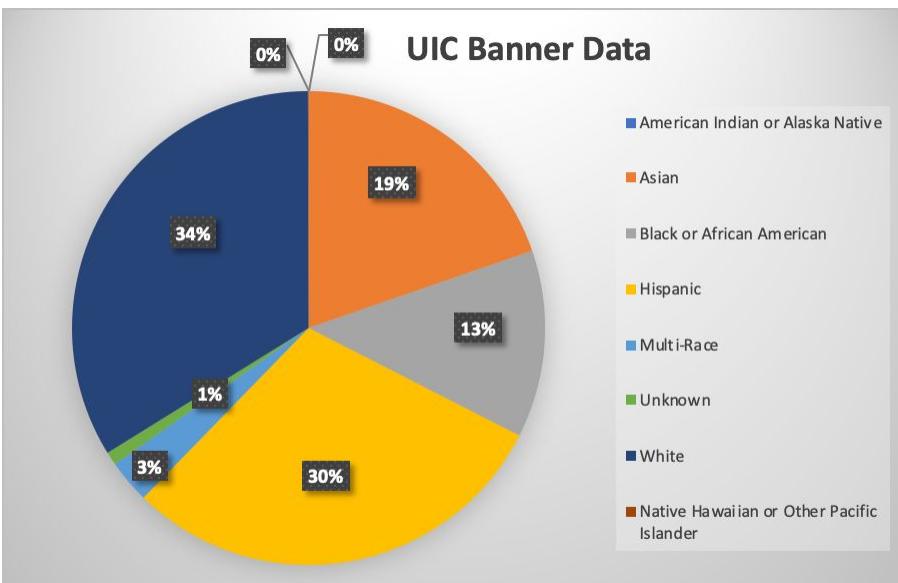
Total Ullinois Data



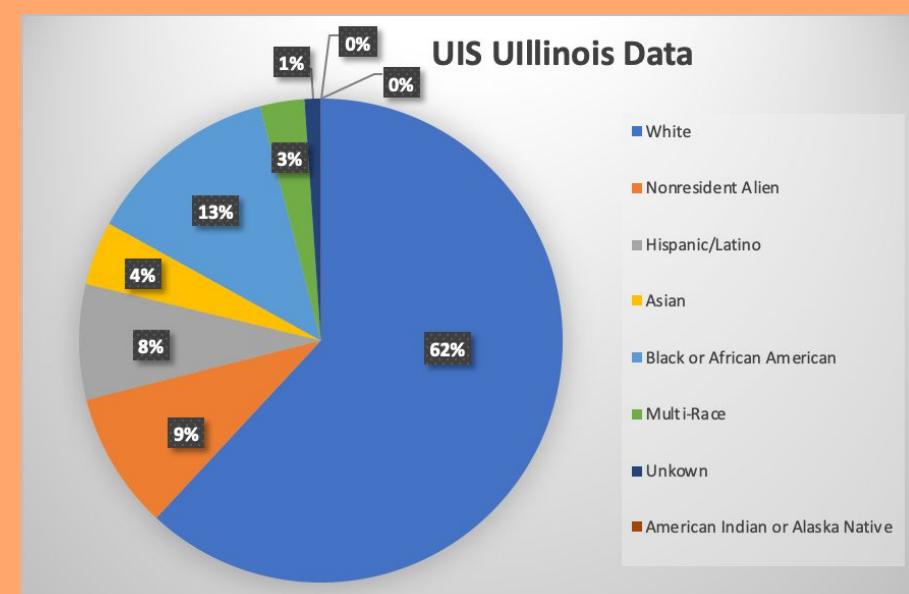
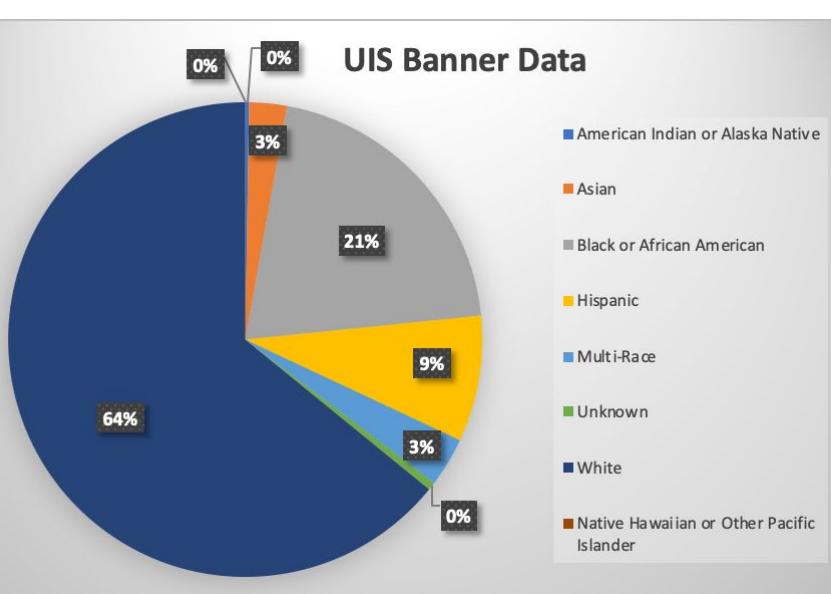
UIUC Ethnicity Comparison



UIC Ethnicity Comparison



UIS Ethnicity Comparison



SECTION 2 TAKEAWAYS

1. Only 13.4% of enrollees choose to participate in quizzes, of which, campaign based modules have the highest participation rates. The campaign availability explains the popular months in the fall semester.
2. Active Borrow badge participants tend to participate in the Protect and Earn program than the other.
3. White ethnicity leading in all three institutions in number of enrollments. Surprised by the numbers of Hispanic ethnicity in all three universities.

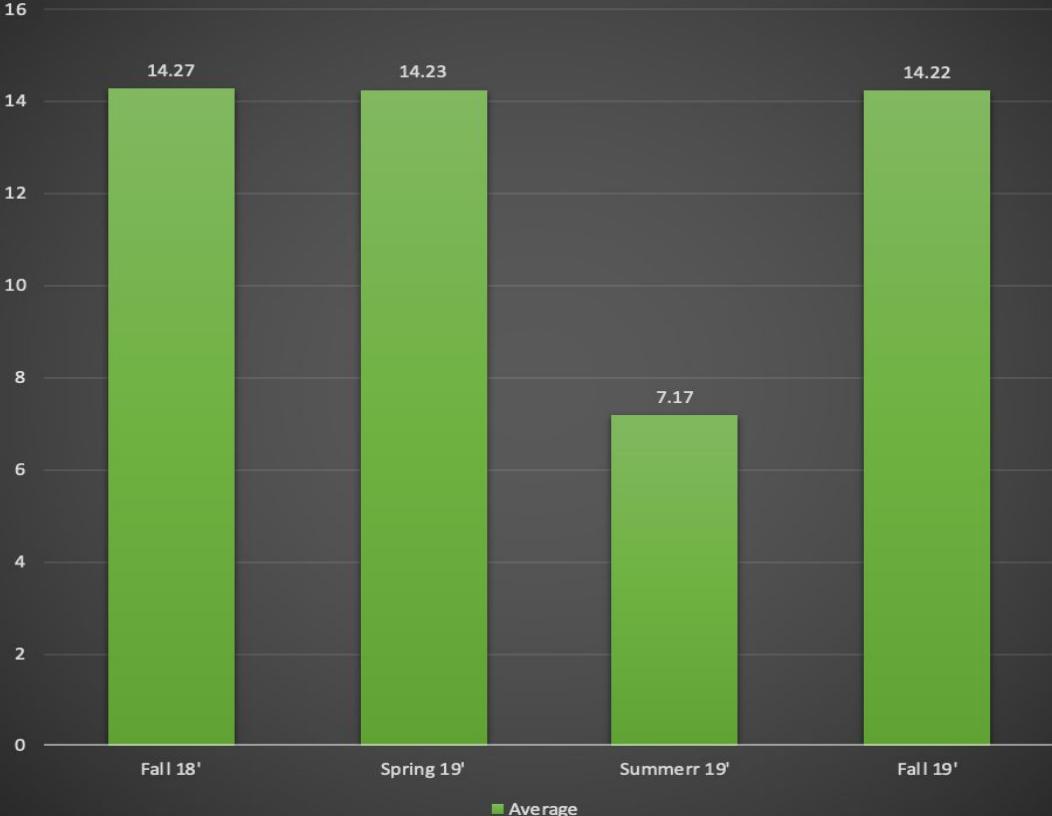
SECTION 3

PREDICTIVE ANALYSIS

IMPACTING FACTORS ON PARTICIPATION
PREDICTIVE MODEL

Total Average Credits taken by Enrolled students

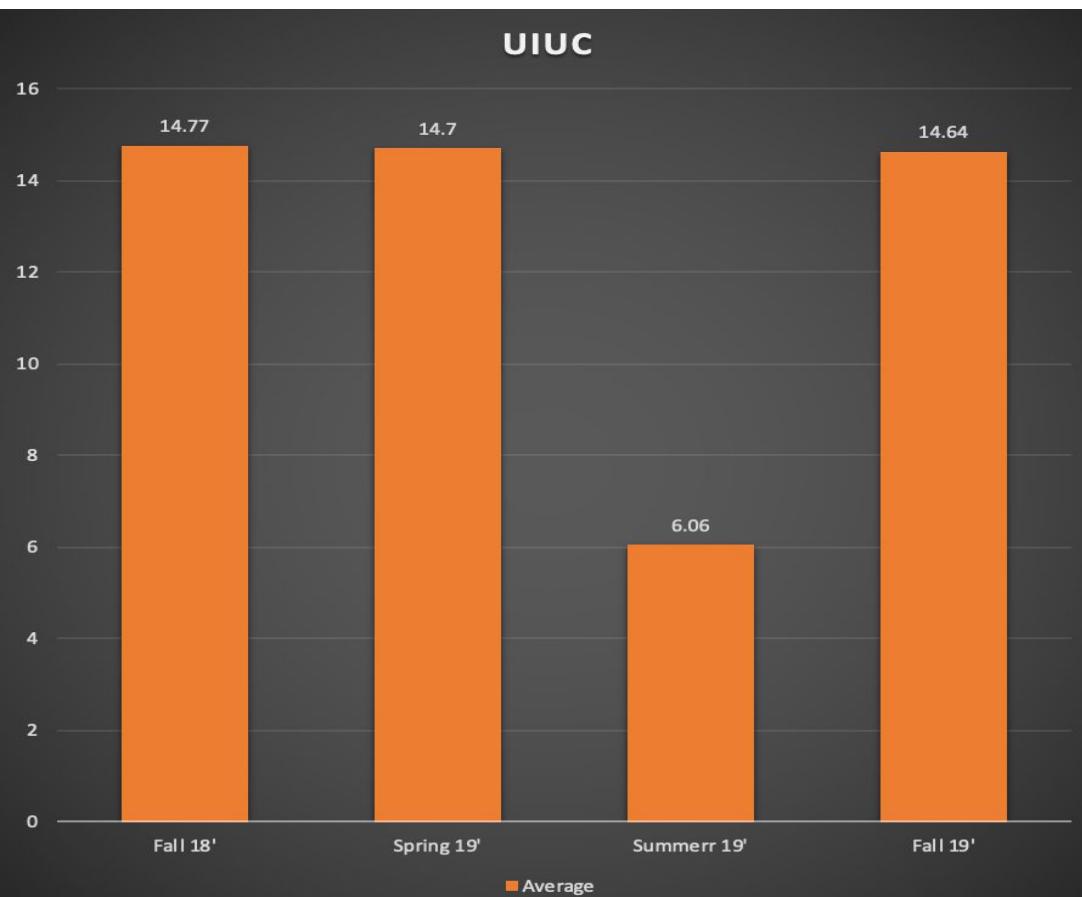
OVERALL



Total number of credits taken by enrolled students:

- Fall 18' = 12,195
- Spring 19' = 12,505
- Summer 19' = 3,494
- Fall 19' = 17,190

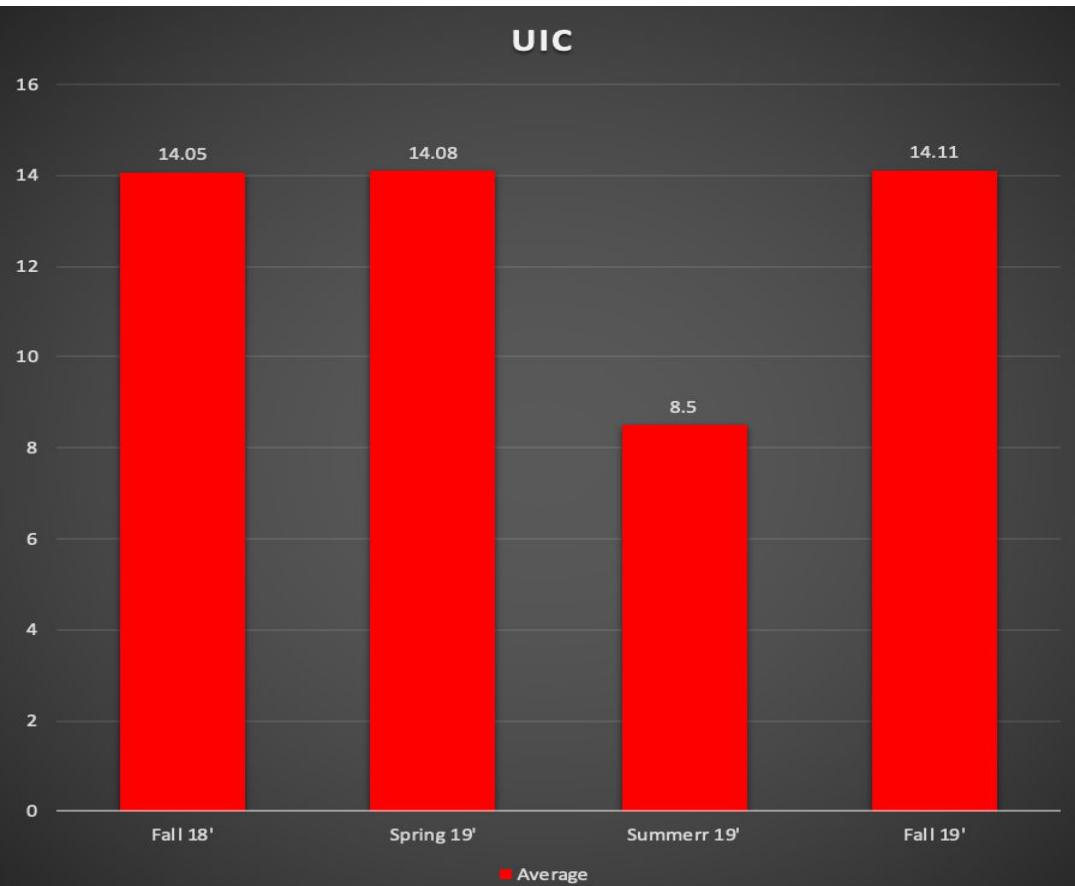
UIUC Credits



Total number of credits taken by enrolled students:

- Fall 18' = 6,228
- Spring 19' = 6,340
- Summer 19' = 1,575
- Fall 19' = 8,741

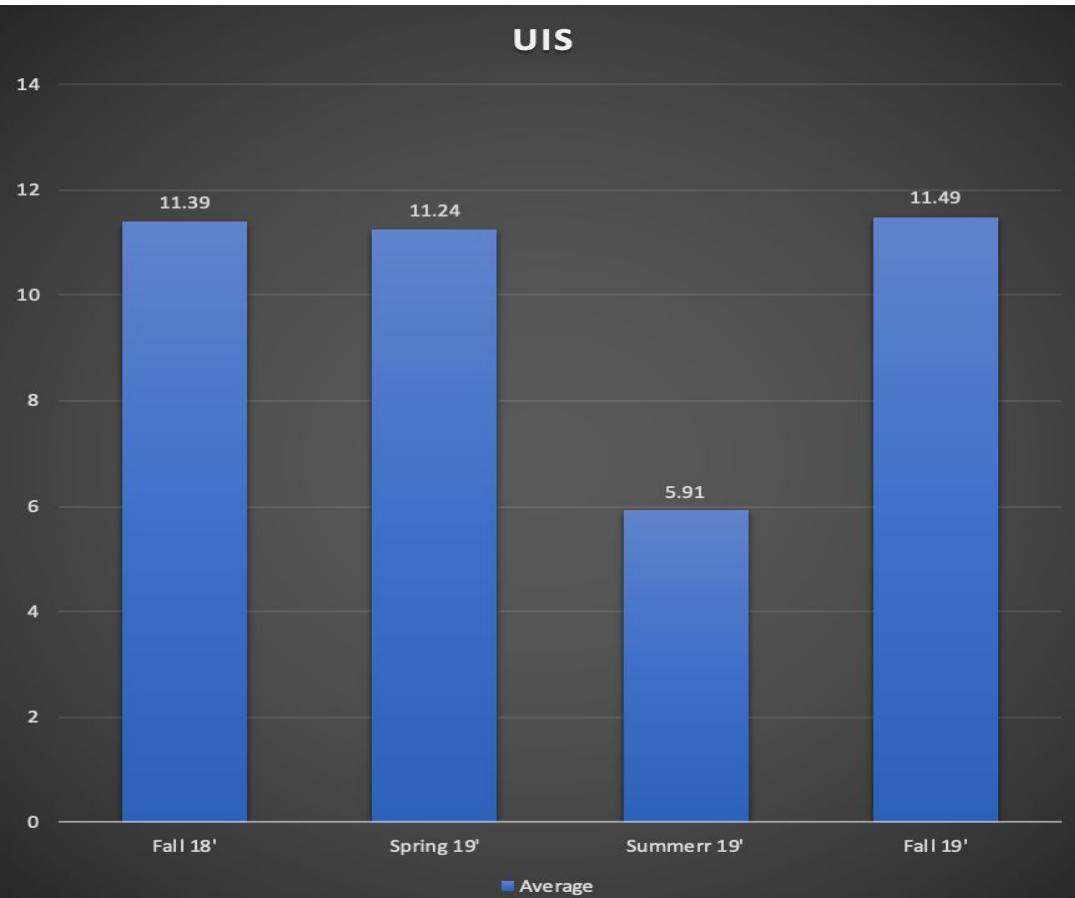
UIC Credits



Total number of credits taken by enrolled students:

- Fall 18' = 5,272
- Spring 19' = 5,415
- Summer 19' = 1,611
- Fall 19' = 7,430

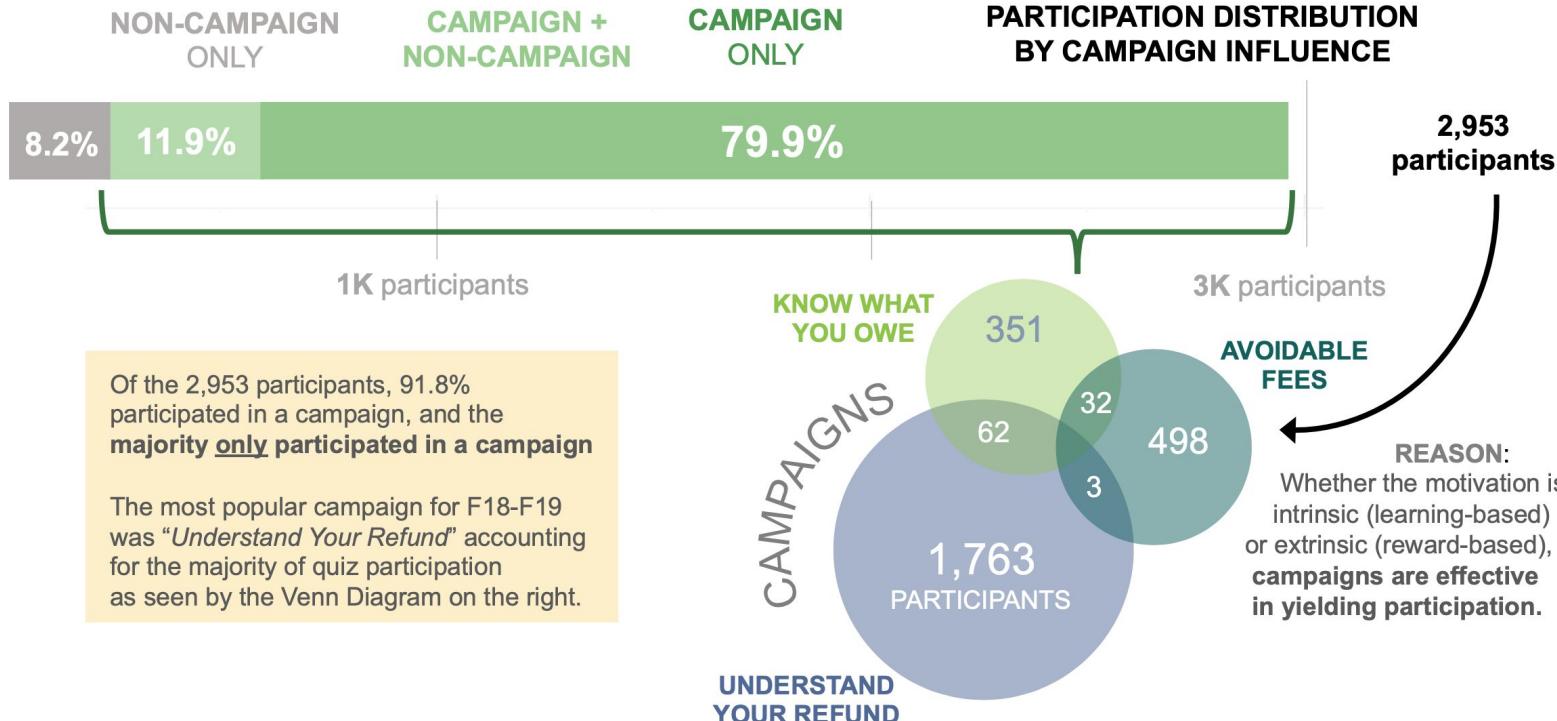
UIS Credits



Total number of credits taken by enrolled students:

- Fall 18' = 697
- Spring 19' = 752
- Summer 19' = 310
- Fall 19' = 1,021

CAMPAIGN INFLUENCE



Note: 83.93% of enrollees don't participate.

We want a predictive model with accuracy higher than 83.93%
Otherwise, it is better to guess that an enrollee will *not* participate
despite any demographic or financial information.

Generalized Linear Model #1

Demographic Model

participation ~ sex + ethnicity +
institution + undergrad

Significant Variables (odds ratios)

- | | |
|------------------------|--------------------------------|
| *** Sex: M | 22% lower than females |
| * Ethnicity Asian | 17% higher than white students |
| *** Ethnicity Hispanic | 31% higher than white students |
| *** Institution UIUC: | 28% lower than UIC students |

* significant ($\alpha < 0.1$)
*** highly significant ($\alpha < 0.01$)

Generalized Linear Model #2

Financial Info Model

participation ~ hold + authorized
payer + aid + payment agreement

Significant Variables (odds ratios)

- *** Hold: Y 33% lower than students without a hold
- ***Auth.Payer: Y 41% lower than students without an auth payer
- *** Financial Aid: Y 53% lower than students without financial aid

* significant ($\alpha < 0.1$)

*** highly significant ($\alpha < 0.01$)

ASSESSING THE GENERALIZED LINEAR MODELS

	GLM #1 (demographics)	GLM #2 (financial info)	Explanation
AIC	AIC = 11,077	AIC = 10,947	Smaller AIC values indicate the model is closer to the truth.
GOF	p-value = 0.2159	p-value = 0.9973	Models appear to fit well. No significant difference between the model and observed data.
Accuracy	75.6%	63.1%	It would be better off guessing that no one participated in a quiz. (83.93%)

Although no great at predicting, the GLM's provide useful insight on significant variables...

It makes sense that the population with the highest representation would have the highest participation rates.

However, some populations have higher odds than the majority of participants:

ODDS OF PARTICIPATING

Significant Variables

Hispanic



31%

Chicago



28%

No Aid



53%

higher than whites

Although whites make up the majority of participants, Hispanics (and Asians by 17%) have higher odds of participating.

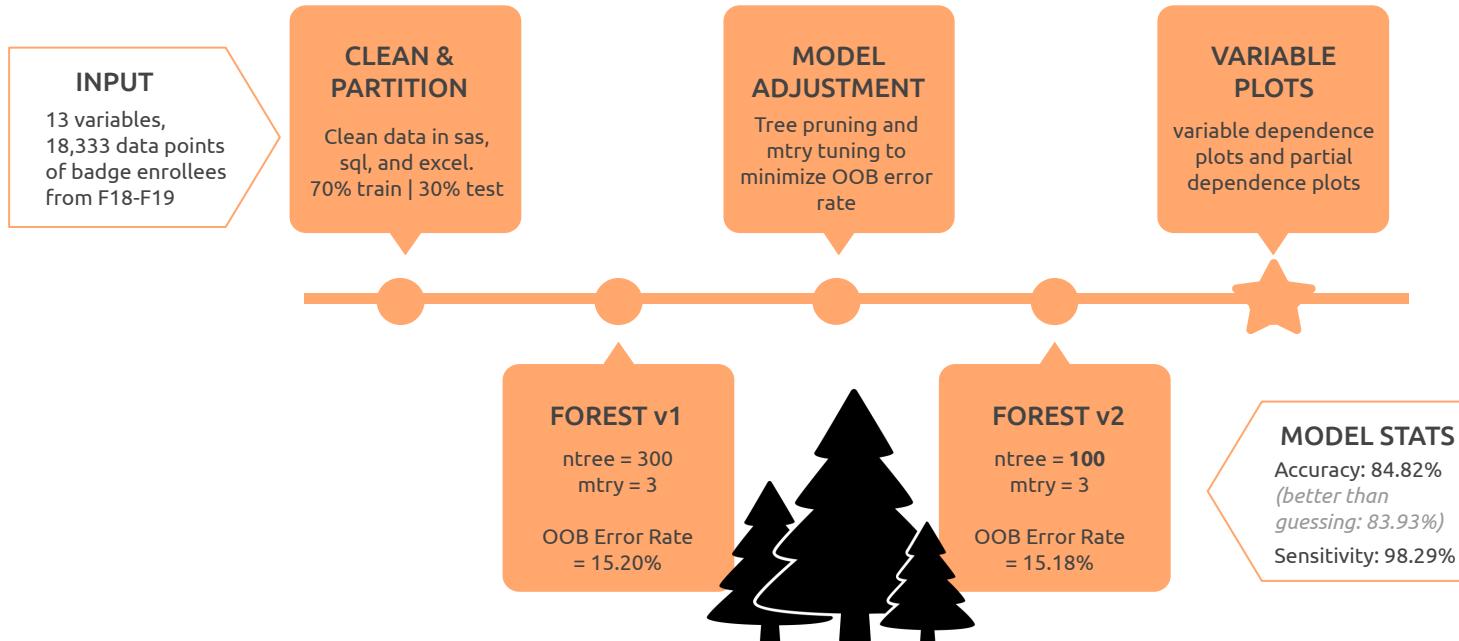
higher than Urbana students

Although UIUC makes up the majority of participants, UIC has higher odds of participating.

higher than those with financial aid

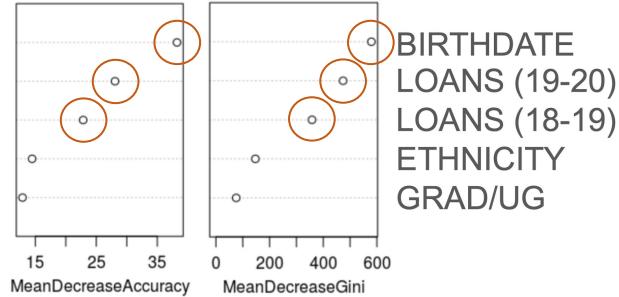
Although the majority of participants receive financial aid, those without financial aid were more likely to participate.

Random Forest Model Pipeline



VARIABLE IMPORTANCE PLOTS

LOANS (19-20)
BIRTHDATE
LOANS (18-19)
GRAD/UG
INSTITUTION



Loan amounts incurred and birthdate are the top 3 variables.

Of the 13 other variables, ethnicity, institution, and grad/undergrad scored highly in importance.

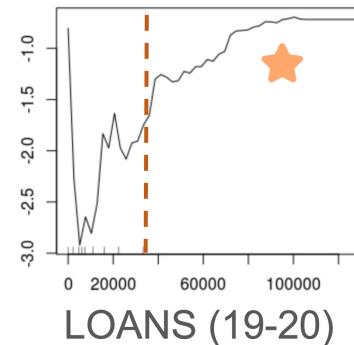
Authorized payer scored least important.

Students with higher loan amounts and older ages were more likely to participate.

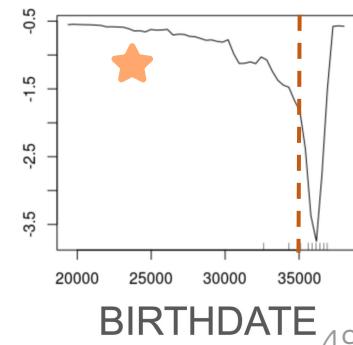
Loan amounts greater than \$30k-40k were more likely to participate.

Birthdates before 1985 (age 35+ as of 2020) were more likely to participate.

PARTIAL DEPENDENCE PLOTS



LOANS (19-20)



BIRTHDATE

Extrapolating insight from all 3 predictive models

CORRELATION

Those who are more likely to participate may have a higher need for financial literacy and the badges program.

ETHNICITY + INSTITUTION

Minorities (especially represented at UIC) have different financial needs and pressures, which may call for financial literacy.

AGE + DEGREE

Older students (typically graduate or professional) are in a different stage of life which require different financial competencies.

LOANS + AID

Students without financial aid, and students with higher loan amounts face the pressure of repaying debt.

Possible outreach ideas for populations with a high need for financial literacy

OUTREACH

There are different ways to provide resources to the badges program to different populations

ETHNICITY + INSTITUTION

Collaborate with cultural houses to host workshops on paying off loans or finding scholarships for people of color.

AGE + DEGREE

Collaborate with graduate schools by sending information via a weekly grad school newsletter, such as resources during tax season

LOANS + AID

Collaborate with Bursar to share relevant information to badges program on repaying loans when offering aid packages

SECTION 3 TAKEAWAYS

1. Based of the Generalized Linear Models: ethnic minorities, UIC's institution, and those *without* financial aid have higher odds of participating.
2. Based on the Random Forest: students with higher loan amounts, and older participants are more likely to participate.
3. There may be a correlation to the likelihood of participating in the program and need for financial literacy. Special attention can be paid towards outreach to these populations.



CONCLUSIONS

INCREASE ENROLLEE PARTICIPATION IN THE OTHER 4 BADGES

Improve the internal promotion of the Earn, Protect, Save, and Spend Badges, since the Borrow Badge accounts for majority of the engagement. Increase promotion of the targeted Badges, and maybe make edits to the content in the modules accordingly.



SERVING UI SYSTEM

ENROLLMENT ACROSS THE CAMPUSES

Majority of participants come from the Urbana and Chicago campuses, respectively. Outreach could be improved for the Springfield campus, as currently 7.02% of participants come from UIS.

Overall, the Badges program does an excellent job in serving the highest represented population for each institution, but predictive models show that populations such as older students and ethnic minorities may have the highest need for financial literacy.