

CS316 Final Project Report

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Introduction

For our CS316 final project, our group chose to recreate Amazon and create a simpler online marketplace e-commerce website. Our design includes the basic features that Amazon has, such as different sellers and a variety of products that can be purchased, as well as basic functionalities for users such as purchasing and leaving reviews. We used the MERN (MongoDB, Express, React, and NodeJS) stack to create this site.

Deliverables

1) **Final code:** <https://github.com/JamesLeong98/miniamazon-cs316>

2) **Final video:**
<https://drive.google.com/file/d/1lodJDnQGTLVxzO0gBzGy3HnjfMP9Jxue/view?usp=sharing>

Database Design (noSQL Schemas)

We changed our database choice from SQL to noSQL (MongoDB).

Items and Review Schemas:

```
//Define review schema
const reviewSchema = new Schema({
  {
    authorId: { type: Schema.Types.ObjectId, ref: 'User', required: true },
    rating: { type: Number, required: true, min: 1, max: 5},
    title: { type: String, required: false },
    comment: { type: String, required: false },
  },
  {
    timestamps: true,
  }
});

//Define item schema
const itemSchema = new Schema({
  itemName: { type: String, required: true },
  category: { type: String, required: true },
  image: { type: String, required: false }, // link to AWS file
  description: { type: String, required: true },
  reviews: [reviewSchema],
  avgRating: { type: Number, required: false, min: 0, max: 5, default: 0},
  lowestPrice: { type: Number, required: false, default: 0},
});
```

SoldBy Schema (captures information of when user sells an item)

```
//Define schema for soldBy
const soldBySchema = new Schema({
  item: { type: Schema.Types.ObjectId, ref: 'Item', required: true },
  seller: { type: Schema.Types.ObjectId, ref: 'User', required: true },
  quantity: { type: Number, required: true },
  price: { type: Number, required: true },
});
```

Transaction Schema:

```
//Define transaction schema. A transaction is a list of transaction items made by a buyer at one datetime.
const transactionSchema = new Schema({
  {
    buyerId: { type: Schema.Types.ObjectId, ref: 'User', required: true },
    totalPrice: { type: Number, required: true },
    transactedItems: [{
      item: { type: Schema.Types.ObjectId, ref: 'Item', required: true },
      seller: { type: Schema.Types.ObjectId, ref: 'User', required: true },
      quantity: { type: Number, required: true },
      price: { type: Number, required: true },
    }],
  },
  {
    timestamps: true,
  }
});
```

User Schema:

```
//Define user schema
const userSchema = new Schema({
  fullName: { type: String, required: true },
  username: { type: String, required: true, unique: true },
  email: { type: String, required: true, unique: true, dropDups: true },
  password: { type: String, required: true },
  avatar : { type: String, required: false},
  isAuth: { type: Boolean, required: true, default: false },
  isSeller: { type: Boolean, required: true, default: false },
  isAdmin: { type: Boolean, required: true, default: false },
  balance: { type: Number, required: true, default: 0 }
});
```

Implementation

Login Page

The screenshot shows the login page for 'a mini amazon'. At the top is a dark blue header with a hamburger menu icon on the left, the 'a mini amazon' logo in the center, and a 'Sign In' link on the right. Below the header is a white box titled 'Sign-In'. Inside this box, there are two input fields: 'Email' and 'Password'. Below these fields is a yellow 'Sign In' button. At the bottom of the box, there is a link that says 'New user?' followed by 'Create your Mini Amazon account'.

- The user is prompted to enter their email and password, or create an account if they do not have one currently.

Create Account/Register Page

The screenshot shows the 'Create Account' page for 'a mini amazon'. It has the same dark blue header as the login page. Below the header is a white box titled 'Create Account'. Inside this box, there are five input fields: 'Full Name', 'Username', 'Email', 'Password', and 'Re-Enter Password'. Below these fields is a checkbox labeled 'Seller Account?'. At the bottom of the box is a yellow 'Register' button.


- If they wish to create an account, they must enter their name, username, email, password, and check the box if they want a seller account (otherwise they will have a default user account).

Main Page


(Main page - filtering options)

The screenshot shows a dropdown menu for filtering options. The text 'Sort By' is visible on the left. The dropdown menu is open, showing four options: 'alphabetical (A-Z)' (which is selected and has a checkmark), 'alphabetical (Z-A)', 'rating', and 'category'.

(Main page - example of sorting by rating)

Cart Profile

Sort By rating




Harry Potter Book Set

Books

\$64.90

★★★★★ 2 ratings




(30cm x 50cm , Plaids Cream White+White) - Miulee Classic Retro Checke...

Cushions & Accessories

\$7.99

★★★★★ 2 ratings




Blue Devils Tee

Apparel


\$20.00

★★★★☆ 8 ratings

(Main page - example of searching)

Cart Profile

Sort By alphabetical (A-Z)



Skippy's Peanut Butter Spread


Food & Beverage

\$2.30


★★★★☆ 3 ratings

- The user must be logged in to enter the Main page, or the user will be sent back to the login page
- Search options: search by string/value match on keyword, or filter by alphabetical, category, star ratings, etc
- Render search results after search submit
- Profile button that links to user profile page
- Cart button that links to cart page

Item Page

mini amazonCart Profile

[Back to Results](#)



(30cm x 50cm , Plaids Cream White+White) - Miulee Classic Retro Checkers Plaids Cotton Linen Soft Solid Decorative Square Throw Pillow Covers Home Decor Design Cushion Case for Sofa Bedroom Car 12 x 20 Inch 30 x 50 Cm

★★★★★ 2 reviews

Description:
Material: Grade A Cotton Linen. Natural eco-friendly materials, this is your most suitable choice. This cushion cover could surely provide a warm, welcoming feeling to your daily life. Size: 12 x 20 Inch / 30 x 50cm.
Zippers: This cushion cover has an invisible zipper. NOTE: 1 Pc pillow cover only. Pillow inserts are not included. Machine wash in cold water, delicate cycle and pattern available in both sides. Suitable for sofa, bed, home, office, living room, outdoor. MIULEE 100% SATISFACTION WARRANTY: Every pillow cover we make delivers premium quality and amazing workmanship. Plus, you get friendly customer service and Miulee 90-Days No Questions Asked Warranty.

Category:
Cushions & Accessories

Sellers:

Seller: goblue	Price: \$7.99	Available: 25	Quantity: <input type="text" value="1"/>	Add to cart
Seller: gored	Price: \$13.12	Available: 11	Quantity: <input type="text" value="1"/>	Add to cart

Reviews

There are 2 reviews for this product.

Reviewer: goblue
★★★★☆ 4 stars
2020-11-14
Customer service was very friendly

Reviewer: goblue
★★★★★ 5 stars
2020-11-16
very nice

Write a customer review for this product:


Product Rating (Stars)

Leave a Comment

[Submit](#)


- Category information for the item.
- Item information: Item name, brief item description, image, star rating, reviews.
- Selling information: Show main seller and a list of sellers selling this item (sorted in ascending price order). The list contains seller name, availability, quantity dropdown list, price, and add to cart button. Note that different sellers may have different selling prices for the item as well as different numbers of copies available.

Cart Page

mini amazonCart Profile


Shopping Cart

Price




(30cm x 50cm , Plaids Cream White+White) - Miulee Classic Retro Checkers Plaids Cotton Linen Soft Solid Decorative Square Throw Pillow Covers Home Decor Design Cushion Case for Sofa Bedroom Car 12 x 20 Inch 30 x 50 Cm
Sold By: goblue

Qty: [Delete](#)



3 Pc Mens Tie Bar Pinch Clip Set For Regular Ties 2.1 Inch
Sold By: gogreen

Qty: [Delete](#)



SCD1 Bathroom Solid Wood Stool Child Low Stool Old Man Slip Bathing Foot Washing Small Bench (Size : 30X22X28CM)
Sold By: goblue

Qty: [Delete](#)

Subtotal (4 items): \$199.65

[Proceed to Checkout](#)

\$7.99

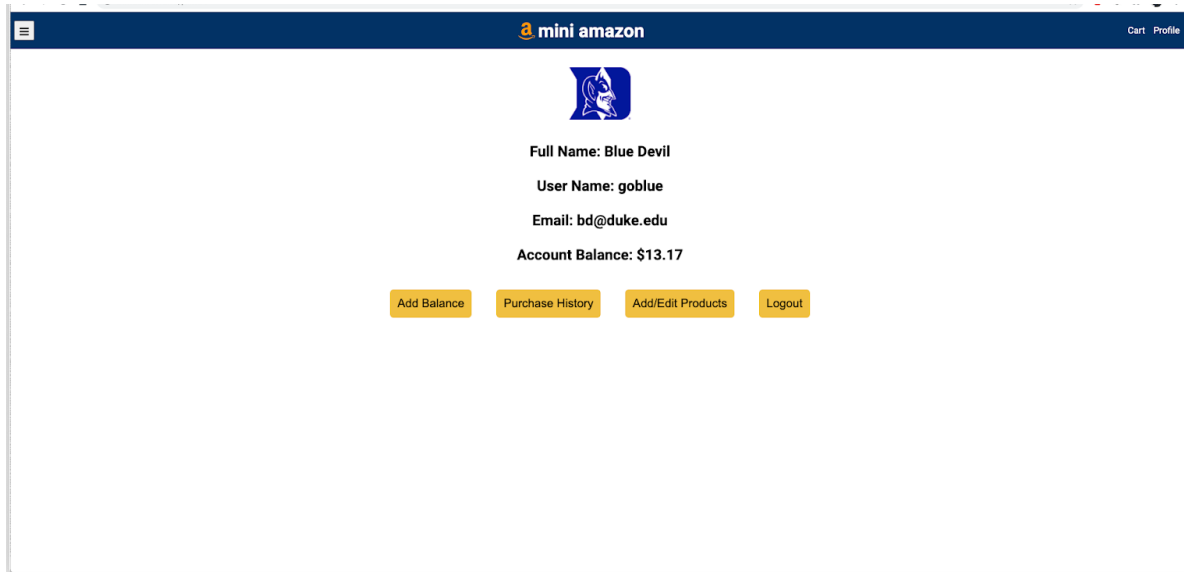
\$17.22

\$157.23

- List of items in the cart: item image, item name, seller name, price, count, and remove button. Item name should be the link to the item page.
- Users can remove items or change quantity.

- When a user adds an item to cart, make sure the amount added to cart is \leq quantity of item remaining. The item is deducted from the items list once the user makes a successful checkout.
- At time of purchase (clicking 'buy') ensure there are sufficient amounts of the item and balance left.
- Check out button: All items in cart will be recorded in transaction history. If the seller has not enough copies to sell, "insufficient quantity" alert shows up. If balance is insufficient, "balance is insufficient" alert pops up.


User profile page:



- User profile: all useful user information
- Name, username, email, account balance all displayed
- Buttons allowing user to add to their account balance, review their purchase history, add/edit products (seller account only), and logout

Purchase history page

Purchase History

Transaction Number: 5faf7e3912c72228ec749463
Order Total: \$7.99
Time of Transaction: 2020-11-14 06:50:33
<div><p>(30cm x 50cm , Plaids Cream White•White) - Miulee Classic Retro Checkers Plaids Cotton Linen Soft Solid Decorative Square Throw Pillow Covers Home Decor Design Cushion Case for Sofa Bedroom Car 12 x 20 Inch 30 x 50 Cm</p><p>Material:Grade A Cotton Linen.Natural eco-friendly materials,this is your most suitable choice.This cushion cover could surely provide a warm, welcoming feeling to your daily life. Size:12 x 20 Inch / 30 x 50cm. Zippers:This cushion cover has an invisible zipper NOTE:1 Pc pillow cover only,pillow inserts are not included.Machine wash in cold water, delicate cycle and pattern available in both sides.Suitable for sofa,bed,home,office,kEliving room,outdoor MIULEE 100% SATISFACTION WARRANTY:Every pillow cover we make delivers premium quality and amazing workmanship. Plus, you get friendly customer service and Miulee 90-Days No Questions Asked Warranty</p><p>Sold By: gobblue</p><p>Quantity: 1</p><p>Price: 7.985661565703575</p><p>Purchase Subtotal: 7.99</p></div>
Transaction Number: 5faf7ded12c72228ec7493ee
Order Total: \$43.34
Time of Transaction: 2020-11-14 06:49:17

- List of items purchased: item image, item name, seller name, price, count and purchased date/time. Item name should link to the item page. Total amount spent at the bottom.

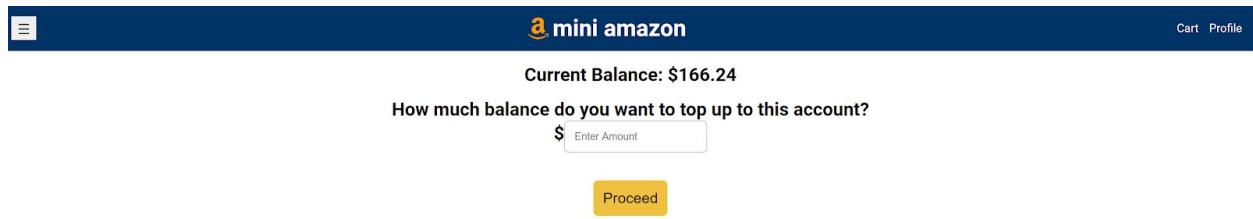
Selling list page (only if the user is also a seller)

mini amazon					Cart	Profile
Products					Create Product	
ID	Item Name	Price	Category	Action		
5f8a5f1dee52b63a60cf3a6b	Green Tea	10.00	Food & Beverage	Edit		
5f8a5f69ee52b63a60cf3a6c	Twinnings Chai Tea	7.00	Food & Beverage	Edit		
5f8afb6eb9add5e56f3ba7d	Blue Devils Tee	20.00	Apparel	Edit		
5f8afc726b9add5e56f3ba85	Harry Potter Book Set	64.90	Books	Edit		
5faf679538345d24b218c369	DreamWave - Tremor Portable Bluetooth Speaker - Green,Black	290.99	Electronics	Edit		
5faf679638345d24b218c36a	Universal Remote Control - 48-Device Universal Remote - Black	254.99	Electronics	Edit		
5faf679738345d24b218c36b	SpeakerCraft - 6-1/2 In-Ceiling Speakers (5-Pack) - White"	449.99	Electronics	Edit		
5faf679838345d24b218c36c	Kenwood KFC-1653MRW 6.5 2-way Marine Speakers Pair (White)"	46.69	Electronics	Edit		
5faf679938345d24b218c36d	Ultimate Ears MEGABLAST Portable Wi-Fi/Bluetooth Speaker with hands-free Amazon Alexa voice control (waterproof) - Graphite Black	299.99	Electronics	Edit		
5faf679a38345d24b218c36e	SpeakerCraft - Profile CRS6 Two 6-1/2 In-Ceiling Speaker (Each) - Black"	229.98	Electronics	Edit		
5faf679a38345d24b218c36f	DENAQ - AC Power Adapter and Charger for Select HP Omnibook, Pavilion and Presario Laptops - Black	25.89	Electronics	Edit		
5faf679b38345d24b218c370	Speaker - 60 Watt (60 W RMS) - 165 - 1650 Hz - 2-Way - 100%	459.00	Electronics	Edit		

- List of items being sold by a seller: item image, item name, price, and count. Item name should link to the item page. A delete button should appear on the right of each item to delete this item.
- Add/modify item button. When clicked, a container appears add/modify the list item. Input space for all fields needed for an item: item name, item image, item description, seller (this seller only) description, price, and count.
 - "Add item" should have all fields blank
 - "Modify item" should have them filled (editable) with previous values

- When modifying an item, sellers can edit the price and quantity, but not other attributes to prevent interference (in terms of description, item name, etc) with other sellers selling the same item.

Add Balance Page

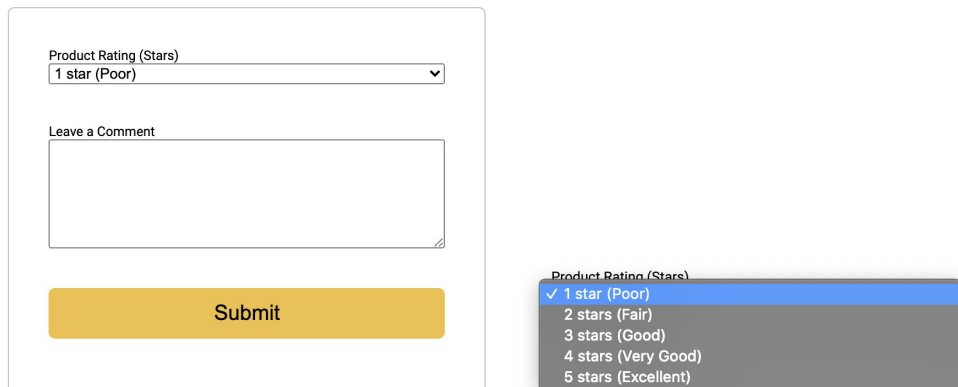


The Add Balance page features a dark blue header with a hamburger menu icon on the left, the 'mini amazon' logo in the center, and 'Cart Profile' links on the right. Below the header, the current balance is displayed as '\$166.24'. A prompt asks the user 'How much balance do you want to top up to this account?'. This is followed by a text input field with a dollar sign icon and the placeholder text 'Enter Amount'. A yellow 'Proceed' button is located at the bottom of the form.

- Miniamazon icon, User dropdown, Cart: (as before)
- Shows current balance of user.
- One input box:
 - How much balance do you want to top up to this account?
- One button:
 - Proceed.

Add Review Page

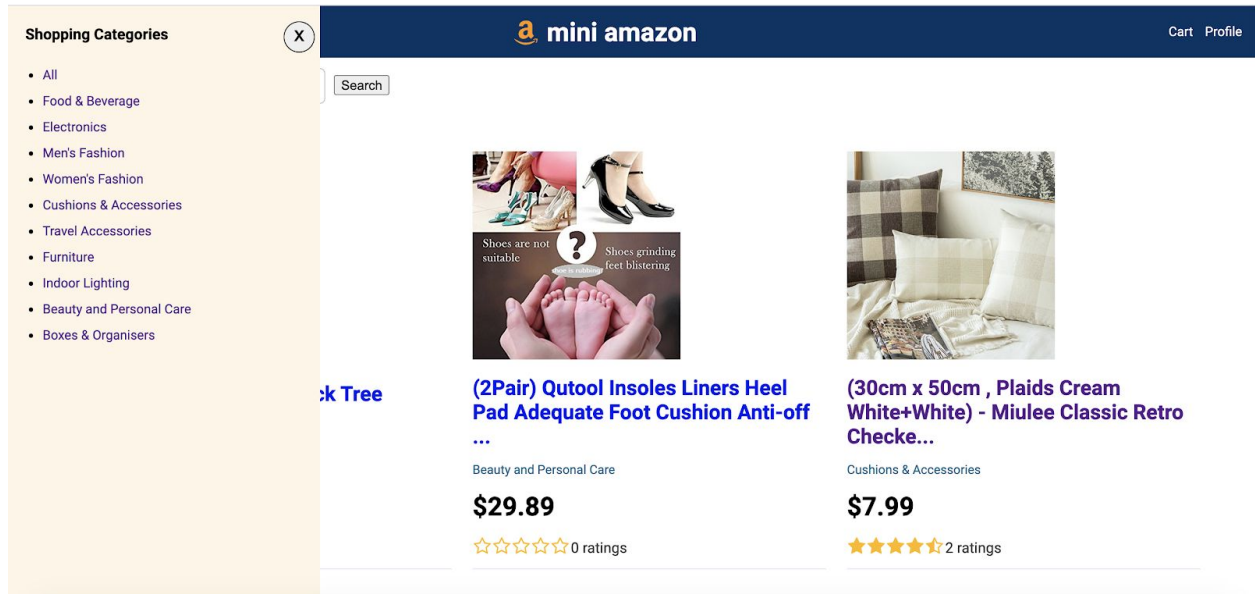
Write a customer review for this product:



The Add Review page contains a form titled 'Write a customer review for this product:'. The form includes a 'Product Rating (Stars)' dropdown menu currently set to '1 star (Poor)'. Below the rating is a text area labeled 'Leave a Comment'. A yellow 'Submit' button is positioned at the bottom of the form. To the right of the form, a separate dropdown menu for 'Product Rating (Stars)' is shown with its options expanded: '1 star (Poor)', '2 stars (Fair)', '3 stars (Good)', '4 stars (Very Good)', and '5 stars (Excellent)'. The '1 star (Poor)' option is highlighted with a blue background.

- Input space for rating for item, (optional rating for seller), and free text for the review itself.
- Submit button: confirms and submits the review

Sidebar



- Interactive sidebar to browse products by category

Dataset

To populate our database, we obtained data from [data.world](#). Specifically, four datasets were used: Electronics, Men's Fashion, Women's Fashion, and Amazon Australia Product Listing. Relevant columns from the datasets including product name, category, product image url, price, and description were extracted and cleaned up. We wrote a python code utilizing the Python HTTP library Requests to post products to our database.

```
import pandas as pd
import string
import numpy as np
import requests
import csv

url = 'http://localhost:8080/api/products/'

df = pd.read_csv(r'electronics_c.csv')
df2 = df.drop_duplicates()
k=0
prev=''
with open('id_price.csv','w',newline='') as f:
    writer = csv.writer(f)
    writer.writerow(['id','price'])
    for row in df2.iterrows():
        imgurl = row[1][2].split(',')
        if(imgurl != prev):
            prev = imgurl
            if('pisces' in imgurl[-1]):
                myobj = {'itemName': row[1][0], 'category': row[1][1], 'image': imgurl[-1], 'description': row[1][0]}
                print(myobj)
                k = k+1
                x = requests.post(url, data = myobj)
                ids = x.text.split("id\:")
                writer.writerow([ids[1][1:25],row[1][3]])
    if(k==200):
        break
```

Approximately 200 products were added to each of the nine categories: Electronics, Men's Fashion, Women's Fashion, Cushion & Accessories, Travel Accessories, Furniture, Indoor Lighting, Beauty and Personal Care, and Boxes & Organisers. Our current database holds approximately 1800 products.

MongoDB Injection Attack

As we were using MongoDB instead of SQL, we had to guard against MongoDB attacks. We used the mongoose library to implement our database, which already has built-in type casting and validation. This means that if an API request is sent to the backend, mongoose will validate the schema fields such that for example, if it expects a string and receives an object, the query will throw an error.

Also, we used the mongo-sanitize library for further protection against query selector injection attacks. The sanitize function is applied on every API request input that will be used to query the database (example below), and it will strip out any keys that start with '\$' in the input, so it can be passed to MongoDB without worrying about malicious users overwriting query selectors.

```
//Get list of items sold by seller id
router.get( path: "/", isAuth, isSeller, async(req : Request<ParamsDictionary, any, any, ParsedQs> , res : Response<any> ) => {
  const sellList = await SoldBy.find({seller: sanitize(req.user.uid)}).populate('item');
  res.send(sellList);
})
```

Work Division

	Backend/ Frontend (based on our design)
Anna Xu	Register, profile, seller list, create/edit product, deployment
James Leong	Backend models and endpoints for items, transactions, soldBy Add to cart, cart checkout, transactions, profile rerendering, balance updating/transference, search bar/filter MongoDB injection guards Database setup and population User authentications Deployment
Michael Jang	Backend model and route for user User profile page, balance page Populating database
Mina Kim	Add/display reviews (seller, rating, item), register page, list of other sellers, site appearance/logo
Vanessa Chen	Add selling list page (show all seller products, seller can add and edit products) Add cart functionality (add to, delete elements in cart) Login Page Site appearance Deployment

Challenges

It was our first time building a full-stack end-to-end web app from scratch, so we definitely faced obstacles while trying to implement the various functionalities of our app. We also had to efficiently divide the work and combine the front and back end properly. We spent some time trying to get authentication to work, as each user has access to different sets of functionalities/data.

Future Work

In the future, we might implement more features such as recommended products based on user preferences, and the ability to make and process return requests. Another interesting feature we could add would be to allow different login methods, such as connecting through Google or Facebook. This would require us to look into more authentication techniques and utilize the APIs from those sites to fetch a certain user's data. Additionally, we could try to improve the response time/interactivity time for much larger datasets, because realistically an e-commerce website would need to handle datasets that are much larger than ours. This could be done through pagination of the products or lazy loading of API calls.