SE 491 BIWEEKLY REPORT 2

sdmay20-25: Consumer Aware Warehouse Management

1/30/20 – 2/13/20

Team Member	Roles
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Elijah Buscho elijah@iastate.edu	Test Engineer Software Dev Proj Manager
Devin Üner druner@iastate.edu	Software Architect Machine Learning Specialist

Bi-Weekly Summary

Objective

The primary objective has been to finalize queries needed for input into the learning algorithm, finalize the testing plan, and ideate on how the data will be visualized in a user interface.

Accomplishments

The backend team, Andrew, Omair and Sam created queries that reported the stock levels of a certain item in the warehouse. This data was given to Elijah and Devin who are developing the initial algorithm. Questions to the client were resolved and thus issues in querying the database were fixed.

Here is a query that is going to be very helpful. It shows the products coming into the warehouse:

```
SELECT
	clients.id as account_id,
	clients.archived as account_archived,
	inventory_centers.name,
	inventory_centers.menu_active as inventory_center_active,
	inventory_centers.operator_app,
	client_products.on_hand_inventory as client_inventory,
	distributor_products.id as dp_id,
	brands.name,
	products.name,
	TRIM(LEADING ' - ' FROM CONCAT(coalesce(product_sizes.number_of_packs || ' ' ||
product_sizes.pack_name || ' of '),product_sizes.units, ' - ',
product_sizes.size_of_measurement, ' ', product_sizes.unit_of_measurement, ' ',
product_sizes.name)) AS display_name,
	client_products.auto_reorder as active
FROM
	purchasing_sizes as client_products
inner join
	distributors as inventory_centers
```

```
       on inventory_centers.id = client_products.distributor_id and
inventory_centers.distributor_type = 1
inner join client_inventory_purchasing_sizes
       on client_products.id = client_inventory_purchasing_sizes.purchasing_size_id
inner join corporate_users as clients
       on clients.id = inventory_centers.corporate_user_id
inner join purchasing_sizes as distributor_products
       on client_products.reorder_purchasing_size_id = distributor_products.id
inner join skus
       on distributor_products.sku_id = skus.id
inner join distributors
       on distributor_products.distributor_id = distributors.id
inner join products
       on skus.product_id = products.id
inner join breweries as brands
   on products.brewery_id = brands.id
inner join product_sizes
       on product_sizes.id = skus.product_size_id
where
       client_products.deleted is false
       and inventory_centers.deleted is false
       and clients.deleted is false
       and distributor_products.deleted is false
       and distributors.deleted is false
       and skus.deleted is false
       and products.deleted is false
       and brands.deleted is false
       and product_sizes.deleted is false
       and client_products.archived is false
       and distributor_products.archived is false
       and distributors.archived is false
       and skus.archived is false
       and inventory_centers.operator_app is false
```

```
        group by
        clients.id,
        clients.archived,
        inventory_centers.name,
        inventory_centers.menu_active,
        inventory_centers.operator_app,
        client_products.on_hand_inventory,
        distributor_products.id,
        brands.name,
        products.name,
        TRIM(LEADING ' - ' FROM CONCAT(coalesce(product_sizes.number_of_packs || ' ' ||
product_sizes.pack_name || ' of '),product_sizes.units, ' - ',
product_sizes.size_of_measurement, ' ', product_sizes.unit_of_measurement, ' ',
product_sizes.name)),
        client_products.auto_reorder
               order by
        inventory_centers.name asc,
        brands.name asc,
        products.name asc;
```

Summary of Weekly Advisor Meeting

During the weekly advisor meeting, a consensus was made on the testing plan and creation of another diagram to detail the plan of traceability from a requirement to each interface component.

Past Accomplishments (Individual)

Lindsey Sleeth

I have worked on learning how to program using React and coming up with a plan for how to visualize the data in the frontend UI -- initially we thought that it would be good to take a similar approach to how our client Crafty is currently visualizing the data in a table format for each distributor which has all of the products and estimates of how much they should order from each vendor. However, after working on the LTSM network, we decided as a team that it will be better to show a list of all of the products that can be ordered for a given day and the trends of each individual product rather than

showing it on a distributor basis because it will allow our client to very quickly and easily identify what products they need to order, how much, and why they should order a specific quantity. We want to be able to visualize things such as weekly consumption rate and fluctuations of stock in the warehouse, as well as, get the best price for the product if there are multiple distributors that they can order from.

Elijah Buscho
I worked on getting familiar with python, matplotlib.pyplot, scikit-learn, and implementing machine learning and statistical analysis methods in python.

Jameel Kelley
I met with other team members in the frontend team to work on examples and explain project structure. I worked on researching how to implement cgiscripts on an Nginx server to get Devin's scripts working (not possible with Nginx).

Andrew Smith
I worked on getting more data from the database with query development. I also worked with our Client to figure out where some information in the database is. I found out with the help of our client that there isn't historic data for customer inventory history.

Omair Ijaz
Andrew, Sam and I worked together to create a query that would report the stock levels of a given SKU. In addition, I created a page in our git wiki that shows the tables in the database and the queries we have written. The wiki page also makes note of special cases in the tables and gives explanations to each query written.

Sam Stifter
With the help of Omair and Andrew, we generated a report of the stock levels over time of a selection of products to help with modeling the data. The queries needed to be engineered using the given data relations and table descriptions. It was reported back that the model was not a very good fit. We tried to see if the individual customer stock levels were being tracked, but they were not so we will not be able to model that data.

Devin Üner
Worked on optimizing the LTSM network, working on making it genetically optimized as well as variably risky.

Individual Contributions

Name	Individual Contributions	Hours this Period	Hours Cumulative
Lindsey Sleeth	Learning react, data visualization in the UI	7	13
Jameel Kelley	React training, cgi-script research	4	9
Sam Stifter	Data Queries and Exports	15	22
Andrew Smith	Database work and query development	16	22
Omair Ijaz	Tables wiki page and Database Querying	13	19
Elijah Buscho	Learning python and machine learning techniques	10	25
Devin Üner	Genetic algorithms	2	6

Pending Issues

Lindsey Sleeth

It has been difficult to decide how we will visualize the data for our client, specifically because it is difficult to get away from thow they currently visualize the data, and also because how we will visualize the data will depend largely on the output of the algorithm and how we can elaborate on the data that is output by supporting it with factors that influenced the algorithm's output. There are some rough sketches I can make of a table that will list all items for a day and how ordering history and consumption rates will be visualized through a graph, but it depends largely on which queries we can get based on the data that is available and the output of the algorithm based on the data that it reads in.

Another issue I faced is that while learning React, I could not figure out if we should be using TypeScript or not. Using TypeScript would give us type-safety, but it will add an additional learning challenge and I am not sure if it will be worth the end result or not.

Elijah Buscho
No issues

Jameel Kelley
One issue that was discovered this period is dealing with using cgi-scripts with a Nginx web server. These two technologies are not compatable out of the box and thus a migration is needed on the hosting server to using apache.

Andrew Smith
Spent a long time trying to get customer inventory history as our algorithm team wanted that information. After trying for hours to get that information, I asked our client for some help and he informed me that they only started collecting that information at the start of this project. So the data that I was finding was the correct data but there just isn't enough to create trends.
Omair Ijaz

Sam Stifter
Data was hard to find using all the joins. We had to contact the sponsor for help understanding the data relations. The initial data did not produce a good model, so more options for modeling need to be explored.

Devin Üner
Apache is going to need to be installed to make the web site work with the python code. Not really hard, just another thing to do.

Upcoming Plans

Lindsey Sleeth
My primary task is to do front-end development and display the data that is output from the algorithm in a way that makes sense. I will continue learning React and create small components that can be used in a larger design once we have a more concrete decision about the output of the algorithm. Something I also hope to accomplish this next week is get a formalized wireframe for data presentation and present this to our customer and our advisor to get feedback on what they like and dislike. The data visualization is very important because our client has expressed to us that it is very hard for their team to

understand how much product they should order when they don’t understand the predictions that are made for how much that they should order. Their team does not trust the client’s current algorithm and so not only do we need to have a better prediction method, but it needs to be highly trustable too.

Elijah Buscho
Continue learning python, and then start learning time-series forecasting algorithms, and begin implementing them.

Jameel Kelley
I plan on reviewing my GitLab merge request for the current frontend implementation, working with the team to teach React, working with Devin to implement the cgi-scripts.

Andrew Smith
Continuing to get data figure out how to connect it to our backend framework and possibly connecting it to our algorithm team.

Omair Ijaz
Next period we need to be able to write more specific queries that can give us more detailed information. We need a query that would help us figure out how many of each product is leaving the warehouse, and a query that shows us an individual customer's stock.

Sam Stifter
Working on ways to determine the customer demand by computing how much of each product is leaving the warehouse to customer deliveries every week.

Devin Üner
Add apache to the server, finish the genetic algorithm, maybe try another algorithm?