



# (ECE6) EcoWell: Automated ETL Pipelines Environmental Route Optimization

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## Introduction

### Product Definition

UMD Plant Sciences researchers studying the effects of nature walks on wellbeing have no way to experiment with how certain factors, such as plant presence or traffic noise, impact the quality of wellness walks.

### Our Solution

We built a full-stack platform that allows admin users to experiment with optimized routes with weighted parameters from uploaded datasets. The optimized routes are then published such that regular users can experience the wellness walks

### The Impact

Transforming UMD campus into a living laboratory, allowing researchers to study the effects of environment-driven walks on the wellness of the campus community.

## ETL Data Cleaning Pipeline

### Extract

Pull raw data from multiple sources such as iNaturalist data and files uploaded by approved admins.

iNaturalist

### Transform

Transform, clean, and structure data to be added to the database. used to create necessary data layers.

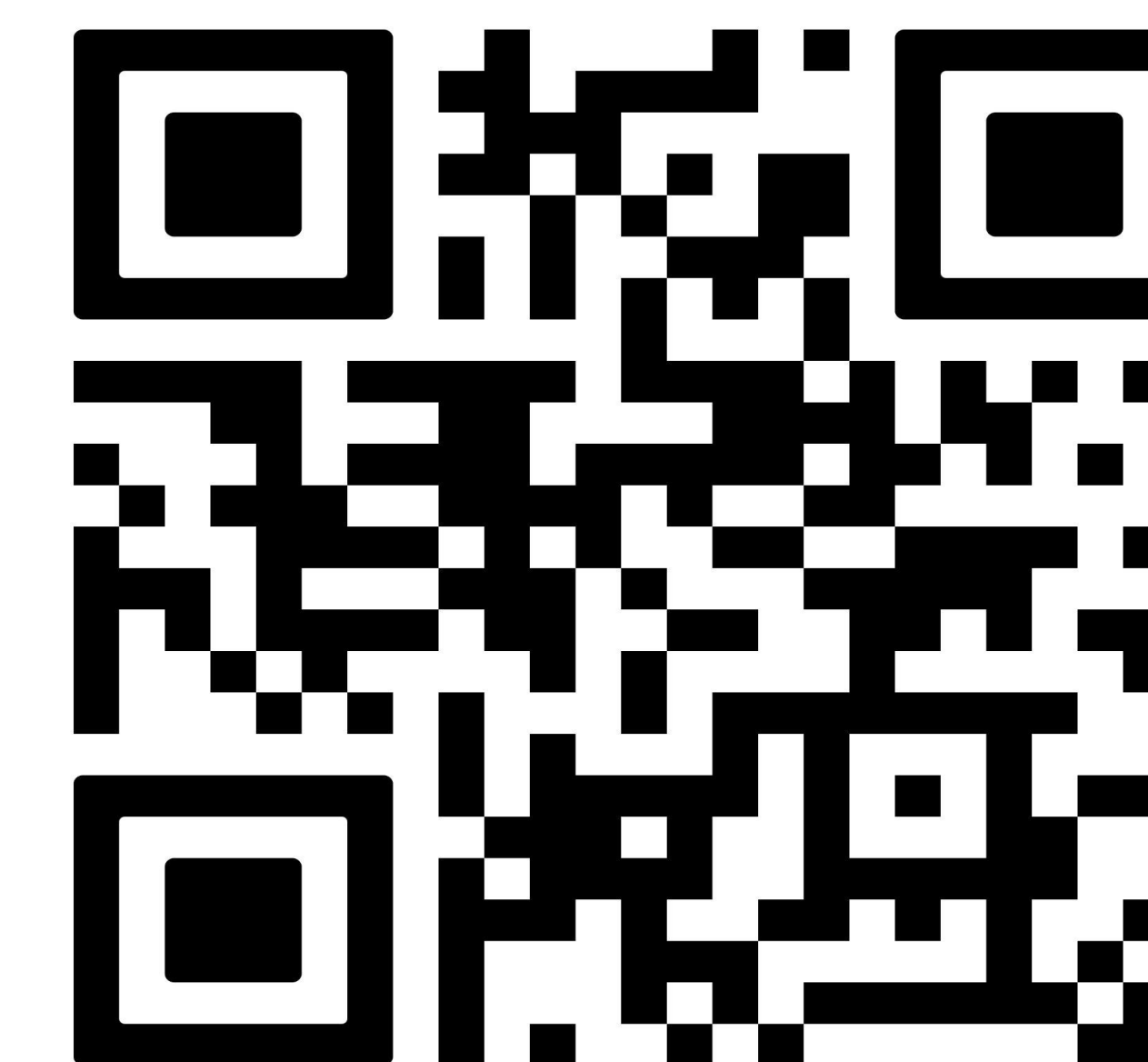
pandas

### Load

Load cleaned data into final database used for routing experiments & generating wellness walks.

Prisma

## Try Our App



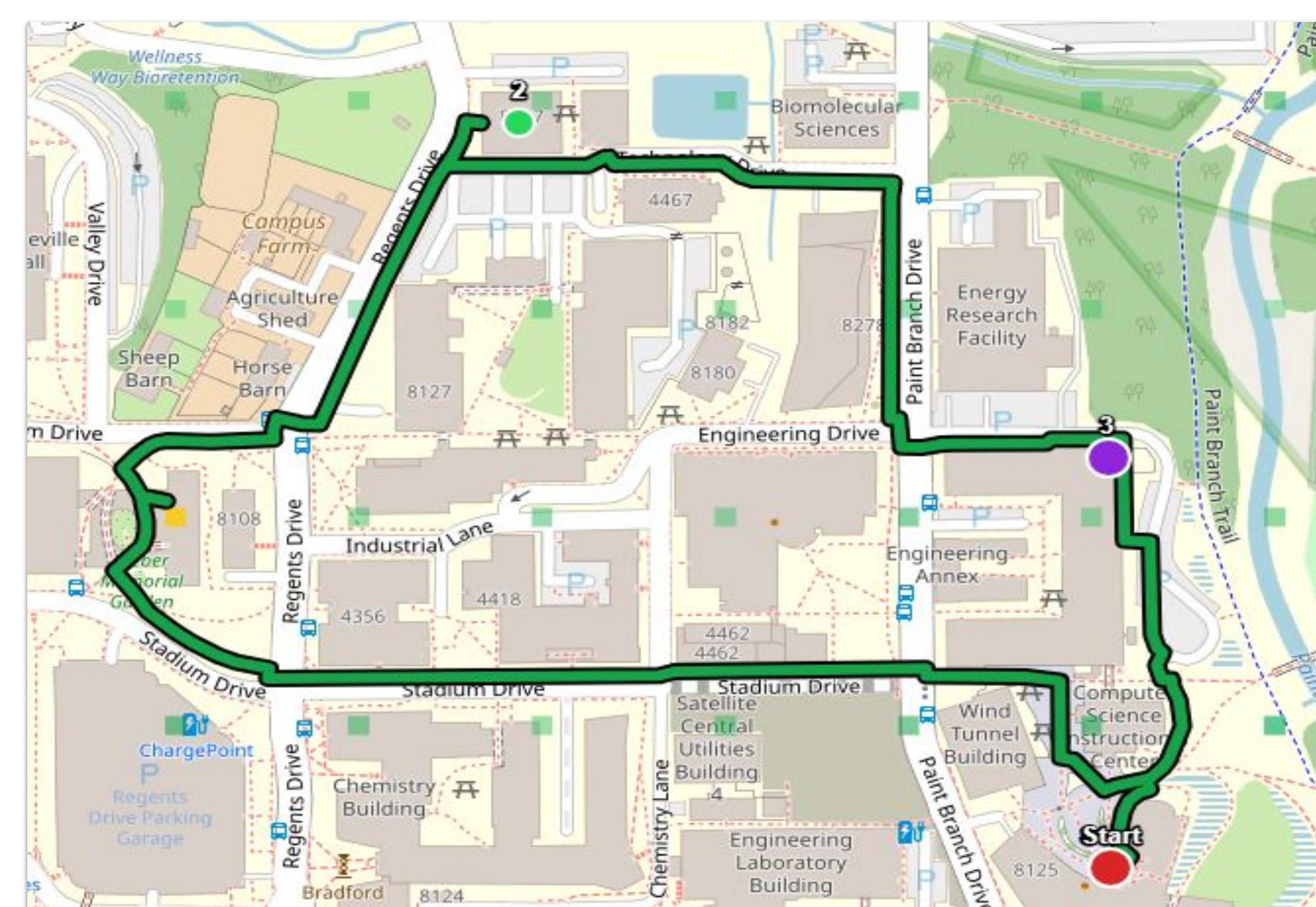
## Routing

Our routing engine helps you navigate campus in ways that support well-being while discovering nature. Think of it like Google Maps, but designed for a better mental experience.

$$\sum_{i=1}^n weight_i \cdot normalized'_i(p) - P_{penalties}$$

Includes penalties for distance, time, and overlap (user controlled)

Example: Biodiversity Optimized Route



- Combine Data Layers
- ▼
- Apply Weights
- ▼
- Normalize Data
- ▼
- Evaluate Route Options
- ▼
- Select Highest Scoring Route

## Experimentation

1. Ask a Research Question  
*Does shade coverage improve perceived wellness during campus walks?*
2. Form a Hypothesis  
*Routes with higher shade coverage will provide better wellness outcomes.*
3. Adjust Parameters  
*Increase shade weight, reduce noise weight, remove unwanted parameters...*
4. Run an Experiment  
*Generate a route with selected parameters and corresponding weights.*
5. Test/Reproduce Results  
*Save the experiment to await admin approval so others can try your experiment.*
6. Analyze Findings  
*Compare perceived wellness across experiments.*