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November 10th, 2020
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Writing 1

Writing 1 Dasgupta

Amazon, the biggest e-commerce platform, has become so ingrained in our society that buying anything online is synonymous with it. Many people are aware of the positive and negative impacts of the company, but the convenience of the platform prevents people from choosing alternatives. In the words of Hasan Minaj's *Patriot Act*, Amazon, "Convenience is the commodity that matters most to our generation."[1]

E-commerce is growing larger every passing year and it is increasingly evident that brick-and-mortar in-person stores may no longer be around. Movements like "shop local" and "buy local" are popular because of the many benefits of local small businesses. One of the many reasons to buy local is the typically more sustainable processes used in creation of consumer goods. Another reason to support small businesses is that you are directly supporting someone's dream. The main drawback of small businesses is that it usually is not as convenient as large businesses. For example, if you wanted to purchase groceries, clothes, and electronics, it is very unlikely that one trip to one local business could meet all of your needs. However, a trip to a large chain store like Target or Walmart would most likely be able to meet all of your needs.

Therefore, a clear need for a tool that allows user customization to meet personal sustainability goals to offset the environmental impact of online shopping was discovered and Pachira was created. Pachira is a small step in making individual consumerism more intentional and informed. We want to empower our users to make more informed decisions about their personal impact while still being convenient and user-friendly. Users can search for local alternatives filtering by large and/or small businesses. This allows for them to be able to make informed decisions as there are tradeoffs the user can optimize for: convenience or sustainability.

Pachira is a combined web application and browser extension that aims to increase the sustainability of online shopping in a world increasingly embracing e-commerce. Users install a browser extension that will scrape their online shopping cart contents. Pachira will then give users a score based on their cart contents and give users the option to view alternatives. All the suggested alternatives are brick-and-mortar local stores filtered based on user preferences such as business size, distance from the user, and other factors. We also provide environmental impact scores of our alternatives to help users make more informed purchasing decisions. If a user selects a presented alternative, we will provide an eco-friendly route from their location to the brick-and-mortar destination. Pachira also aims to allow users to steadily improve their sustainability and track their progress. This is done by data visualization of past use and allows users to easily see their impact and empowers them to continue to set new sustainability goals for their consumerism.

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While corporations have a greater need to reevaluate their large environmental impact, individual efforts toward sustainability are still important on a smaller scale. Pachira empowers users to hold themselves accountable to their own sustainability standards and allows them to take control of their personal environmental consumption.

[1] Minhaj, Hasan, "Amazon | Patriot Act with Hasan Minhaj | Netflix" *Youtube*, commentary by Hasan Minhaj, 4 Nov. 2018, *youtube.com/watch?v=5maXvZ5fyQY*

Writing 1 Schwarz

The world is currently facing a climate crisis. In order to combat this climate emergency, major societal changes must be made. It is crucial that people start taking steps in their daily lives to progress towards a more sustainable future. Choices that people make everyday have the potential to negatively impact the earth's environment. For example, online shopping is an incredibly convenient option that many partake in, but its environmental impacts are often worse than driving to a local store[1]. To help solve this problem, our team has come up with Pachira. Pachira is a browser extension that aims to increase the sustainability of online shopping in a world increasingly embracing e-commerce. When wastefully online shopping, Pachira uses machine learning, an application of artificial intelligence that allows the computer to learn and improve from experience, to suggest local alternatives with a lower environmental impact. Pachira is a cross-browser compatible, secure extension that aims to help users improve their ability to make sustainable purchases by allowing users to set goals.

Pachira allows users to save time while shopping sustainably. Instead of spending hours scouring the internet for more environmentally-friendly alternatives, Pachira does it for you. Through using web scraping technologies, Pachira takes all of the items in your online shopping cart and produces a list of local stores that have your items in stock. When shopping online, products often come from different distribution centers that are thousands of miles apart. Shopping locally is a crucial step in cutting down on fuel consumption and air pollution, not to mention helping your local economy flourish.

In order to determine the environmental impact of each item in your shopping cart, Pachira uses machine learning to score each item by metrics of the transit distance, packaging, and how eco friendly the product itself is. The scoring algorithm will rate how sustainable your online shopping cart is, and Pachira will provide suggestions as to how the sustainability score can be improved.

Due to the nature of Pachira storing many of the user's preferences, security is of the utmost importance. Browser extensions are notorious for lacking security measures. Upon downloading, the user is prompted with a permission request to access data, and even then Pachira will use the minimum amount of user data necessary to function. Users are required to

make Pachira accounts with secure passwords for authentication. Ultimately, the most secure methodologies are utilized in the makeup of Pachira.

Although online shopping from massive companies is incredibly convenient, the damage it has done to the planet is detrimental to our futures. We've created Pachira with the mindset of still wanting to shop in a way that is quick and convenient by allowing users to find local, more environmentally friendly options with the click of a button. In order to create major societal change in the way we shop, we need a tool that is quick and easy to use. Pachira is exactly that.

1. Kavilanz, Parija. "Online Shopping Can Be Worse for the Environment than Driving to a Store." *CNN*, Cable News Network, 7 July 2020, www.cnn.com/2020/02/26/tech/greenhouse-gas-emissions-retail/index.html. https://www.cnn.com/2020/02/26/tech/greenhouse-gas-emissions-retail/index.html

Writing 1 Shanley

Pachira, the goal-oriented browser extension for sustainable shopping

Online shopping is an essential part of many people's daily lives. Whether the reason for online shopping is out of necessity or convenience, the reality is that the modern consumer is more likely to purchase online than they are to go to a department store[1]. The modern consumer is also becoming more environmentally conscious through their shopping by being more selective about which brands they buy from[2]. These two sentiments don't always necessarily synergize, however. Online shopping incurs a carbon footprint that shopping in person at department stores doesn't: the transportation of their order. This, coupled with the regular carbon footprint produced by products, like fast fashion overproduction and waste, can lead consumers feeling cognitive dissonance when purchasing their goods online.

This is where our product, Pachira, comes in. Pachira is a browser extension that enables online shoppers to scan their shopping carts and receive a "sustainable score" on their shopping cart. It will evaluate factors such as whether or not it is fast fashion, internationally shipped, and others to see how sustainable the production and shipping of your entire shopping cart is. Then, if their score doesn't meet a score that a user chooses for their sustainability goal, Pachira will find alternatives, be it a local store selling something similar, or another online merchant selling the same product but shipping more sustainably. This way, Pachira helps consumers make educated and sustainable decisions while enjoying the convenience of online shopping.

Another feature of Pachira is its emphasis on goal-oriented progress for its users. Pachira allows users to set their "sustainability goal" to wherever they would like. It then issues a short quiz to its users and determines where their current sustainable score is. Then, Pachira tracks user progress. Users can receive a newsletter detailing their online shopping habits- specifically

how sustainable they were. Pachira will detail the user's progress by displaying their data for the past month of usage. With intuitive data visualization, users can understand easily in what ways they want to try and improve their online shopping.

Overall, Pachira is an application that gives users the ability to improve themselves at their own pace when it comes to sustainability and shopping. In a realm where this journey to self-improvement can be incredibly gatekept and overwhelming, Pachira hopes to provide users with an easy method of improving their habits in whatever way they can.

1. CNBC, Apr 2 2019
https://www.cnbc.com/2019/04/02/online-shopping-officially-overtakes-brick-and-mortar-retail-for-the-first-time-ever.html
2. Business Insider, Apr 22 2020
https://www.businessinsider.com/sustainability-as-a-value-is-changing-how-consumers-shop

Writing 2

Comparison

Functionally, our project is similar to something like Honey[1]. Honey is a Google Chrome extension that finds online shoppers coupon codes automatically when a shopper navigates to their shopping cart. It shares commonality with Honey in that it is a chrome extension that users make an account for initially and then are able to reap the benefits easily while they shop. Pachira will web scrape the contents of a user's shopping cart and determine how sustainable their purchase is. If it is less eco-conscious than the user would like, Pachira will then suggest more sustainable alternatives, like local shops where they can purchase similar items. This combined functionality is unique on its own, but there are two other apps that have similar functional components. DoneGood[2] is a Google Chrome extension that will suggest sustainable online alternatives to items you want to purchase from web stores like Amazon. Neutral[3] is a Google Chrome extension that will determine the carbon footprint produced by your purchase.

Pachira combines these two components for a more useful product. Having both the online and local retail suggestions *and* the carbon footprint calculation makes Pachira different, but what makes Pachira novel is how this combination of components is used. The combination of these two components allows for users to utilize Pachira to track their progress on sustainability goals, such as tracking the overall scores of purchases made over time. Allowing users to set these goals can lead to more sustainable behavior in the long term.

1. Honey. *Honey Chrome Webstore* Accessed Oct 2020
https://chrome.google.com/webstore/detail/honey/bmnlcjabgnpnenekpadlanbbkooimhnj?hl=en-US

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2. DoneGood. *DoneGood Chrome Webstore* Accessed Oct 2020
https://chrome.google.com/webstore/detail/donegood-ethical-affordab/bhniioifamlbhnepehjpcpfcopknilfc?hl=en-US

3. Neutral. *Neutral Chrome Webstore* Accessed Oct 2020
https://chrome.google.com/webstore/detail/neutral/oagdejngkgbfnaankoehhanicaodcdpd?ref=producthunt

Target Audience

In 2019, a poll by Marist College and National Public Radio (NPR) found that 76% of all United States adults shopped online, with 25% doing so at least once a month and 16% at least once a week.[1] Of the 76% of adult online shoppers, it was found that 64% chose online shopping over traditional brick-and-mortar stores due to the convenience of online shopping.[1] Clearly, the main advantage of online shopping is the convenience, but one of the biggest drawbacks is the environmental cost.

Climate change has been a topic of discussion for the past 30 years but concern has become increasingly prevalent with studies showing that Earth may become uninhabitable within the next 30 years.[2] Pachira aims to combine the convenience of online shopping with the lesser environmental impact of brick-and-mortar stores and empower users to track their personal sustainability. The target audience of our product is online shoppers who want to improve their sustainability and support local brick-and-mortar stores.

Pachira is free to download from the chrome extension store. Pachira's revenue model is commission based from affiliate marketing. Everytime a user clicks a suggested alternative link & affiliate confirms your purchase, Pachira makes 5-10% commission based on the affiliate store for corporations. Everytime a user clicks a suggested alternative link & affiliate confirms your purchase, Pachira makes 1% commission based on the affiliate store for registered small businesses. This allows us to provide a free service without selling user data.

1. NPR, The Marist Poll. *Nature of the Sample: NPR/Marist Poll of 1,057 National Adults* Apr. 25, 2019
http://maristpoll.marist.edu/wp-content/misc/usapolls/us180423_NPR/NPR_Marist%20Poll_Tables%20of%20Questions_May%202018.pdf

2. Alia Armistead, David Spratt, Stefaan White, & Harry Goodman. *Australian local government climate emergency declarations: A preliminary survey.* Breakthrough - National Centre for Climate Restoration. Feb 2020
https://www.breakthroughonline.org.au/papers

Societal and Global Impact

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Online shopping has taken over much of the shopping industry worldwide. Society has quickly adapted to the concept of wanting an item and getting it delivered the next day with just the click of a button. However, the negative impacts of this are detrimental to the planet and local communities. Packages are often shipped with too much material, which amounts to a large quantity of waste, and they frequently end up being inefficiently transported. Due to the fact that it takes more fuel for packages to travel thousands of miles than it does for a person to go to a store to get a similar locally-sourced item[2], online shopping conglomerates, such as Amazon and Walmart, dramatically increase the carbon footprint of the E-Commerce industry.

Pachira allows for a seamless transition to sustainable shopping without society needing to endure a habitual shift. Essentially, the convenience of Pachira's centralized toolset allows users to shop more sustainably without them needing to manually search for more eco-friendly products. The easy-to-use factor of Pachira has the potential to yield a large user base, meaning that the number of environmentally friendly shoppers would increase. The global impact of more people shopping sustainably would be tremendously beneficial in terms of the environment and the circulation of money among local economies, as it would advocate for more people to shop locally with ease. If Pachira is used widely, it could lead to a decrease in carbon emissions, and the stimulation of the local economy would ultimately result in lower unemployment rates and job growth[2].

1. "Environmental Impact of Online Shopping." *British Council*, 18 May 2020, learnenglish.britishcouncil.org/business-english/business-magazine/environmental-impact-of-online-shopping.
https://learnenglish.britishcouncil.org/business-english/business-magazine/environmental-impact-of-online-shopping

2. Home - Center for Community and Economic Development - Michigan State University, ced.msu.edu/. https://ced.msu.edu/upload/reports/why%20buy%20local.pdf

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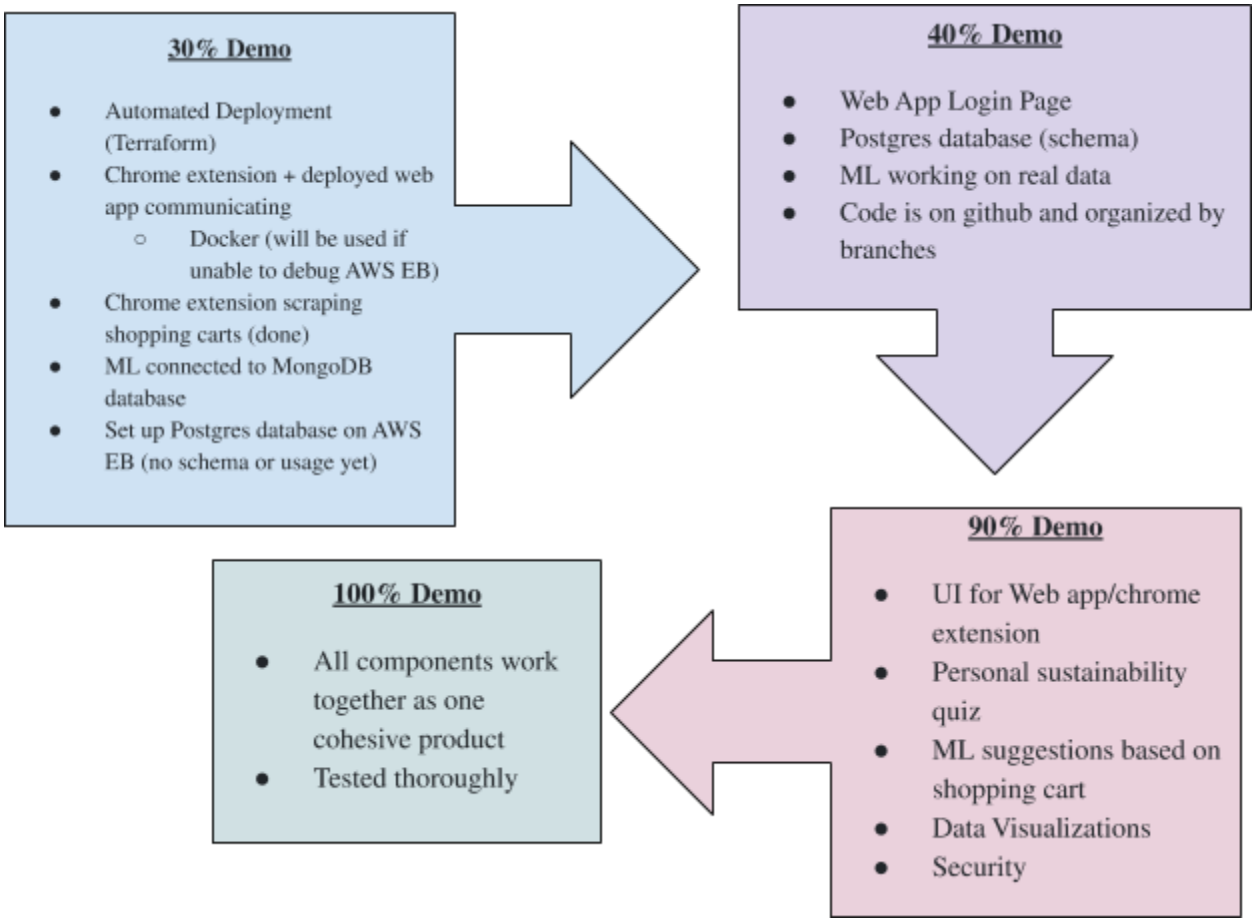

Figure 1, Pachira timeline and milestones

Technical innovation

Pachira allows users to transition to sustainable shopping through an easy-to-use and convenient web extension. Pachira's innovative nature stems from its cohesive toolset, as different aspects of Pachira are found in other tools, but Pachira offers them all in one convenient location. For example, DoneGood is a chrome extension that will offer eco-friendly alternatives sold at other online retailers, but it doesn't have the capacity to recommend local brick-and-mortar stores like Pachira does. Additionally, another chrome extension, Neutral, allows the user to track their carbon footprint and gain insight on how to reduce it. Pachira goes

above and beyond to combine the tools offered by both DoneGood and Neutral and offers a more personalized approach to recommendations by utilizing the user's location and shopping history. Pachira users will be prompted to make an account using the web app interface, and their sustainable shopping history, location, and shopping preferences will be stored. The machine learning component of Pachira will then use that data to make personalized, sustainable shopping recommendations based on the products parsed from the user's online shopping cart. Pachira is technically novel due to the fact that it combines many different technologies in order to create the most seamless user experience.

Technical feasibility

Pachira is composed of three major components: Chrome extension, web application, and machine learning model. The Chrome extension, consisting of HTML and vanilla Javascript, uses message passing to be able to parse a user's shopping cart into JSON to send to the web app. The web application is deployed on AWS Elastic Beanstalk and contains a load balancer, compute instance, and relational database. The web application is a Django server and computes the sustainability score of the user's shopping cart contents. This score is then sent and displayed in the Chrome extension.

Upon seeing the sustainability score of their cart, users can choose to see alternatives. These alternative choices are calculated by a machine learning collaborative filtering algorithm, which outputs recommendations with a lower sustainability score.

In every aspect of Pachira's technology stack, there has been extensive research done to determine the best tools, frameworks, and technologies for the needed functionality. This allows us to be confident in the technical feasibility of our product. The conclusion of this research and development is the above proposed technology stack for our product.

Cost, risks, and risk mitigation

Pachira will be running on AWS Elastic Beanstalk due to its convenient combination of multiple services that we need, such as an ec2 instance and a relational database. However, this all-in-one tool costs about $60 a month if it was to stay running the whole time. Pachira will also have a Machine Learning model deployed on AWS, which is a compute cost that is to be determined but will be less than the web app. These costs are inefficient during production of our project, so we've come up with solutions such as using a Continuous Integration tool such as Github Actions and Terraform to be able to spin up a server for our web application quickly, and save the state before terminating when we're done working on it.

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We estimate a lightweight Chrome extension with about 100 Lines of Code (LOC). Our Machine Learning model will need a python script to run it, which will be about 500 LOC. The web application will have around 500 LOC, with the Continuous Integration program at about 100 LOC.

The project timeline is detailed in Figure 1, with each percentage demo equating to Pachira's biggest milestones.