

Grocery Deal Hunter Application: Finding Ways to Cut Costs

(Technical Paper)

Potential implications of using machine learning to supplement understaffed USCIS

(STS Paper)

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction:

As prices for common household goods and inflation start to rise, people need to save money in every way they can. “The food index increased 11.4 percent over the last year, the largest 12-month increase since the period ending May 1979” (BLS). The technical project, grocery deal hunter app, proposes to create a mobile application which can take the prices of multiple different grocery stores to find the cheapest combination of prices for a grocery list. This is important since groceries are a necessary expense, so people don’t have the option to cut costs by simply consuming less.

My STS question, which is unrelated to the technical project asks: what are the potential implications of using machine learning to supplement understaffed USCIS? The United States Citizen and Immigration Services (USCIS) are suffering from a severe understaffing problem. They are simply unable to handle the number of cases as is, and “there were 8.5 million pending applications at USCIS as of April, and over 5 million of those were pending beyond their deadlines” (Maurer). So, to help alleviate this problem, could machine learning algorithms be used to help automate this process? Machine learning is the process of a network of nodes learning how to solve a specific type of problem by being fed a set of test inputs with known answers against which the program can compare its own output and modify itself (Samuel, 2008). This is repeated countless times so the program can perform the task better and better. Millions of people are going to be waiting for years for the agency’s decisions if the current system is left as is. The outcomes of these cases are life changing. Putting them on hold for so many years can induce massive anxiety and stress. It could also lead to financial losses and missed employment opportunities. USCIS is already planning to be able to fully support end-to-end electronic processing by 2026 (USCIS Section 4103). It seems like a natural next step to automate the

decision-making process to further decrease processing times since all of the necessary information will be digital soon anyways.

Technical Project:

Abstract:

There is a nationwide increase in the prices of basic necessities, especially gas and food. The proposed solution to this is the development of a mobile app that can scour through nearby grocery stores' apps to find which items to buy at which stores to get the overall lowest cost, including gas costs. An iterative UX wheel method would be used to approach this problem, and it would be developed in the Kotlin framework.

STS Problem:

The issues that cause the giant backlog of cases at the USCIS can be broken down to 2 main root causes. A lack of manpower, and a lack of funding. "'The pandemic led to a 40 percent reduction in immigration filings ... [which] caused USCIS to twice notify over two-thirds of its staff of a potential furlough due to its anticipated inability to meet payroll expenses" (Maurer). By addressing the USCIS's lack of manpower by introducing an algorithm to take over much of the workers' responsibilities, the lack of funding would be addressed since the agency wouldn't need as many employees. The paper will mostly follow the frameworks of SCOT and Public Policy.

The affected parties would be the immigrants, USCIS employees, and the broader public of America. The broader public of America might be affected by this depending on the number of immigrants who are let through. There are concerns around immigration that "a 10 percent increase in the number of workers with a particular set of skills probably lowers the wage of that

group by at least 3 percent” (Stauffer). Their concerns are valid, and I will be examining these concerns by finding, reading, and synthesizing previous literature. The next social group is the immigrants who would be directly affected. “Current (as of January 2016) predicted GC wait times for immigrant doctoral recipients from India and China are 10 and 6 years, respectively. This may decrease the probability of retention of fresh graduates (0–2 years since graduation) from these two countries by one-half and one-third, respectively” (Khosla). Excessive wait times can fatigue anyone, and it is turning away even the best talents due to the USCIS’s sheer inefficiency. There is the chance that the algorithm would make a mistake and wrongly deny an immigrant who should have been approved, but there is an appealing process to a different branch of the USCIS to cover such cases. “Filing an appeal does not delay any decision in your case from going into the effect or extend a previously set departure date”, so these people could still suffer irreversible harm (USCIS. Questions). Another social group to consider is the USCIS workers who could potentially be displaced by the introduction of this algorithm. Although they might be negatively impacted by the algorithm, the current system is unsustainable. Even while facing the backlog of millions of cases, the agency seriously considered a furlough because of the extent of its financial troubles. So, it is unlikely that the algorithm would displace many potential future employees. Their group size is also greatly dwarfed by the other two groups.

My goal for the timeline is to first have a complete prospectus by the end of the semester. This will be necessary to plan out the rest of the research paper. Then, by the end of February I should have the research all done, and finished up around half of the paper. I will then have a first draft around the end of March, and a final draft at the end of April. That would leave me some time to add some polish to it.

Key Works

Hagendorff, T. (2020). The Ethics of AI Ethics: An Evaluation of Guidelines. *Minds & Machines* 30, 99–120. <https://doi.org/10.1007/s11023-020-09517-8>

This paper gives a detailed overview of the field of Artificial Intelligence (AI) ethics. I will use this paper to see how a machine learning system proposed in the STS question could fit in with the AI ethics guidelines.

Miller, S. (2019). Machine Learning, Ethics and Law. *Australasian Journal of Information Systems*, 23 <https://doi.org/10.3127/ajis.v23i0.1893>

This paper discusses the ethical and legal issues that could arise from the use of machine learning techniques. It specifically focuses on the use of machine learning in profiling & predictive policing, legal adjudication, and machines' compliance with legally enshrined moral principles. I will use this source for when it might be harmful to use machine learning in a setting such as the USCIS which has similarities or is related to all three points.

Samuel, A.L. (1959) Some Studies in Machine Learning Using the Game of Checkers. *IBM Journal of Research and Development*. <https://doi.org/10.1147/rd.33.0210>

This is one of the foundational works about machine learning, and explains the basics of how it works. The author used it to teach a program to play checkers, which was the first of its kind. I will be using it to explain the general concepts of how machine learning algorithms are taught, and how it can apply to my STS question.

USCIS. (2019) RAO DIRECTORATE – OFFICER TRAINING: RAO Combined Training Program DECISION MAKING - TRAINING MODULE.

https://www.uscis.gov/sites/default/files/document/foia/Decision_Making_LP_RAO.pdf

This document is a training module for officers who would make legal adjudications for the Refugee, Asylum and International Operations Directorate (RAIO) at USCIS. I will use this document to analyze the steps of the decision-making process at USCIS. Understanding how the problem is solved manually is important in considering how to automate parts of it through machine learning.

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