

SNAC Forecast

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Introduction

This analysis aims to predict the number of patrons SNAC will have next year. We begin with preliminary visualizations, then build a time series model to project unique visitations for the next year.

Data Visualization

SNAC has seen a significant rise in the number of unique patrons visiting on a monthly basis.

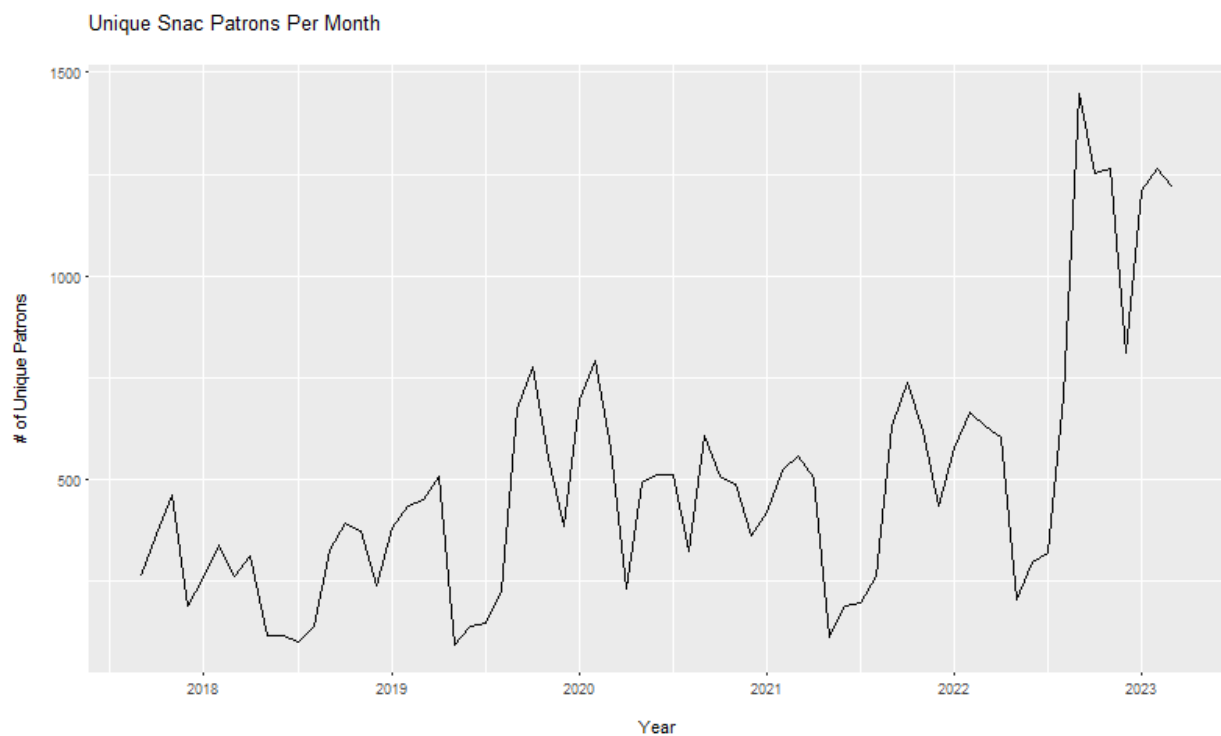


Figure 1: A popularity surge beginning in September 2022 reflects growing student demand for SNAC

SARIMA Model

A seasonal auto-regressive moving average model was fit to predict the number of SNAC patrons we should expect to see over the next 12 months. ARIMA models are the most common class of statistical model for forecasting demand. These models assume a time-dependence structure in the data. In other words, information from predictions made on known data (at time t , for example) can be used to make predictions about measurements at time $t + 1$.

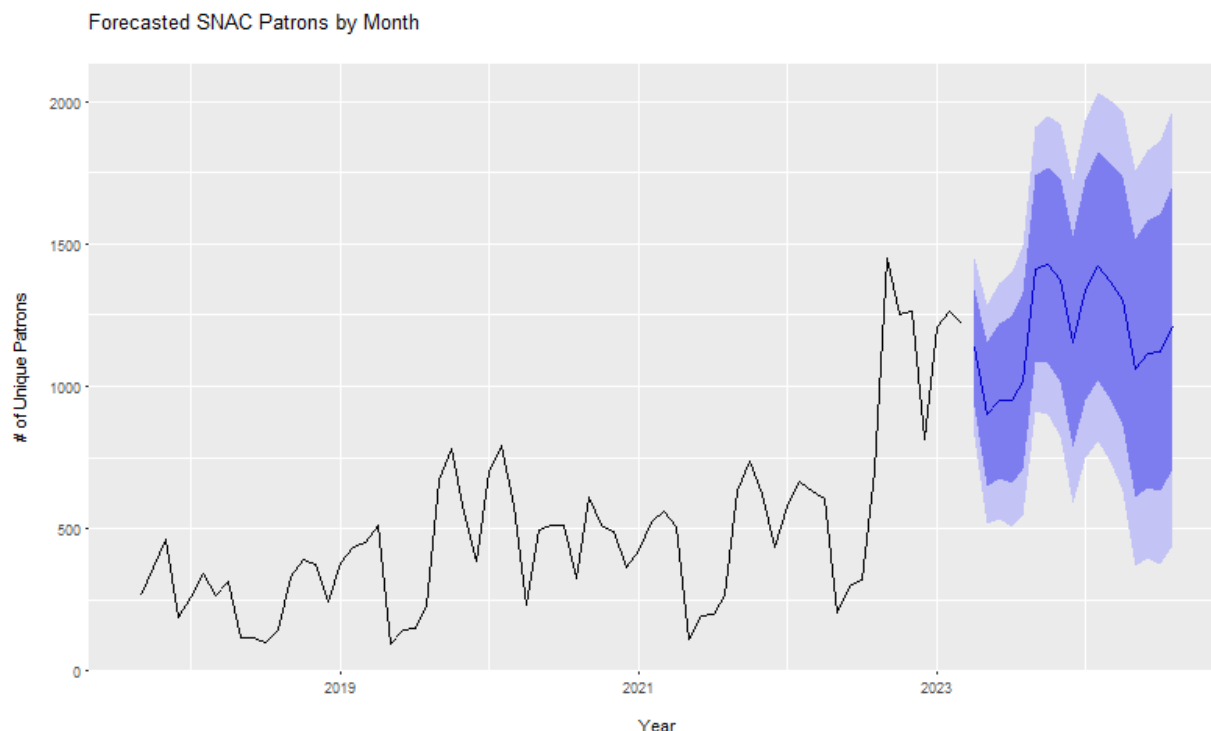


Figure 2: Prediction intervals are wide indicating some uncertainty in the model, but even the low end of the interval suggests that the increased demand is here to stay.

Over the next 12 months, the model estimates SNAC will see an average of 1205 unduplicated patrons per month. During the previous 12-month cycle SNAC assisted an average of 883 unique students per month. The previous 12 months saw 464 unique students per month.

Simple Regression Setting

To answer the question: How many unduplicated individuals/households does your agency plan to serve in the coming year with this funding? we will build a simple linear regression model. The model will use the number of unique patrons per month to predict the number of unique patrons per year. I suspect near perfect correlation between these variables so we should be able to get a reasonable estimate.

Note that the data collected for the current academic year was incomplete. The value used for the September 2022 through March 2023 was an extrapolation that assumed decaying growth in the number of unique patrons per year (a more precise estimate can be calculated if necessary). The calculation was

$$Y = \frac{3041}{7} * 5 * 0.7$$

where 3041 is the number of unique patrons *so far* this academic year, and 5 is the number of months we don't yet have data for. 0.7 is the decay factor.

The linear model was fit on just 6 data points, but $R^2 = 0.94$ and a highly significant p-value corroborates suspected high-correlation.

For the upcoming academic year, the time series model predicted that SNAC will serve an average of 1275. Taking this value as input to our model, SNAC should expect to see 5109 unique visitors for the upcoming academic year.