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Optimizing Summer Outreach: A Data-Driven Look at Non-UCLA Student Enrollment

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Abstract

This project investigates enrollment patterns among non-UCLA students during UCLA Summer Sessions, with a focus on understanding online course selection and course load decisions. Using course-type data and student residency, we analyzed what predicts fully online enrollment and what differentiates students who take one course versus multiple.

Our key findings include:

- Out-of-state students are twice as likely to take only online courses.
- Taking more courses significantly decreases the odds of being fully online.
- Californian students tend to take STEM and social science courses, while non-Californians prefer Arts, particularly upper-division offerings.
- Most students take only one class, but behavioral patterns suggest strategic opportunities to encourage multi-course enrollment, especially through arts and online offerings.

Limitations include the lack of international student indicators and a short time frame (three years), which restricts trend analysis. Future work should examine longer time periods, include international student status, and consider student intent or course waitlist data to better estimate unmet demand and guide course planning.

Questions of Interest

- What seems to predict or to characterize taking only online courses, and what can be inferred about students based on the number of courses taken?
- What kinds of courses are more popular for students from outside of California as compared to students in-state?
- Overall, given the patterns in the data, what actions can be taken to increase summer session enrollment?

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Variable Definitions & Measurement Context (Codebook)

Variable Name	Label	Type	Definition / Levels
casenumber	Case Number	Numerical	Unique student identifier
californian	In-State Status	Categorical	Indicates if the student is from California (Yes/No)
online_course_ct	Number of Online Courses	Numerical	Number of online courses taken during the term
lower_division_course_ct	Number of Lower Division Courses	Numerical	Number of lower-division courses taken
arts_ct	Number of Arts Division Courses	Numerical	Number of Arts courses enrolled
engineering_ct	Number of Engineering Courses	Numerical	Number of Engineering courses enrolled
humanities_ugeduc_ct	Number of Humanities/UgEduc Courses	Numerical	Number of Humanities or Undergraduate Education courses enrolled
life_sci_ct	Number of Life Sciences Courses	Numerical	Number of Life Sciences courses enrolled
phys_sci_ct	Number of Physical Sciences Courses	Numerical	Number of Physical Sciences courses enrolled
soc_sci_intl_inst_ct	Number of Social Sciences/Intl Institute Courses	Numerical	Number of Social Sciences or International Institute courses enrolled
mgmt_ct	Number of Management Courses	Numerical	Number of Management courses enrolled
other_prof_ct	Number of Other Professional Courses	Numerical	Number of Other Professional school courses enrolled
count_of_courses_taken	Total Number of Courses Taken	Numerical	Total count of courses taken in the summer term
all_online	All Courses Taken Online	Categorical	Indicates if all courses were online (Yes/No)

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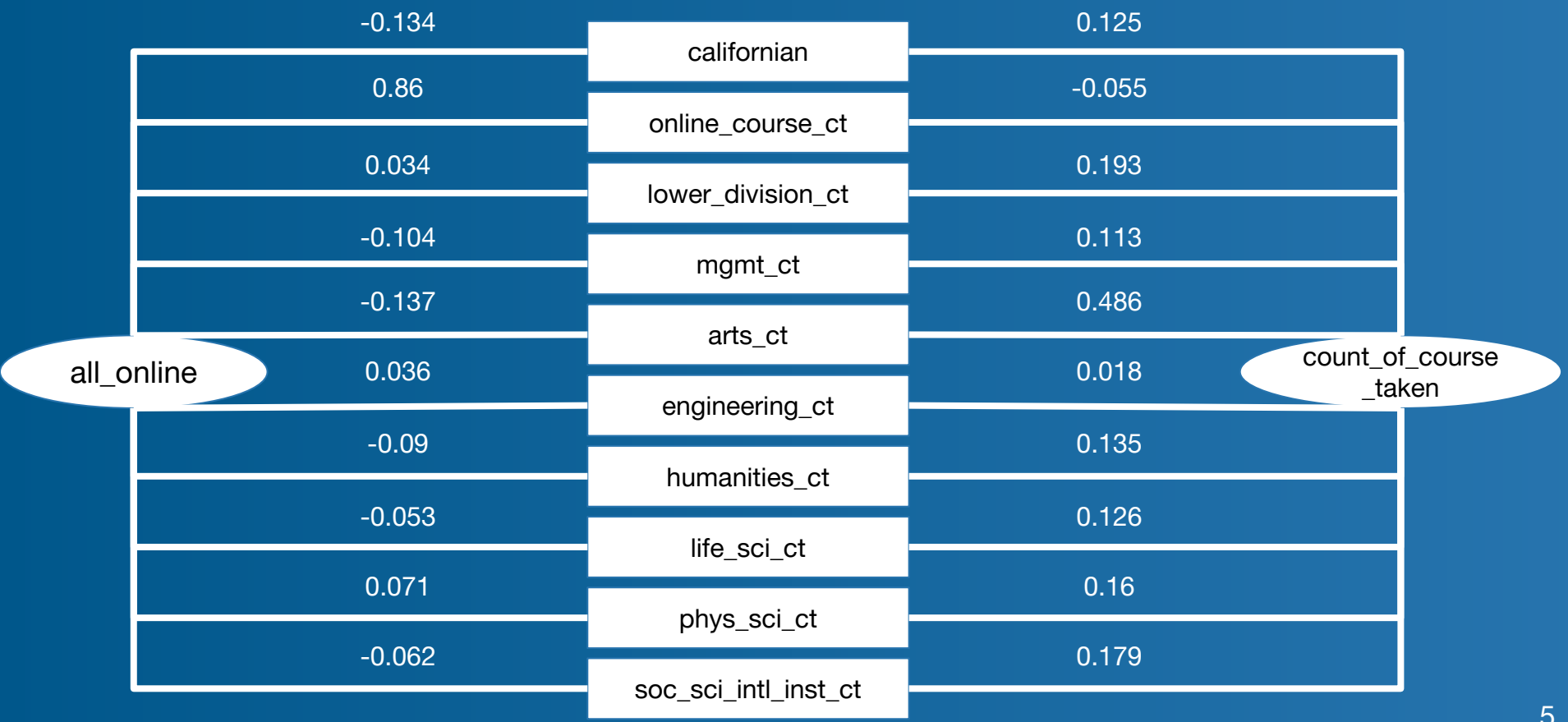
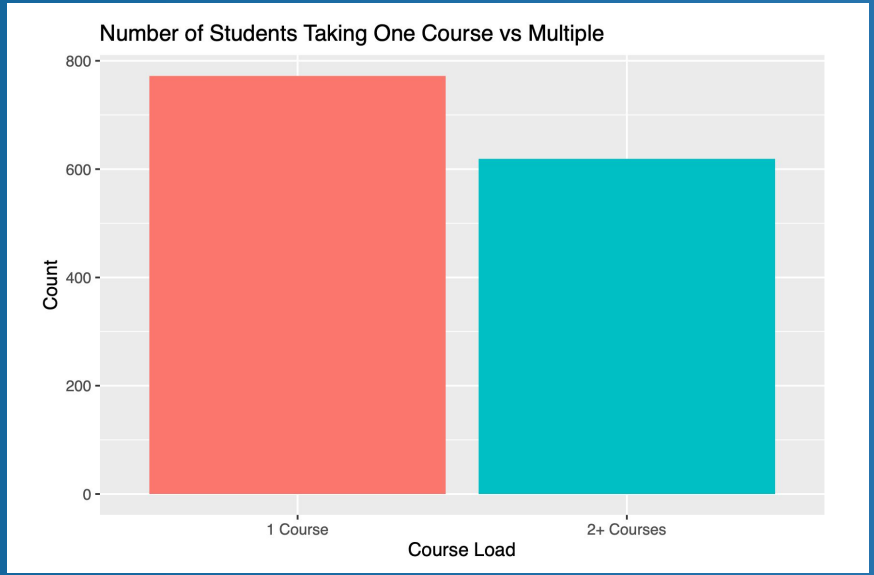
Schematic



EDA: Exploring Enrollment Patterns in UCLA Summer Sessions

Course Load Findings

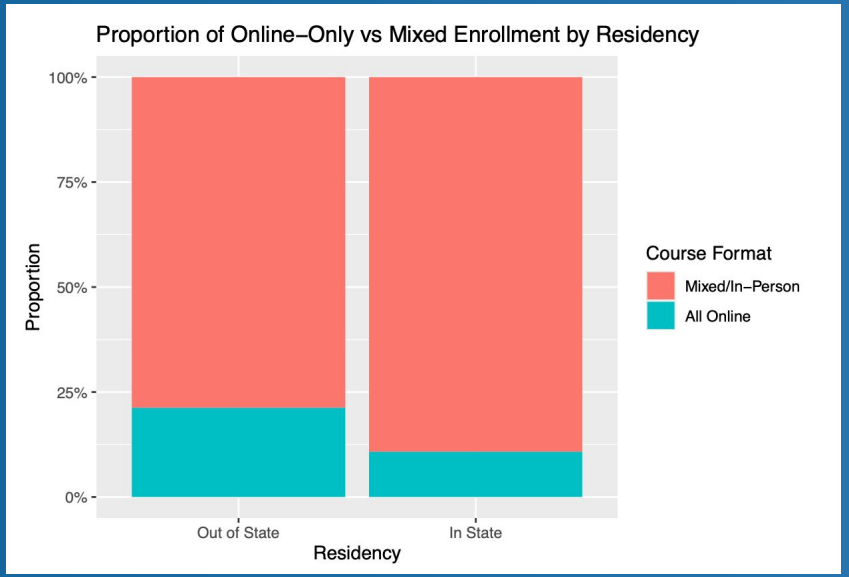
- Majority of non-UCLA students took only one course
- Out of 1,441 students:
  - 772 enrolled in one class
  - 510 enrolled in two classes
  - Very few took three-four classes.
- Average number of courses: 1.56 (right-skewed distribution)
- <u>Key Opportunity:</u>
  - Many students may be open to taking a second class
  - Targeted encouragement or incentives could boost enrollment
  - Offer cheaper cost per unit or other perks for students taking >1 class



Online Enrollment by Residency

- Online-only enrollment was more common among out-of-state students
  - 10.8% of in-state students took all courses online
  - 21.2% of out-of-state students took all courses online

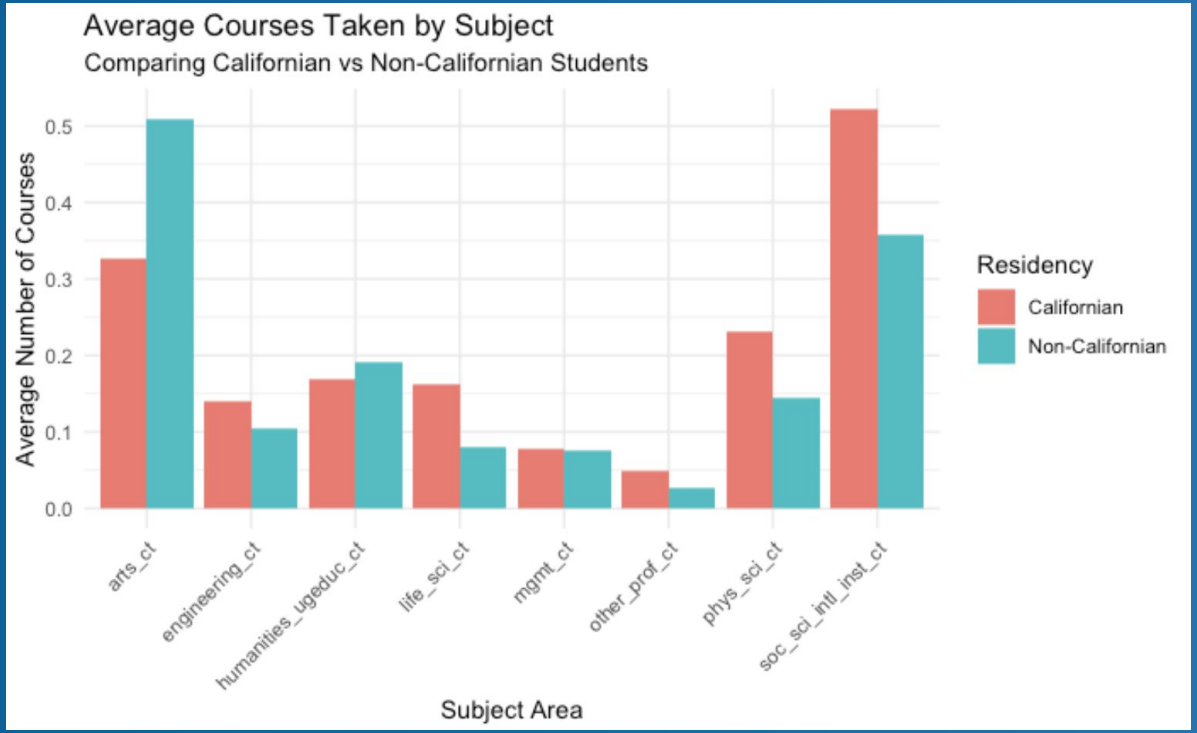
- Indicates a strong preference or need for remote learning among non-local students



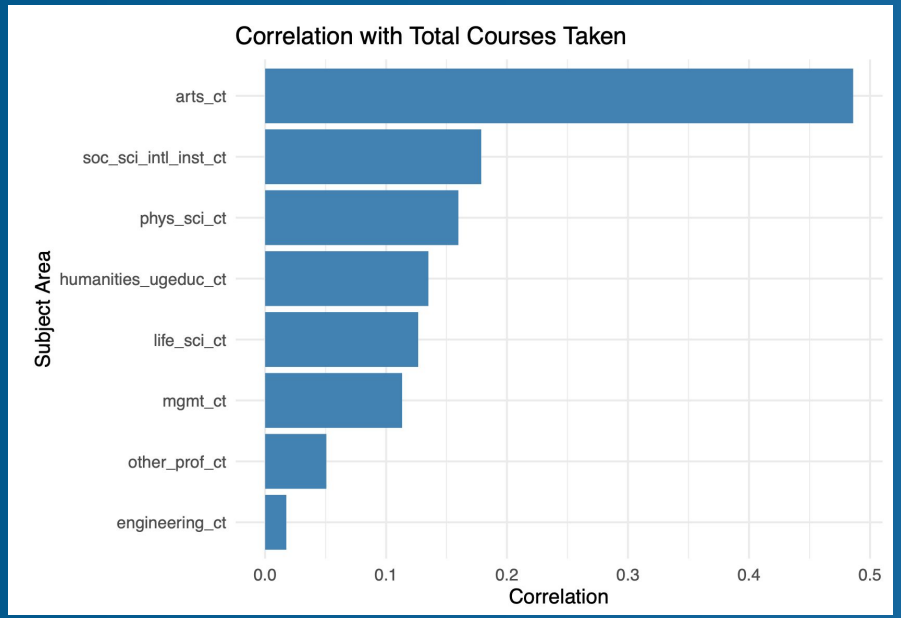
<u>Opportunity for Summer Sessions:</u>

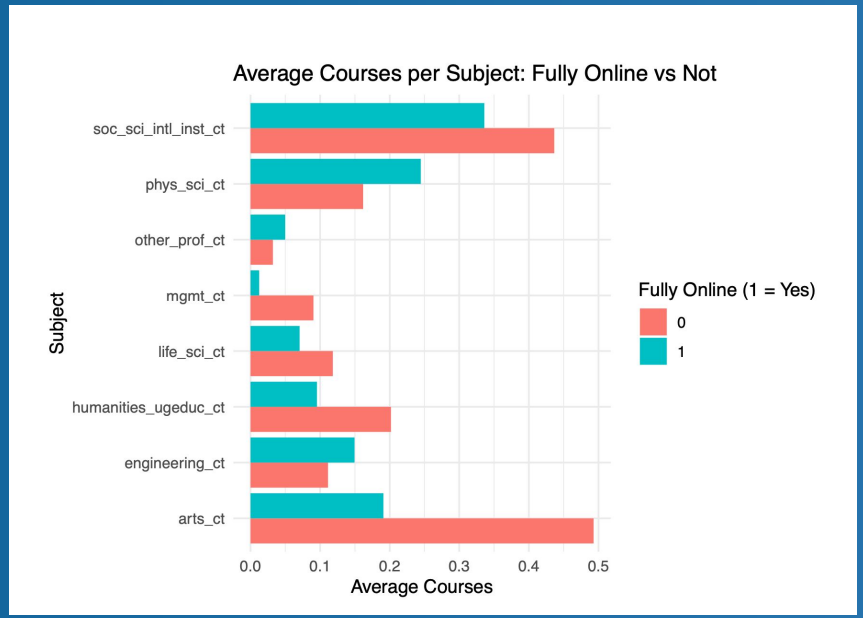
- Expand fully online course offerings
- Emphasize flexibility and convenience in outreach to out-of-state students

- Non-Californian students are more likely to enroll in Arts courses
- Californian students enroll more frequently in social science, life science, and engineering.



- Arts have a moderately positive correlation with Total Courses taken with UCLA
- Arts, social sciences, management, humanities, life sciences are more popular online while Physical sciences and engineering are more popular offline





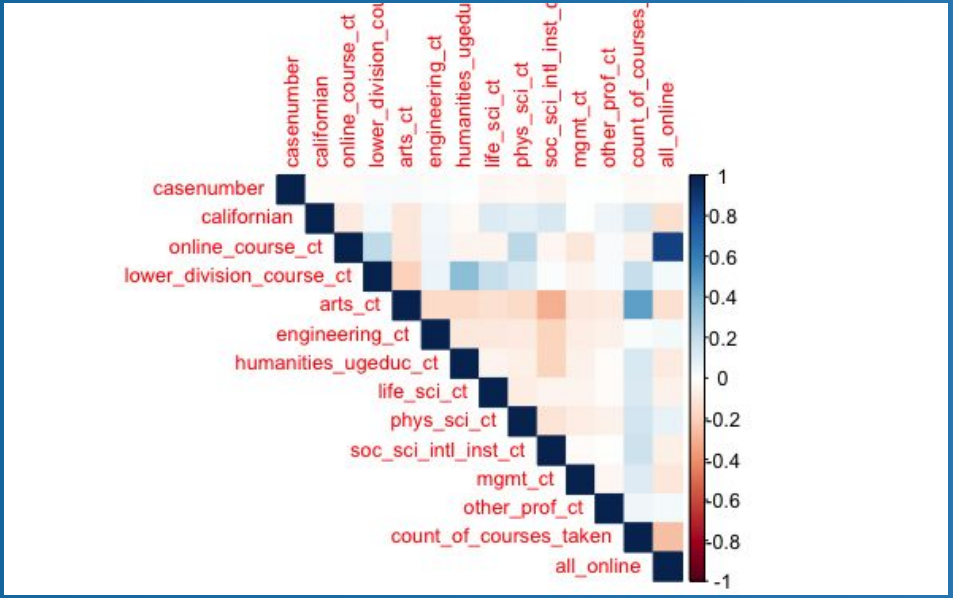
Correlation Matrix

1. Number of Courses Taken:

- Students taking more courses are heavily enrolled in Arts (0.486), followed by Social Sciences, Humanities, Life, and Physical Sciences.
- These students are less likely to be fully online (-0.254), indicating a preference for in-person or hybrid formats.

2. Out-of-State Students:

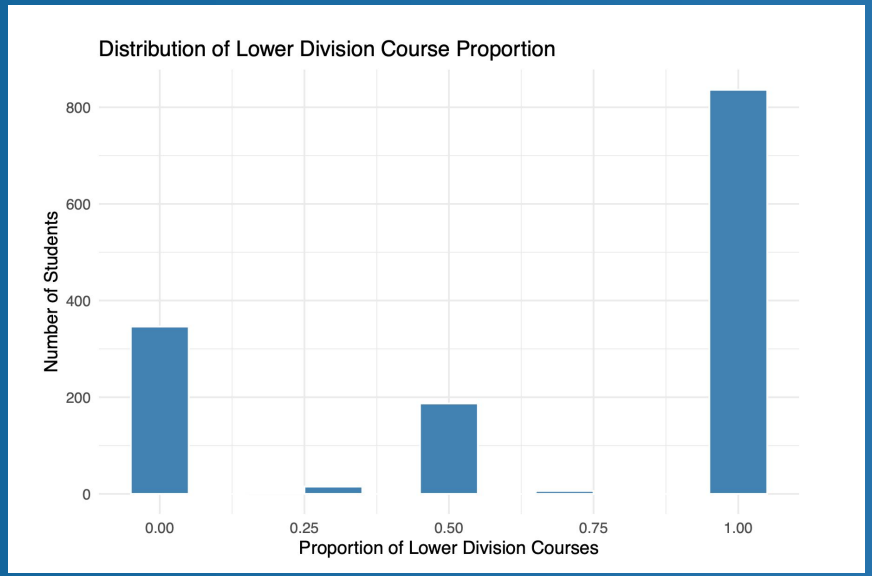
- Prefer STEM and global studies: more likely to take Physical Sciences (0.095), Life Sciences (0.117), and Social Science/Intl courses (0.131).



Most Students Take Either All Lower or All Upper Division Courses

A majority of students take only one course level:

- Over 800 students took only lower division courses
- A large group also took only upper division
- Very few students mix both lower and upper division courses



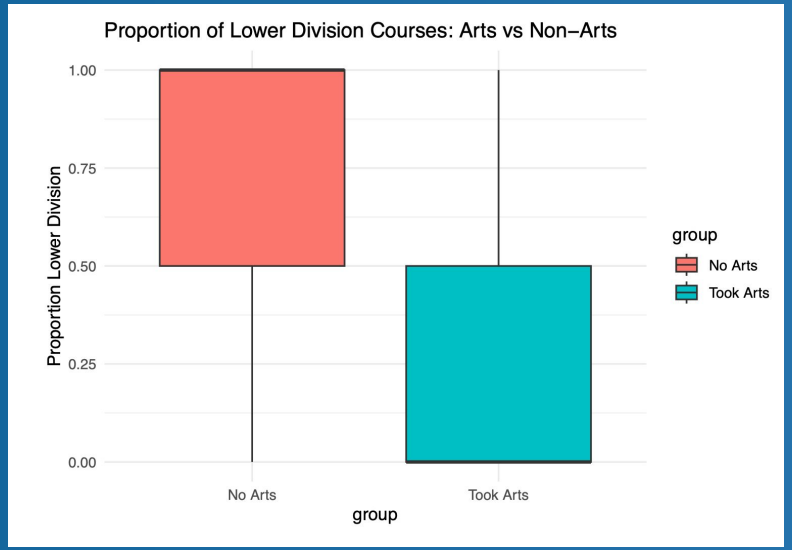
Arts Students Are More Likely to Take Upper Division Courses

- Students who took Arts courses had lower proportions of lower division classes.

  (Median proportion = ~0.50)

- Students who did not take Arts had a higher proportion of lower division.

  (Median = ~1.00, mostly lower division)



Understanding Relationships in the Data: Modeling Student Enrollment Behaviors

Modeling Approach & Overview

- **Objective:** Use logistic regression to understand what factors influence (1) fully online enrollment and (2) course load decisions among non-UCLA students in Summer Sessions.

- **Model Type:** Binary logistic regression, chosen for its interpretability and suitability for categorical outcomes.

Modeling Approach & Overview

- **Response Variables:**
  - **all_online:** Whether a student took only online courses
  - **takes_two_plus:** Whether a student enrolled in more than one course

- **Predictors Selected:**
  - **Residency status** (californian)
  - **Course characteristics** (e.g., number of courses, online course count)

- **Evaluation Metrics:**
  - Model summaries interpret **odds of outcomes**
  - **AUC** (Area Under Curve) used to assess classification performance

- **Note:** These models are part of a work-in-progress analysis and reflect preliminary findings for exploratory and explanatory insight.

Predicting All-Online Enrollment

Item	Details
Question	What characterizes students who take only online courses during the summer?
Model	Predicts whether a student took only online courses based on their residency status and total number of courses taken.
Findings	1. Out-of-state students tend to be more likely to enroll exclusively online. 2. Students taking more courses tend to be less likely to be fully online.
AUC	0.7165 — strong predictive performance

Predicting All-Online Enrollment

term	odds estimate	std.error	statistic	p.value	conf.low	conf.high
(Intercept)	1.9765807	0.2290285	2.975037	2.93E-03	1.2735263	3.1294515
californianTRUE	0.5687202	0.1705557	-3.308988	9.36E-04	0.4044835	0.7901987
count_of_courses_taken	0.2138044	0.1834523	-8.409233	4.13E-17	0.1467377	0.3016095

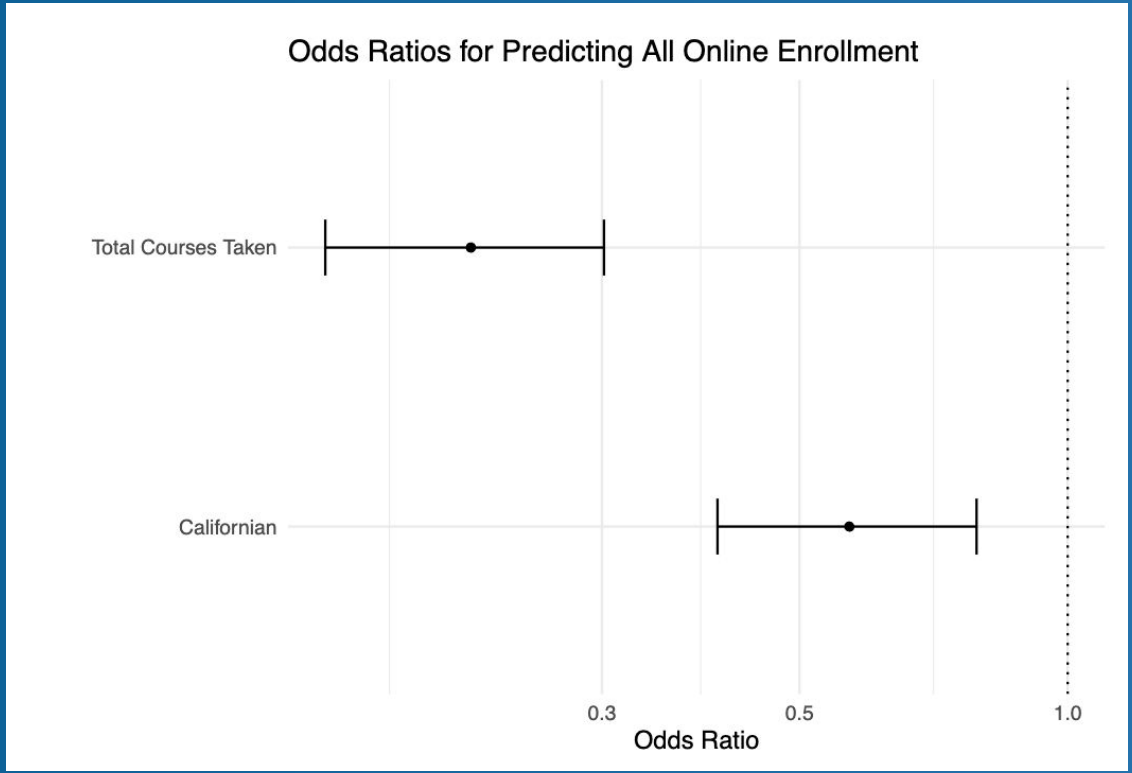
Term	Interpretations
(Intercept)	Baseline odds for a non-California student enrolled in zero courses (not interpretable).
californianTRUE	California students have about **43% lower** odds of taking all online classes compared to non-Californian students.
count_of_courses_taken	Each additional course **reduces** the odds that a student is taking all online classes by about **79%**.

Interpretations
Being in-state is associated with lower odds of being all-online.
Taking more classes is associated with substantially lower odds of being all-online.

Plot of Odds

- Odds ratios and 95% confidence intervals from the logistic regression model predicting fully-online enrollment.

- Odds ratios less than 1 indicate lower odds of being fully online; values farther from 1 suggest stronger associations.



Predicting Whether a Student Takes >1 Course

Item	Details
Question	What predicts whether a student takes 2 or more courses?
Model	Predicts whether a student enrolled in more than one course based on their residency status and number of online courses taken.
Findings	1. In-state students tend to be more likely to take more than one course. 2. Students who take more online classes tend to be less likely to take multiple classes
AUC	0.6277 — moderately strong

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Predicting Whether a Student Takes >1 Course

term	odds estimate	std.error	statistic	p.value	conf.low	conf.high
(Intercept)	0.6432817	0.07566774	-5.830391	5.53E-09	0.5541744	0.745624
californianTRUE	2.1880358	0.11349408	6.899076	5.23E-12	1.7527546	2.735221
online_course_ct	0.7033855	0.11932465	-2.948679	3.19E-03	0.5544115	0.885617

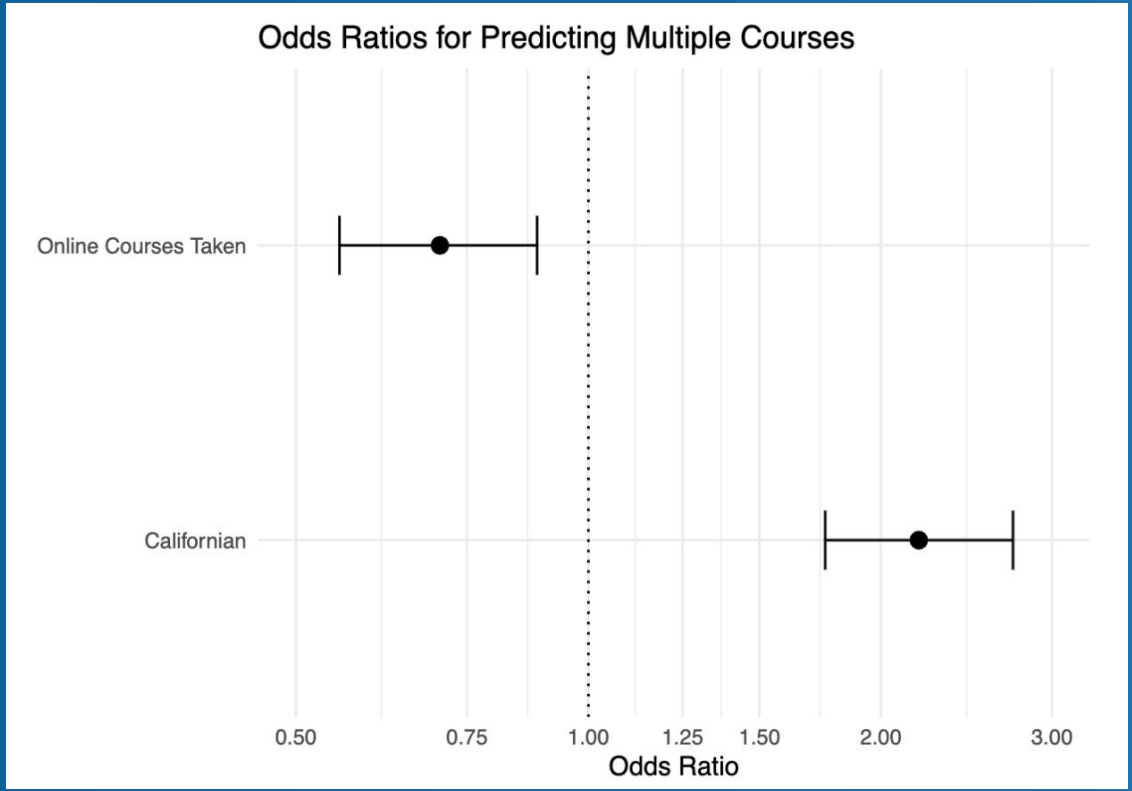
Term	Interpretations
(Intercept)	Baseline odds for a non-California student enrolled in zero online courses (not interpretable).
californianTRUE	Californian students have about **2.19** times higher odds of taking more than one class compared to non-Californian students.
online_course_ct	Each additional online course decreases the odds that a student is taking more than one class **29.7%**.

Interpretations
In-state students tend to have higher odds of taking 2+ courses
Students who take more online courses tend to have lower odds of taking multiple courses

Plot of Odds

- Odds ratios and 95% confidence intervals from the logistic regression model predicting enrollment in multiple courses.

- Odds ratios less than 1 indicate lower odds of taking multiple courses; values farther from 1 suggest stronger associations.



Findings and Limitations

Findings

- Students enrolling in just one summer course and multiple classes seem to take different classes (especially arts classes)
- More out-of-state students took all-online classes than in-state students
- Upper division arts classes seem to be in higher demand than most other classes offered, UCLA summer sessions may offer more relevant classes

Limitations

- No international students column
- Limited years of data

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Overall Conclusions

Our analysis of recent UCLA Summer Sessions enrollment data suggests three key patterns:

1. **Distinct Enrollment Behavior by Course Load**
    a. Students who enroll in a single summer course gravitate toward different subject areas than those taking multiple courses.
    b. One-course students favor **Arts-related offerings** more than multi-course peers, whose schedules lean toward core STEM and high-demand GE requirements.
2. **Out-of-State Students Prefer Fully Online Delivery**
    a. A markedly higher share of out-of-state students completes **all courses online** compared with in-state students.
    b. Travel costs, housing constraints, and the ability to work remotely over the summer likely motivate this preference. The finding underscores the strategic value of robust online offerings for attracting non-resident tuition revenue.
3. **Upper-Division Arts Courses Face Capacity Pressure**
    a. Upper-division Arts classes (consistently reach or exceed capacity sooner than most other disciplines.
    b. This unmet demand signals an opportunity for Summer Sessions to **expand or replicate popular Arts courses**

Challenges of the Study

Challenge	Mitigation	Remaining Gap
Lack of an "International" residency flag limited our ability to isolate behavior of students outside the U.S.	Focused comparison on in-state vs. out-of-state groups and flagged need for finer residency codes.	Still cannot quantify international-only patterns (e.g., visa constraints, time-zone effects).
Short time horizon (three summers) constrains trend detection and pandemic-related anomalies may bias demand.	Performed year-over-year descriptive checks and sensitivity analysis excluding 2020 data.	Cannot confirm whether observed patterns are persistent or simply post-pandemic artifacts.
Course classification granularity: "Arts" umbrella groups diverse subjects; some misclassification possible.	Manually validated top-enrolled Arts courses and cross-checked with departmental codes.	Small mis-labels may remain; automated tagging would raise reliability.

Recommendations for Future Work

Expand the Time Series (1):

Secure at least five additional years of pre-pandemic data to confirm whether Arts demand spikes and online preferences persist over different economic and academic cycles.

Add Residency Granularity (2):

Incorporate an “International” column and, if possible, country-level codes. This would allow a follow-up study on time-zone effects, visa-related course load constraints, and marketing opportunities.

Segment by Student Intent (3):

Collect survey or application-level data on student intent (e.g., “explore personal interest,” “accelerate graduation,” “earn transferable credit”) to link motivations with course-taking patterns.

Capacity & Wait-List Analysis (4):

Merge wait-list counts and add-drop activity to measure unmet demand more precisely, especially for high-pressure Arts courses. This would support data-driven decisions on adding sections or adjusting caps.