Have you ever wondered why you can’t buy a monthly pass on BART? As a daily BART commuter, I spend almost $150 a month on BART fares. Browsing their [website](http://bart.gov/tickets/index.aspx), I learned that “BART fares are set with a mileage-based formula, therefore time-based passes (e.g., weekly or monthly) are not available.” Using BART’s fare table, and Google Maps driving directions, I figured out what their formula is.

Fare = 1.75 + 0.105xMiles + 4.50 if you’re traveling to/from SFO

This formula explains 98.5% of the fare. If you want to know how I figured this out, keep reading!

First, we need the fare between every pair of stations. [Here is BART’s fare table](http://www.bart.gov/docs/community_meetings/March_2012/1.4_fare%20table.pdf), effective July 1, 2012, which lists the fare between every pair of stations in the system. With 44 stations, that’s 946 pairs!

The next step was to figure out how far apart each station is. I enlisted my wizard friend Ryan Schenk to query the Google Maps API driving directions for each pair of stations, and thereby grabbed just the mileage.

Now, we are ready for statistics! I had two pieces of prior knowledge that I gave to the regression model. First, I know that the minimum fare between stations is $1.75. Second, I know there is a surcharge for traveling to or from the San Francisco International Airport station. Therefore, I included an SFO dummy variable, which is 1 if the trip originates or terminates at SFO, and 0 otherwise. Secondly, I expect to be 1.75. No doubt the Bayesians out there have a more rigorous way to incorporate this, but I ran the model with and without a specified intercept and got similar results.

Ten and a half cents per mile seems like a pretty good deal to me, considering the [IRS](http://www.irs.gov/uac/2013-Standard-Mileage-Rates-Up-1-Cent-per-Mile-for-Business,-Medical-and-Moving) values business miles at 56.5 cents, moving miles at 24 cents, and charitable miles at 14 cents. However, BART is not the only mileage-based system in the US: Washington DC’s Metro system also uses distance-based fares.