Survey on UGA Student Nonresponse and Free Time

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1 Introduction

For this project, we designed a survey that would help us investigate multiple different ideas. The first goal was to investigate which UGA students are more or less likely to answer a survey. However, in order to get unbiased results, we needed to disguise this survey with a secondary survey. For this secondary survey, we decided to figure out what UGA student do in their time outside the classroom. We wanted to use this information to try and predict student's grades. The final survey we designed contained two parts. The first part asked demographic questions to get at the first goal of the project. The second part asked questions about how student spend their time.Our goal was to use this to calculate an estimate of how much time UGA students spend on things like school work, exercising, working, and relaxing as well as predicting a student's final grade based on these different factors.

2 Methods

The first step of any survey is actually designing the survey. In order to properly investigate the nonresponse, we needed the population data for the demographic questions. Thus, the demographic questions we asked were limited to those that we could get population data for from the UGA Fact Book 2022. We asked students their year, gender, ethnicity, degree/major, and Georgia residency status (whether they are from GA or not). For the second part of the survey, we asked students how much time they spent studying, working, exercising, and at leisure. We also asked them what their entertainment preferences were regarding what media they consume the most and what genres they prefer.

After we designed the survey, the next step was getting responses. Since one of the goals of the project was to see who is more willing to respond to a survey, we couldn't use the traditional method of posting a link on social media and sending the survey to our friends and family. That would introduce bias into our study. So, we had to come up with a method that allowed us to ask pseudo-random UGA students to answer our survey. Thus, we decided to put our survey QR code on a poster board, go on campus, and ask students walking by to take our survey. We had to pick location that would have a large, diverse group of students to make the survey as unbiased as possible. Thus, we decided to stand in the Tate breezeway (the area outside between Tate Center and the UGA Bookstore). We stood there from about 10 AM to about 12:00 PM. We asked as many people walking by as possible to take our survey. From 12:00 PM to about 12:40 PM, we stood at the "Million Dollar Steps" crosswalk and asked people waiting to cross to answer our survey.

After we collected our data, the next step was cleaning the data. The first thing we did was look at missing values. There were a total of 363 total surveys. There were 169 complete surveys, 112 surveys missing the job time question, 19 surveys missing the exercise time question, 8 surveys missing both job and exercise time questions, and the remaining 55 surveys had different combinations of missing values. We decided that the 139 surveys that were missing either job time or exercise time was because these student did not have a job and/or did not exercise, thus we replaced these missing values with 0. We felt like it did not make sense to replace any of the other missing values. Our final data set contained 308 surveys. Another part of the data cleaning involved changing the degree/major response into what college the student was in. After going back to the UGA Fact Book 2022, we realized that it didn't have all of the population data for degree/major. But, it did have the population data for college, so we decided to transform the data from major/degree to college. The issue with this was that major/degree was our free response questions. Of the 308 surveys, there were 194 unique answers to the major/degree question, so we had to parse through all 194 of those unique answers (some of which only differed by a space or capitalization) to transform the data into the college the student is in. (Just a side note, it took 1.5 hours to do this. The only reason we are including this information in this report is because it took so long and we want recognition for the work we did on it).

After cleaning the data, we went to work on estimating the amount of time UGA students spend studying, exercising, working, and at leisure. First, we found estimates using the full data. Then, we found weighted estimates using year as the grouping variable to create the weights. Next, we decided to determine what groups of students are more likely to answer a survey based on these results. For this, we used a χ^2 goodness of fit test on each of the demographic questions to determine if students in each category answered the survey as expected, more than expected, or less than expected. Our final analysis was building a predictive model for student's grades using the other questions that we asked in the survey. In total, we built three decision trees using different combinations of explanatory variables. The first tree used all of the data as explanatory variables. The second tree used only the demographic data. The third tree used only the non-demographic data.

3 Results

Below are the distributions of the demographic data. These graphs are from Qualtrics, so they include all of the complete responses for each question. They are not the distributions of the 308 surveys we used for the rest of the analysis, but the distributions are essentially the same. Also, we should mention that we did not close our survey, and since the time we did the survey and analyzed the data, we got 49 more responses to the survey. So, the graphs have more data than what we originally collected. The only graph that is not from Qualtrics is the distribution of colleges. As mentioned in the Methods section, college was not asked in the survey, but was later determined in R, this the graph for college distribution came from R.

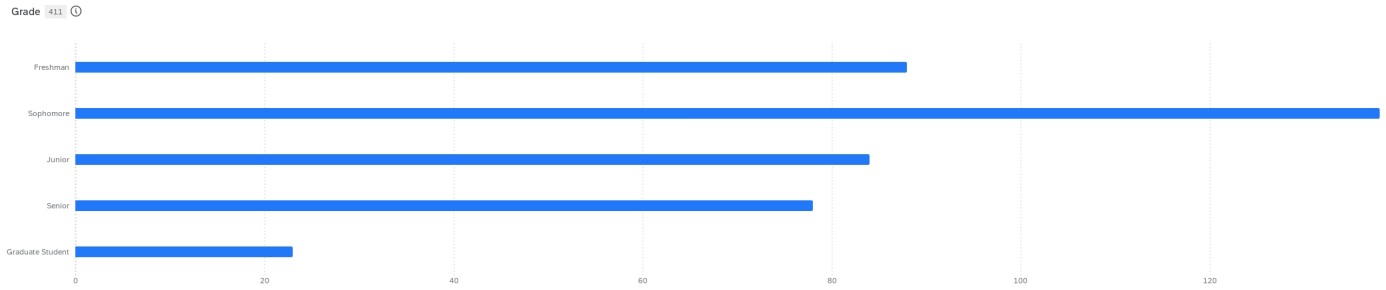

Figure 1: Distribution of surveys by Year

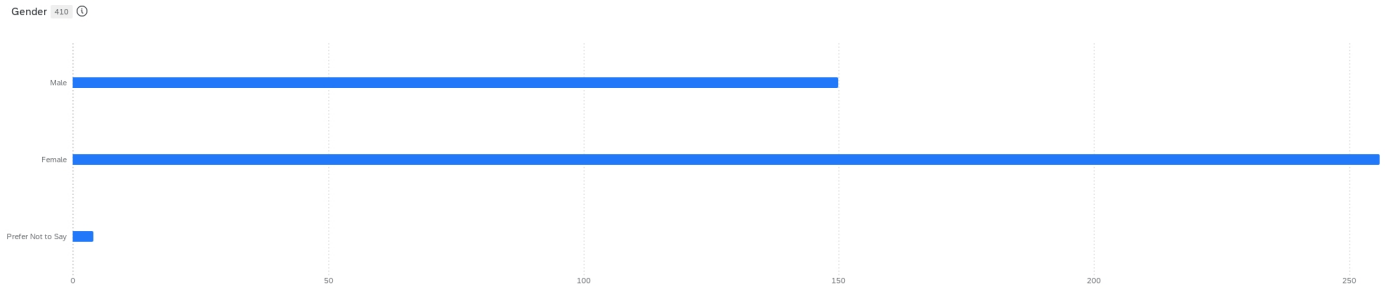

Figure 2: Distributions of surveys by Gender

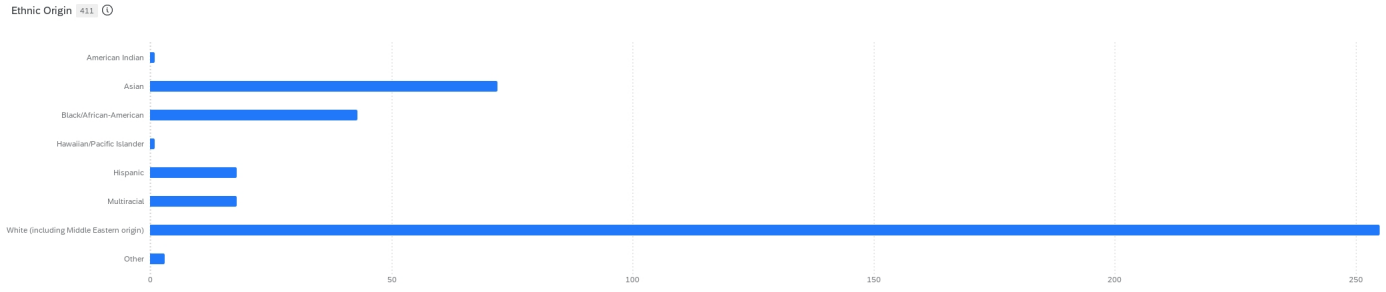

Figure 3: Distributions of surveys by Ethnicity

Figure 4: Distributions of surveys by Georgia Residency

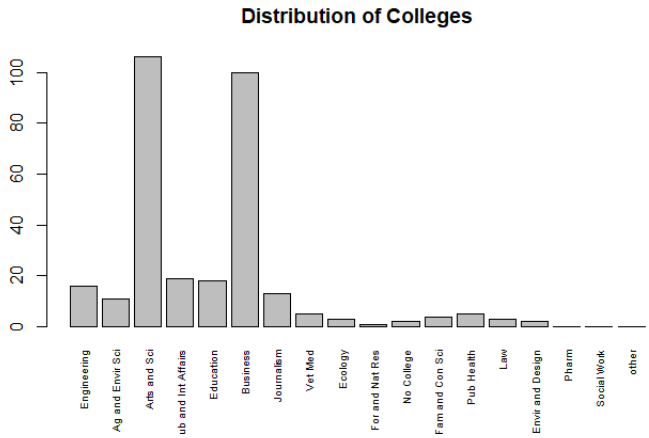

Figure 5: Distribution of College

Below are the distributions of the non-demographic data. The same disclaimer above applies to the Qualtrics graphs here. The distribution of the time questions came from R because the Qualtrics graphs for these slider questions did not look good in Qualtrics.

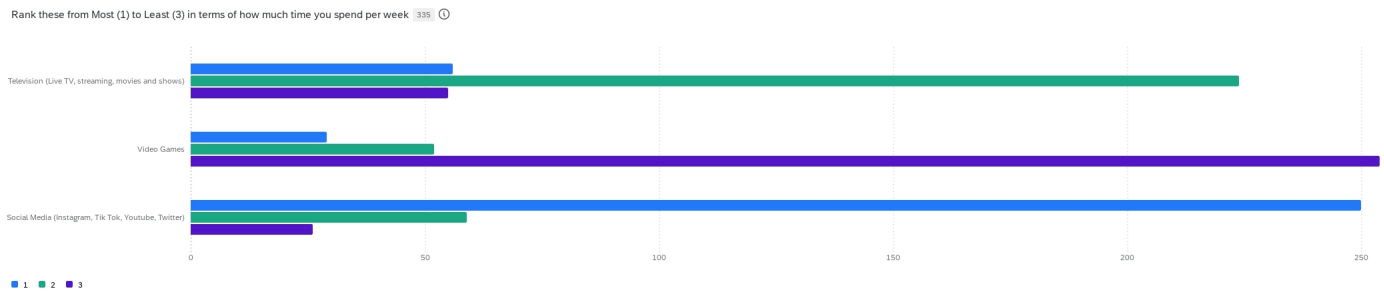

Figure 6: Distribution of Media Preferences

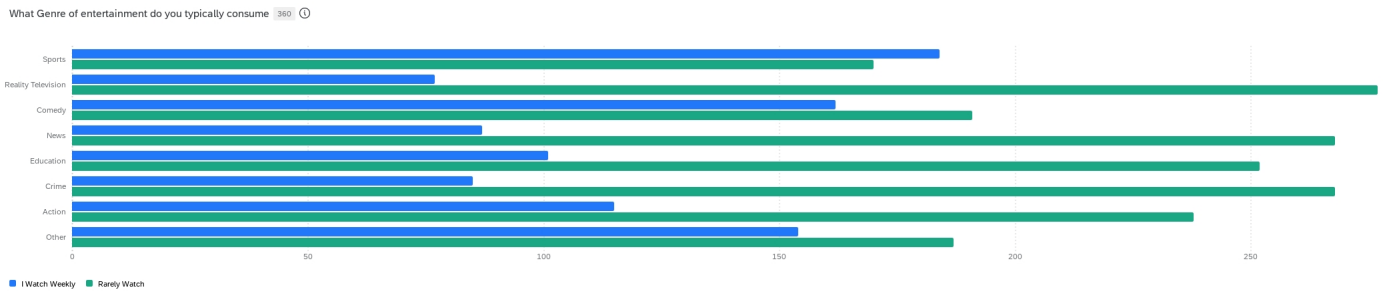

Figure 7: Distribution of Genre Preferences

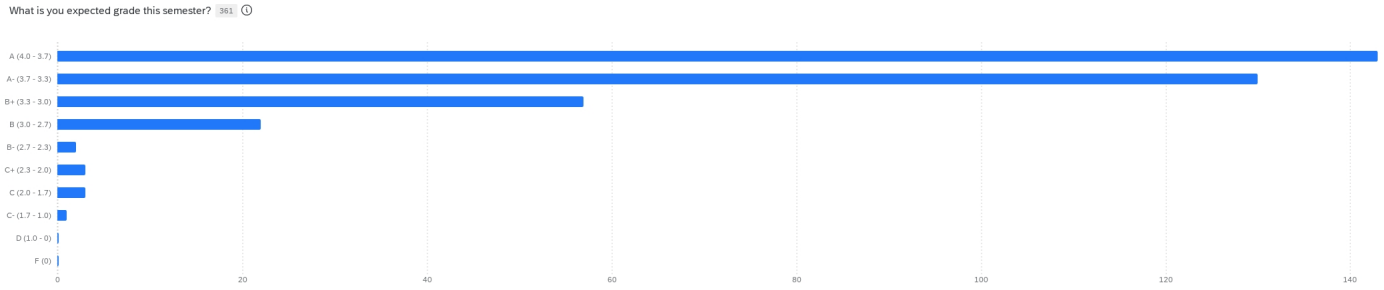

Figure 8: Caption

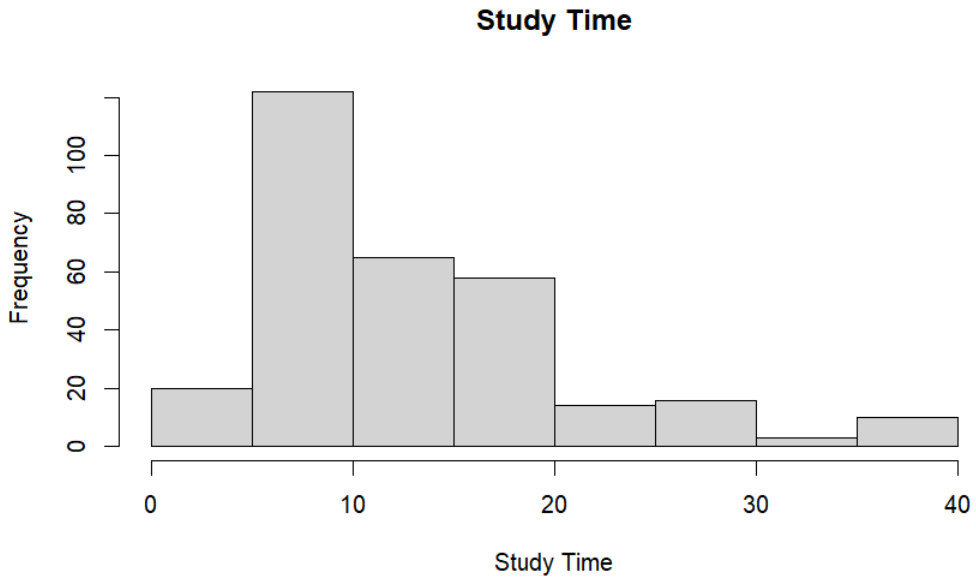

Figure 9: Distribution of Study Time

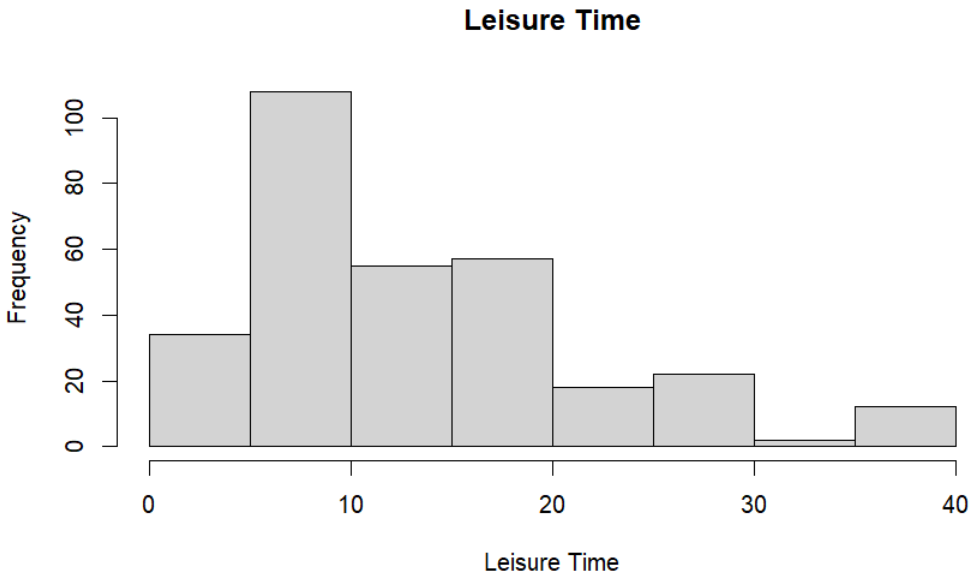

Figure 10: Distribution Time of Leisure Time

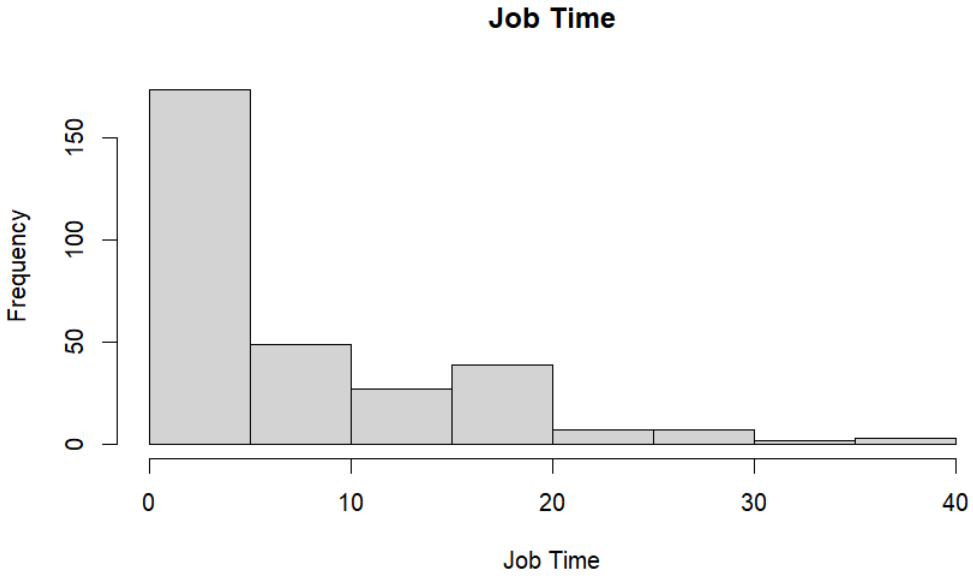

Figure 11: Distributions of Job Time

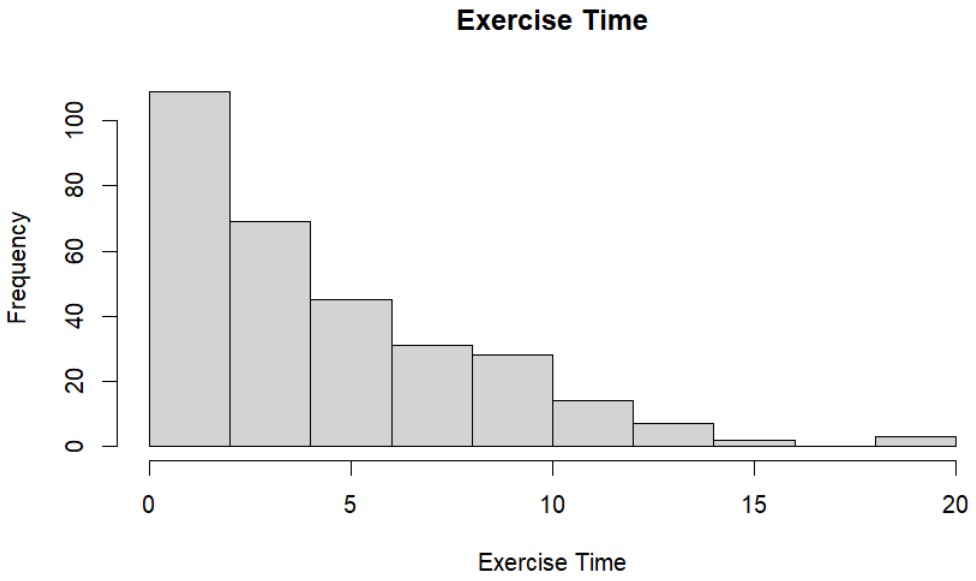

Figure 12: Distribution of Exercise Time

The unweighted estimate for the average study time for a UGA student is 13.92. The weighted estimate for the average study time for a UGA student is 19.18. The unweighted estimate for the average job time for a UGA student is 6.71. The weighted estimate for the average job time for a UGA student is 12.45. The unweighted estimate for the average exercise time for a UGA student is 5.11. The weighted estimate for the average exercise time for a UGA student is 4.68. The unweighted estimate for the average leisure time for a UGA student is 14.07. The weighted estimate for the average leisure time for a UGA student is 13.36.

Based on the p-value of < 0.00001 for the χ^2 goodness of fit test for year, there is sufficient evidence to reject the null hypothesis and conclude that the students that responded to our survey are different than expected based on year. Here are the residuals for this χ^2 goodness of fit test.

Year	Residuals
Freshman	5.33
Sophomore	6.52
Junior	0.11
Senior	-2.56
Graduate	-6.93

Based on the p-value of 0.00001 for the χ^2 goodness of fit test for gender, there is sufficient evidence to reject the null hypothesis and conclude that the students that responded to our survey are different than expected based on gender. Here are the residuals for this χ^2 goodness of fit test.

Gender	Residuals
Male	-1.18
Female	0.73
Other	4.55

Based on the p-value of 0.00001 for the χ^2 goodness of fit test for ethnicity, there is sufficient evidence to reject the null hypothesis and conclude that the students that responded to our survey are different than expected based on ethnicity. Here are the residuals for this χ^2 goodness of fit test.

Ethnicity	Residuals
American Indian	-0.53
Asian	2.53
Black/African American	-2.83
Hawaiian/Pacific Islander	2.44
Hispanic	-1.27
Multiracial	1.61
White (including Middle Eastern Origin	-0.66
Other	-3.01

Based on the p-value of 0.05139 for the χ^2 goodness of fit test for GA residency, there is sufficient evidence to fail to reject the null hypothesis and conclude that the students that responded to our survey are as expected based on GA residency.

Based on the p-value of 0.00003 for the χ^2 goodness of fit test for college, there is sufficient evidence to reject the null hypothesis and conclude that the students that responded to our survey are different than expected based on college. Here are the residuals for this χ^2 goodness of fit test.

College	Residuals
Engineering	-0.60
Agriculture and Environmental Science	-1.35
Arts and Sciences	1.62
Public and International Affairs	2.51
Education	-2.15
Business	3.25
Journalism and Mass Communication	-0.78
Vet Med	-0.96
Ecology	0.94
Forestry and Natural Resources	-1.34
No College	-0.67
Family and Consumer Sciences	-2.36
Public Health	-0.66
Law	-0.65
Environment and Design	-0.34
Pharmacy	-2.72
Social Work	-2.17
Other	-1.08

Here are all three decision trees and their accuracy.

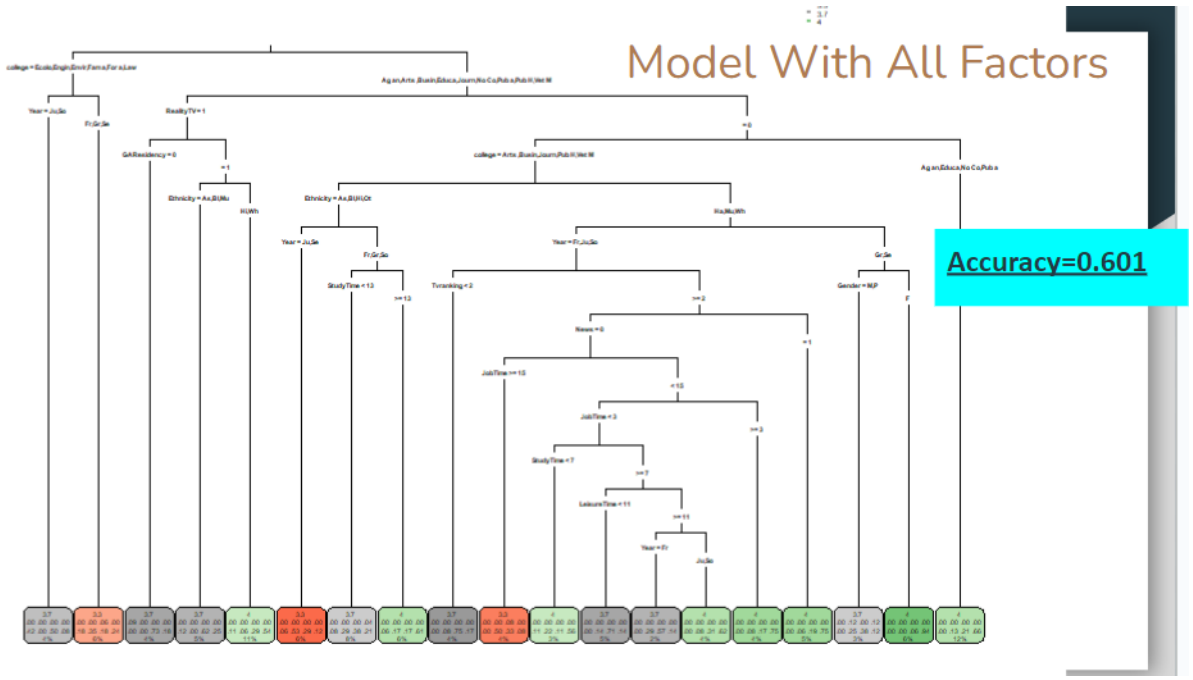

Figure 13: Decision Tree with all questions as predictors

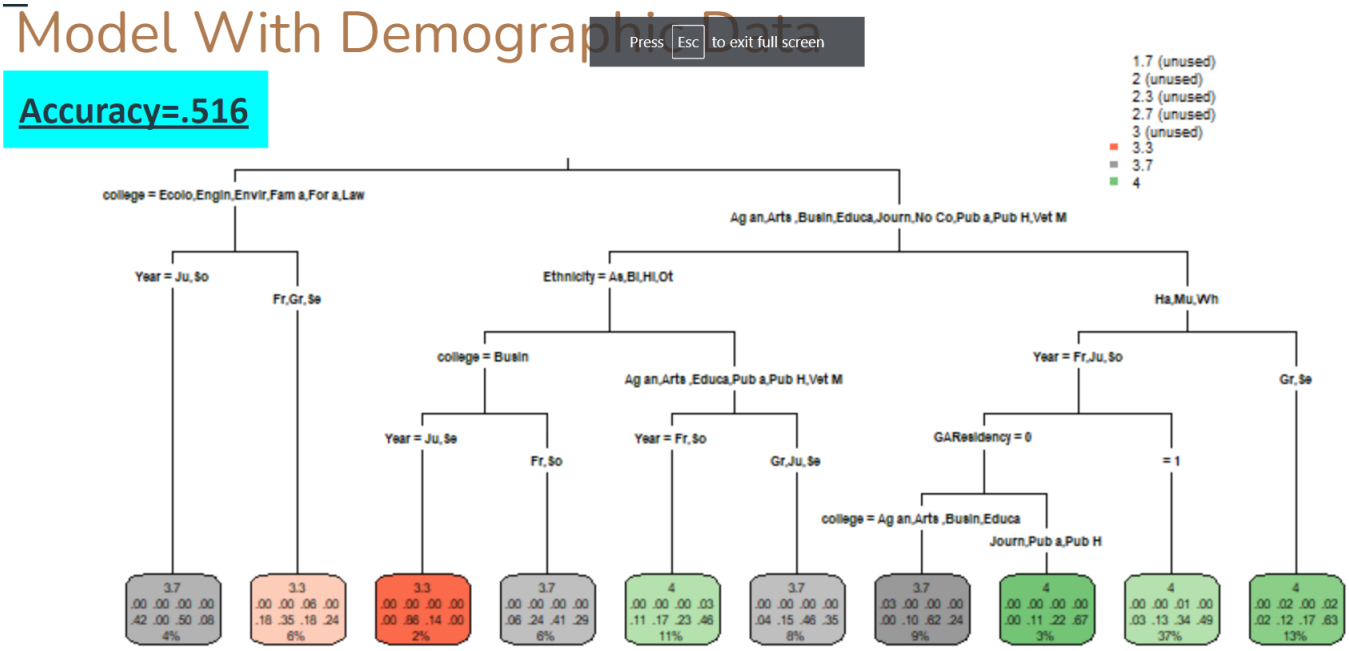

Figure 14: Decision Tree with Demographic data

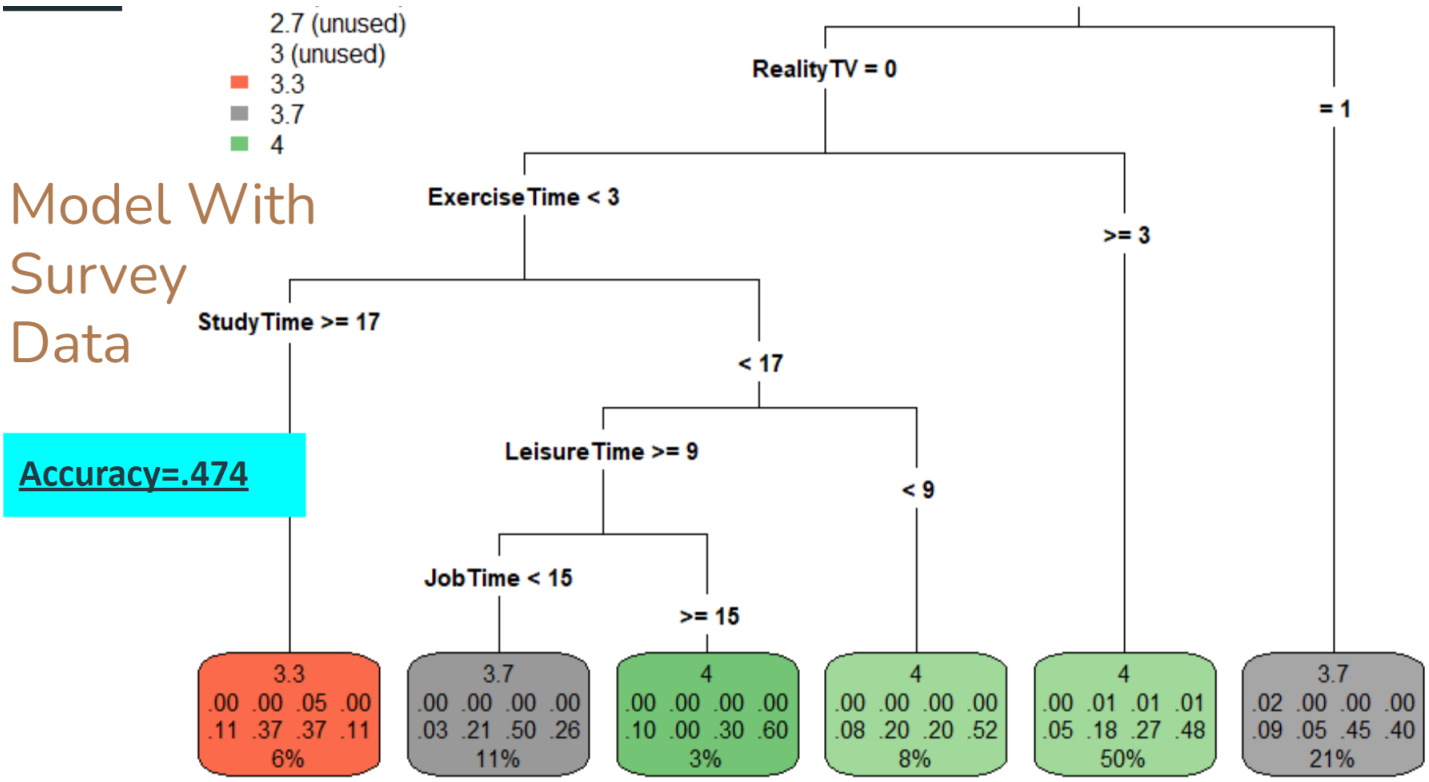

Figure 15: Decision Tree with Survey data

4 Conclusions

First, we are going to analyze the nonresponse data for year, then talk about the time estimates, as this information will inform some of the conclusions we draw about the time estimates. Based on the residuals of the χ^2 goodness of fit test for year, freshman and sophomores answer the survey a lot more than expected. Juniors answer the survey as expected. Seniors answer the survey slightly less than expected, and graduate students answer the survey a lot less than expected. We suspect that freshman and sophomores answered the survey more than expected because they are more likely to be living on campus. Also, during the end of the semester, older students are likely not coming to campus, so that could be why seniors and graduate students answered the survey less than expected.

Using year as a grouping variable, we were able to get weighted estimates for the time variable that reflect the population better than the unweighted estimates. For study time, the weighted estimate (19.18) was about 5 hours more than the unweighted estimate (13.92). We suspect this difference is because there are less graduate students in our survey than expected. It is safe to assume that graduate students study more than freshman and sophomores. Thus, the weighted estimate increased because the graduate student responses were weighted more than the freshman and sophomore responses. For job time, we see the same trend that the weighted estimate (12.45) is greater than the unweighted estimate (6.71) which in this case is nearly double. Once again, we think this occurred because freshman and sophomores are probably less likely to have a job compared to seniors and especially graduate students. For exercise time, the weighted estimate (4.68) is only slightly less than the unweighted estimate (5.11). This small change shows that exercise time does not vary much based on year. For leisure time, we see the a similar trend ass with exercise time. The weighted estimate (13.36) is only slightly less than the unweighted estimate (14.07). Like exercise time, this small change shows that leisure time does not vary much based on year.

Now back to the rest of the nonresponse data. Based on the residuals of the χ^2 goodness of fit test for gender, men and women answered the survey as expected. The other gender category (in our survey this was classified as "Prefer not to say" based on the data from the UGA Fact Book 2022) answered the survey more than expected. We suspect this significant difference occurred because of small sample size, as we had only four responses for this category which weakens the χ^2 goodness of fit test.

Based on the residuals of the χ^2 goodness of fit test for ethnicity, American Indian, Hispanic, multiracial, and

white/Middle Eastern students answered the survey as expected. Asian, Hawaiian/Pacific Islander, and other ethnicities answered the survey more than expected. Black/African-American answered the survey less than expected.

Based on the residuals of the χ^2 goodness of fit test for GA residency, GA and non-GA residents answered the survey as expected. However, the p-value of 0.05139 was still very small. A larger sample size may tell us if there actually is a difference or not.

Based on the residuals of the χ^2 goodness of fit test college, Engineering, Agriculture and Environmental Science, Arts and Sciences, Journalism and Mass Communication, Vet Med, Ecology, Forestry and Natural Resources, No college, Public Health, Law, Environment and Design, and Other answered the survey as expected. Public and International Affairs and Business answered the survey more than expected. Education, Family and Consumer Science, Pharmacy, and Social Work answered the survey less than expected. Because of where we were stationed, there could be some bias towards the colleges of the students who answered the survey. For example, we were fairly close to the Business school, so that could explain why they answered the survey more than expected. We were far from the Education, Pharmacy, and Social Work colleges, so that could be why these students answered the survey less than expected (and not at all in some cases).

Looking at the three decision trees, the model with all the factors had the highest accuracy of 0.601. The other two models had pretty similar accuracies with the demographic model having a slightly higher accuracy of 0.516 compared to the non-demographic model with an accuracy of 0.474. Even though the non-demographic decision tree was slightly less accurate than the demographic tree, it was a simpler model which gives it an advantage in interpretability. Overall, these models are pretty similar in predicting grades. This shows that the non-demographic data is about as good at predicting grade as the demographic data, but it would be better to use both. One downside of these models was that they only predicted grades that were B or above. This is likely do to the data being highly skewed towards higher grades. We think that some of the respondents may have lied or are overly optimistic about their grades this semester, which would contribute to the skewness of the data.