SE 492 BIWEEKLY REPORT 4

sdmay20-25: Consumer Aware Warehouse Management

2/28/20 – 3/12/20

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 objective of the team this week was to improve the documentation and traceability for the project, continue developing the front-end, generate more queries and endpoints for the algorithm, and refine the current algorithm, as well as, research and implement new algorithms.

Accomplishments

Significant progress was made both on the frontend with distributor cards and also with querying the database and setting up endpoints needed for displaying information on the frontend. Another algorithm for prediction was also implemented.

Additionally, this week our team demoed our current working version to our client Jimmy.

Summary of Weekly Advisor Meeting

Our advisor indicated that we should work on integrating our pieces together in the weekly reports to generate a more cohesive summary of the tasks that we complete and how it fits into the larger scope of the project.

Additionally, we had a discussion about improving the communication among team members and sub-teams, integrate new work into our project more frequently, and have better synchronization between sub-teams. The expectation is there each sub-team has knowledge about who is doing what, who is expecting what, and how the pieces will be integrated together.

After we return from Spring Break we will have a detailed plan completed for our remaining milestones with tangible goals on a weekly basis.

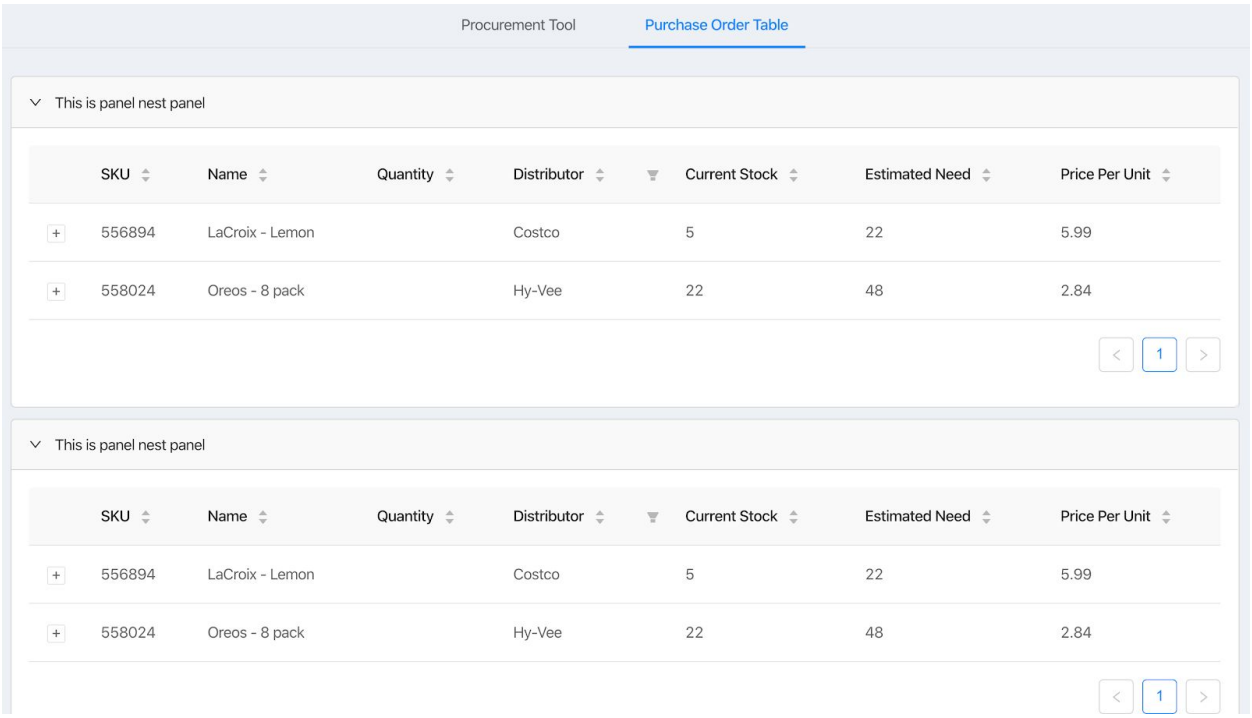
Past Accomplishments (Individual)

Lindsey Sleeth

This week I created a component for distributor cards which will be used in the tab Purchase Order Table. This page will contain a dynamic view of all products that should be reordered for the calendar day. Each distributor has a card which shows a list of items from that distributor that must be reordered. The reason for grouping the items by

distributor is because there is a purchaser for each distributor, and each distributor has attributes such as the days that they will accept orders, order minimums, etc.

Here is a screenshot of the working state of the component. The issue mentioned below in pending issues is causing a build failure both on my local machine and for our pipeline.



Jameel and I made a list together of data points that we need for each distributor and products that we need to put into the table. In order to complete the dynamic card generation, I needed a list of distributors per each day of the week that accepts orders. This will allow for the dynamic generation of distributor cards.

The other endpoints needed for the frontend team were all of the products that a distributor has available for order, and product information about a product a distributor offers such as names of products, sku, quantity, and price. Currently we are using mock data in apiary to fill in the tables or hardcoding where possible.

Elijah Buscho
I implemented a naive forecasting algorithm. This algorithm requires the previous day real data, and predicts the data on the next day as exactly the same value. This algorithm is a very simple baseline that we can use to compare the accuracy of other

algorithms. The data set was split into 2 subsets, a train set comprised of the first ⅔ of the data set, and a test set comprised of the remaining ⅓ of the data set. I calculated the Mean Squared Error of the prediction on the train and test data sets for each of the 4 SKUs we have available. The result is below:

```
Naive TSF:
        Passion fruit train and test MSE:
         581.9707602339181
         758.9766081871345

         Earl Gray train and test MSE:
         0.99107142857142 86
         0.9380530973451328

         Watermelon train and test MSE:
         18.428571428571427
         33.46938775510204

         Granny Smith train and test MSE:
         20.066433566433567
         29.783216783216783
```

We can potentially use this information as a measure of goodness of the algorithms during optimization. There are still concerns that arise when using this method that need to be explored further.

Jameel Kelley

During this period I worked on integrating the new endpoint from the backend team. The new endpoint gives back information about the schedule of a given distributor. This allowed me to fill out a bit more of the Distributor Table. In the lower right screenshot you can see that a bit more information was filled out in the distributor section. The display needs to be updated to be more visually pleasing. I will be communicating with the team in the upcoming meetings about what is best for this. I also worked with Lindsey to generate data properties needed from distributors for displaying still. Below are code screenshots of using typescript to enforce the correct format of the DistributorSchedule Entity, rendering it, and an output.

```
async getSchedule(
  request: DistributorScheduleGetRequest
): Promise<DistributorSchedule> {
  const url = `http://sdmay20-25.ece.iastate.edu:8080/distributor/schedule/${request.distributorId}`;
  let response;
  try {
    response = await axios.get(url);
    return new DistributorSchedule(response.data);
  } catch (error) {
    throw new Error({
      error: error,
      message:
        "There was a problem fetching the distributor list. Try connecting to the ISU VPN"
    });
  }
}
```

```
<p>week_basis: {schedule.id != -1 && schedule.weekBasis}</p>
<p>
  days_to_delivery: {schedule.id != -1 && schedule.daysToDelivery}
</p>
<p>
  days_to_delivery_end:{" "}
  {schedule.id != -1 && schedule.daysToDeliveryEnd}
</p>
<p>
  start_date:{" "}
  {schedule.id != -1 && schedule.startDate.format("MMM Do YY")}
</p>
</div>
<div>
  <p>
    Active: {schedule.id != -1 && schedule.orderDays}
  </p>
  <p>Order Due: </p>
```

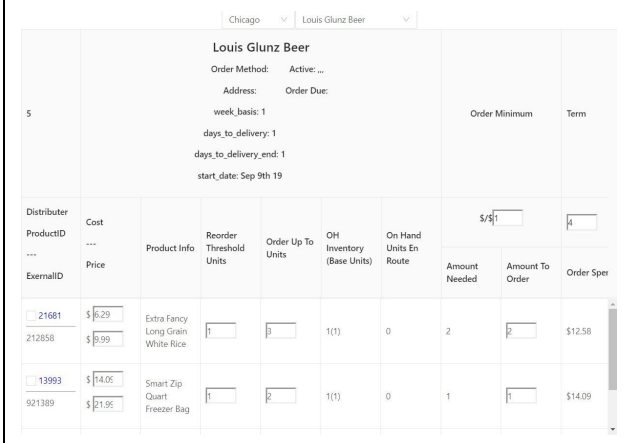
```
export class DistributorSchedule {
  id: number;
  name: string;
  orderDays: string;
  weekBasis: number;
  daysToDelivery: number;
  daysToDeliveryEnd: number;
  startDate: moment.Moment;

  constructor(data: any[]) {

    if (data.length > 0) {
      this.id = data[0].id;
      this.name = data[0].name;


      const orderOays = data.map(schedule => {
        return Day[schedule.orderDays];
      });
      this.orderDays = orderOays.join(",");

      this.weekBasis = data[0].weekBasis;
      this.daysToDelivery = data[0].daysToDelivery;
      this.daysToDeliveryEnd = data[0].daysToDeliveryEnd;
      this.startDate = moment(data[0].startDate);
    } else {
      this.id = -1;
      this.name = "";
      this.orderDays = "";
      this.weekBasis = 0;
      this.daysToDelivery = 0;
      this.daysToDeliveryEnd = 0;
      this.startDate = moment();
    }
  }
}
```



Andrew Smith

Over the time frame for this report I worked on setting up more endpoints for the frontend team and the algorithm team. I got two endpoints set up and under code review. One was an endpoint for getting distributors ordering dates and delivery schedules. This information allows for the days of the week per distributor that we can order, helping the algorithm team in the future to refine and produce a quantity to order to sustain until the next time to order. The front end team also requested this information to display on the UI so I set this up to supply that information to them as

well. The other end point I worked on was getting the products a distributor has as well as other information wanted for those products such as cost and inventory target levels. The front end team requested this information to display on the UI. I believe the current UI is going to display a list of distributors then once selected a list of their products will be listed with the other information provided in the end point like cost and inventory target level. This will also be helpful information for the algorithm because it will need to know the cost of each product from the distributor. Apart from these endpoints I was also requested to make an end point to get missed sale items by sku id. The algorithm team requested this for validation purposes for now. This way we can ensure that our algorithm will produce less missed sales than the current system. I, however, could not get this one working because of a bug that I will further elaborate in the pending issues section about this problem.

Omair Ijaz
Since the last weekly report, I have completed my Get Warehouse Deliveries By Day query.

Sam Stifter
This week I worked with Andrew and Devin to identify what needs to be done to change our prediction from predicting stock levels to predicting the amount of consumption on a weekly basis. This may give us a better and more accurate model. We identified the queries that would be needed to get the data we would require to make these predictions. We also need to communicate with the client to make sure the queries we used are correct.

Devin Üner

I worked more on the genetic optimization algorithm and on researching more algorithms we can use. And I considered adding luck into the algorithm to avoid overfitting and local minimums but have not yet completed it.

Individual Contributions

Name	Individual Contributions	Hours this Period	Hours Cumulative
Lindsey Sleeth	Creating nested and dynamic components	12	25

Jameel Kelley	Updating API with Devin	10	19
Sam Stifter	Algorithm Refinements and Data Finding	10	42
Andrew Smith	Database work and query development	12	50
Omair Ijaz	Tables wiki page and Database Querying	13	44
Elijah Buscho	Implemented and evaluated naive forecasting algorithm	6	41
Devin Üner	Genetic algorithms	3	9

Pending Issues

Lindsey Sleeth

I am working with Jameel currently to resolve an issue with npm on our server. At this point in time, we are unsure if the issue actually correlates to the installation of npm on our server, or if it is an issue with OS compatibilities (I have a mac and Jameel has windows). There is little to no documentation for this error (pictured below), but it is causing our pipeline to fail. This error is reflected in Job #17136.

Elijah Buscho

We are still waiting on the distributor order history data and client demand data (missed sales and order history) per product in order to evaluate the accuracy of our recommendations from the backend team. We might also need expiration data for the same purpose as well.

Jameel Kelley

At the very end of this period the backend team was able to get the query for retrieving products from distributors. Thus, we were waiting for that query during this period. However, there are no outstanding issues left.

Andrew Smith

Like I said before in the past accomplishments section, my current and only issue is the bug I have ran into for the missed sales by sku id. When I create the DTO and the other files to edit to add the endpoint everything was the same as the other endpoints, but when I went to start the spring application I would get the error that one of the elements isn't mapped. I walked through all the joins that are associated with the query and found the element name, but I also saw that it was already mapped to the correct tables. I'm going to have to continue looking into the files to make sure the joins are correct in that chain and look over my code to ensure that I didn't make a mistake.

Omair Ijaz

Currently we are trying to complete the client order history query so that the algorithm team can make a better prediction. Internally, the backend team will need to figure out how to account for perishable items.

Sam Stifter

The client order history has been a tough query to nail down. I have been communicating with the client about it and we are making progress but the data structure around orders is confusing. The client may have to provide parts of the query.

Devin Üner

None

Upcoming Plans

Lindsey Sleeth

After we come back from Spring Break, I will have completed the dynamic distributor cards for the Product Order Table. It is my goal to also complete the list of products to be dynamically generated per distributor, provided that
I can dynamically generate distributor cards. Once Andrew gets warehouse order quantities, these can be displayed in the table as well instead of the mock data currently.

Elijah Buscho

Once I get the data required for calculating recommendation accuracy I will begin developing an algorithm to evaluate the accuracy of our recommendations. In the

meantime I'll work on implementing other prediction algorithms, and other total loss measurement algorithms for optimization.

Jameel Kelley
New issues have been assigned to me to complete the frontend testing framework. Additionally, I will be working more closely with Lindsey over web meetings to complete the purchase order table.

Andrew Smith
One of the things I plan to help with is getting the warehouse orders quantities. This is for the algorithm team so that we can take the order quantities out of the inventory level counts so we can get overall consumption rates for a product as this is what we want to base our prediction on. I also plan on having the missed sales by sku id endpoint finished for the algorithm team so that they can validate their algorithm when then can generate predictions to make sure that our algorithm is better than the crafty's current system. I also plan on helping Sam with the client order history endpoint as I was originally assigned to this endpoint, but I couldn't figure it out. This is so the algorithm can also predict based on a client consumption rate not just warehouse consumption rate. I also plan on refining the current endpoint queries by adding flags to the queries such to make sure that a distributor or product is not deleted and other flags like that. I also am going to update our endpoint documentation through apiary.

Omair Ijaz
As a part of the backend team, we will still service any queries. These queries are posted in a slack channel that the team has access to. Most of the requested/required queries are complete bar a few roadblocks that Sam and Andrew are experiencing, which we need to meet with the client for.

Sam Stifter
I am currently stuck on the Client Order history query. I will be working with the Client and Andrew to get that one in a working state within the next week.

Devin Üner
I plan on adding luck into the genetic algorithm to avoid overfitting.