From Students…
…to Professionals

Project Plan
Picking and Fulfillment Efficiency

The Capstone Experience

Team Meijer
Mitchell Setsma
Dylan Iseler
Sarah Mostofizadeh
Aslan Tashtanov
Yingbao Wang

Department of Computer Science and Engineering
Michigan State University
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Functional Specifications

• Improves professional shoppers' fulfillment efficiency
• A path finding algorithm is used to create optimal shopping routes
• Assist professional shoppers to navigate the store based on an ordered grocery list
• Machine learning to increase route efficiency overtime using data collection
Design Specifications

• Take existing professional shopper’s online orders and produces an optimal shopping route
• Algorithm will take frozen, refrigerated, and unique items into account
• Application will track the time it takes to fulfil orders, evolving to reduce this time
• A map of the store layout will be provided
Screen Mockup: Main Page

Welcome, Dave

Aisle #9

Birds Eye Peas
Type: Frozen Veg
#11111

Picked Up

Not in Stock

Birds Eye Corn
Type: Frozen Veg
#22222

Dino Chicken Nuggets
Type: Frozen Veg
#33333
Screen Mockup: Scroll and Navigation

1. Welcome, Dave
   - You are viewing order number: 1234567

   **Aisle #9**
   - Birds Eye Peas
     - Type: Frozen Veg
     - #11111
     - Picked Up
     - Not in Stock

2. Welcome, Dave
   - You are viewing order number: 1234567

   **Aisle #8**
   - Birds Eye Corn
     - Type: Frozen Veg
     - #22222
     - Picked Up
     - Not in Stock

3. Welcome, Dave
   - You are viewing order number: 1234567

   **Aisle #10**
   - Dino Chicken Nuggets
     - Type: Frozen
     - #333333
     - Picked Up
     - Not in Stock
Screen Mockup: Store Map
Screen Mockup: Settings
Technical Specifications

- Android and iOS development on Xamarin
- Builder pattern to create items
- Data collection to improve route optimization
- Machine learning
  - Perceptron training
- Picking algorithm
  - S-Shape heuristic
  - Largest Gap heuristic
System Architecture

- Microsoft Azure
- SQL
- Shipt
- Xamarin
- GPS
- Android
- Apple

The Capstone Experience
Team Meijer Project Plan Presentation
System Components

• Hardware Platforms
  ▪ iOS devices including iPad
  ▪ Android devices

• Software Platforms / Technologies
  ▪ Visual Studio's Xamarin mobile development
  ▪ Azure SQL database hosting
  ▪ Azure DevOps Git application version control
Risks

Establishing database communication
   **Description:** The app must communicate with Azure Databases to gather product information, that is dependent on each store.
   **Mitigation:** Create a test app to pull data from Azure. Gain insight from the developers at Meijer.

Applying machine learning
   **Description:** Sample size too small.
   **Mitigation:** Research ML using small sample sizes. Implement data collection early.

Unique store layouts and future layout changes
   **Description:** Stores may have unique layouts and changed frequently. This will affect algorithm and how we suggest the shopper navigate the store.
   **Mitigation:** Team Meijer will contact the client and how the store solves similar issues. While modifying the algorithm with unique edge cases.

Unable to find items
   **Description:** There will be times when items in the database cannot be found this may be due to incomplete store records or incorrect edge cases for the algorithm.
   **Mitigation:** Make sure item location databases are up to date. As well, create a product demo that handles lost items in a specific way.
Questions?