

Ideas for my capstone projects:

1-) Before moving to United States, I was working with a 2008-2012 database from a Colombian private health insurance company composed of doctors, location, specialty, number of patients, number of appointments, number of surgeries, cost per appointment and cost per surgery. I was developing an agent-based model in matlab (which I enjoy doing) with parameters optimized by genetic algorithm in order to find out if doctors' behavior (why some doctors have more surgeries/appointments rate than others) can be explained by their wish to maximize income. One idea is to write and improve this work in python (I did most of the code in matlab, except the genetic algorithm implementation, and it would be an opportunity for me to learn that).

2-) I have been reading about Bayesian statistics and I am very excited about learning how to use it. I have been trained in classical (frequentist) statistics, but not in Bayesian statistics and I would really appreciate to learn that. I can understand the concepts by myself, but I need to learn how to implement, for example, Markov Chain Monte Carlo. So other idea is to use the database cited above and Bayesian statistics to predict the behavior of doctors (if doctors from some specialty and/or location are more prone to refer patients to surgeries).

3-) Besides learning Bayesian statistics, I really enjoy working with issues involving income inequality. A simple proposal would be to work with Bayesian regressions involving gini index and some other variables like gdp per capita, corruption perception index, murders per 100.000 habitants and the [https://en.wikipedia.org/wiki/Great\\_Gatsby\\_curve](https://en.wikipedia.org/wiki/Great_Gatsby_curve) .

4-) Alternatively, I would also be interested in using Bayesian statistics with financial variables like the S&P 500. Series of financial variables are not difficult to obtain. One fun/interesting activity would be to predict if the S&P 500 would be positive or negative tomorrow based on information about the index today plus other information like inflation perception, interest rate, TED spread and even the political party controlling the presidency and both houses. Alternatively, another interesting activity would be to organize a portfolio of stocks aimed at some objective like minimize risk.

5-) Finally, I have applied to have access to <https://landscan.ornl.gov> . One colleague of mine told me that some years ago he used data from that website to construct a simulation and see how different increases in sea levels would affect the global population. I think it would be great if we could replicate that.

So these are the five ideas I had. I would be happy to work with any of them.

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