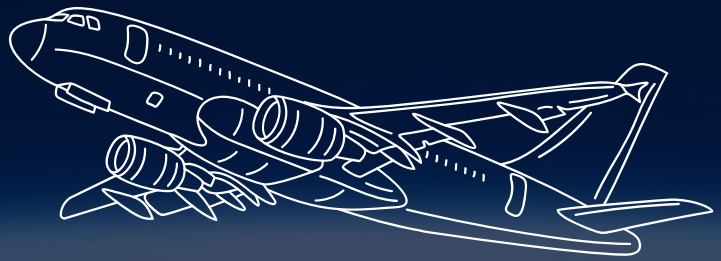
OptiFlight



Real-Time Flight Recovery Optimization for Post-Disruption Scheduling

Team 72 - The Mahwah Masters

01

Introduction

Who are we?

Background About Us...

Vidyut Rajagopal
Aadit Mital
Vikas Shah
Rohan Machhi
Michael Matwiejczuk

The Problem

During significant weather events, flight operations teams in Louisville, KY must manually re-plan every single affected flight while enforcing complex crew, aircraft, and regulatory constraints!

What Makes This Problem Complex

Crew

duty cycles, availability,rest windows

Aircraft

availability, maintenance, type limitations

Cargo Priority

time-sensitive shipments (Next Day Air, medical)

Airport

gate compatibility, fuel access

Certification

crew-aircraft pairing rules, FAA compliance, type ratings

Real-Time Disruptions

dynamic weather, crew no-shows, mechanical failures

Why is this a problem?

Time Consuming

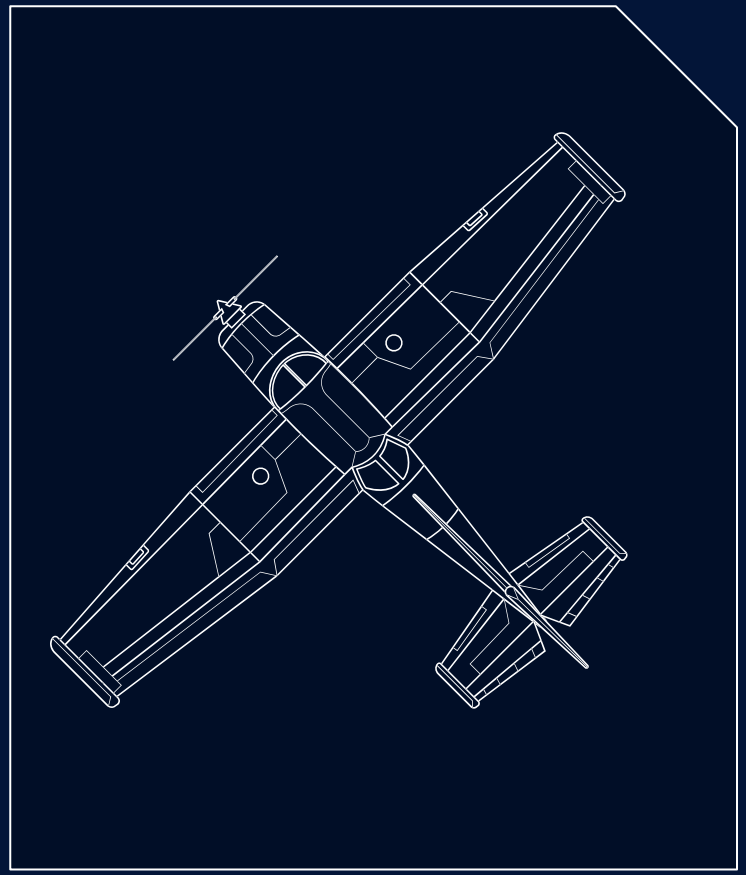
Flight operations teams spend thousands of man hours per year manually navigating this process

Inefficient

Manual human solutions can never create highly optimal solutions

Never ending

On-ground situations are constantly changing and require ongoing resolution



Our Solution:

An optimization-driven solution that automates outbound flight plans in response to real-time weather disruptions.

Brief Solution Overview

1

Real time data ingestion

Sources millions of live data points through real time API

2

Feeding the model

Passes processed data points into the optimization engine

3

Optimization

Uses multi-thread computing and node analysis to determine the optimal output

4

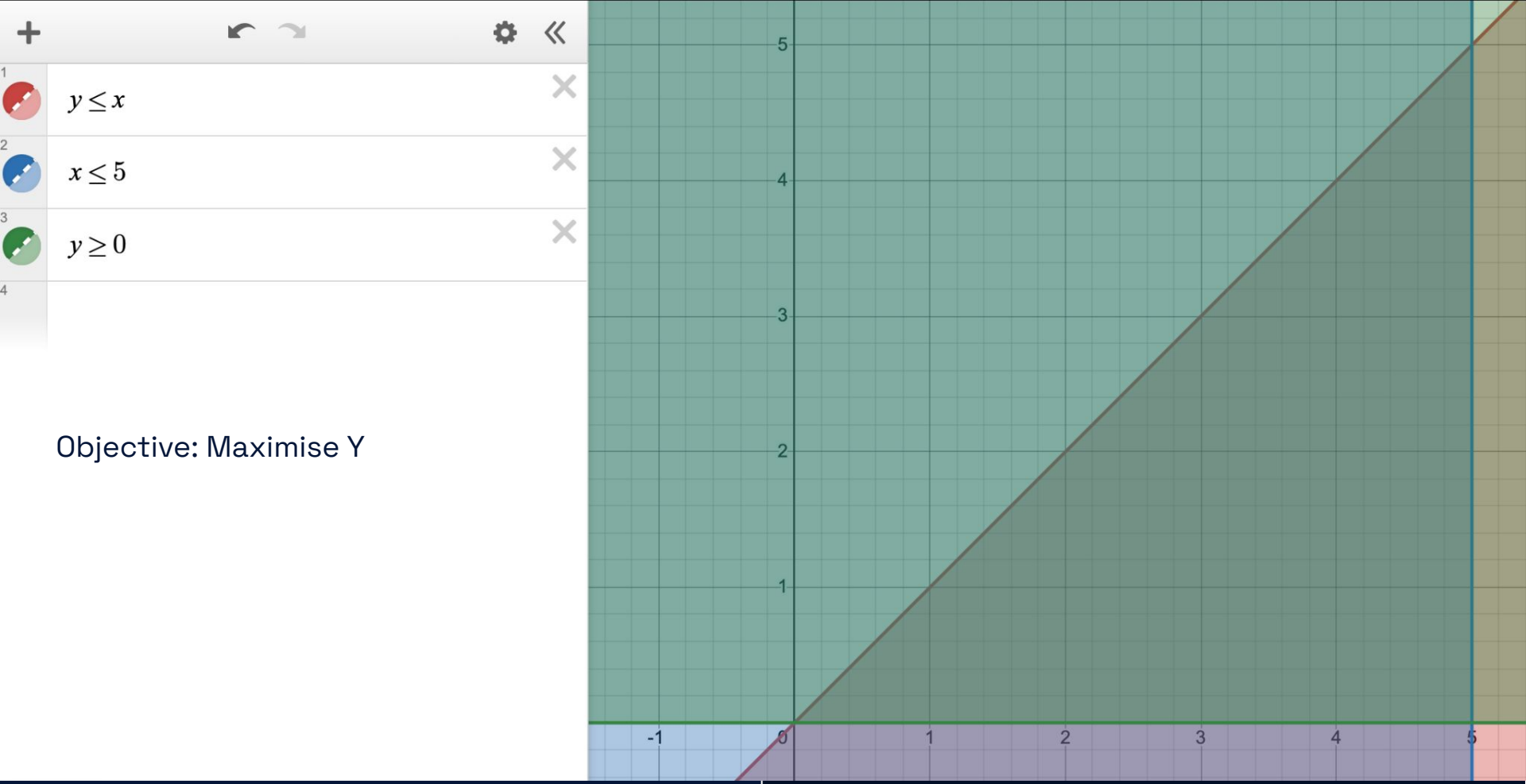
Continuous Feedback

Allows the user to easily edit/refine constraints and generate new optimals

Driving Technology

GUROBI OPTIMIZATION

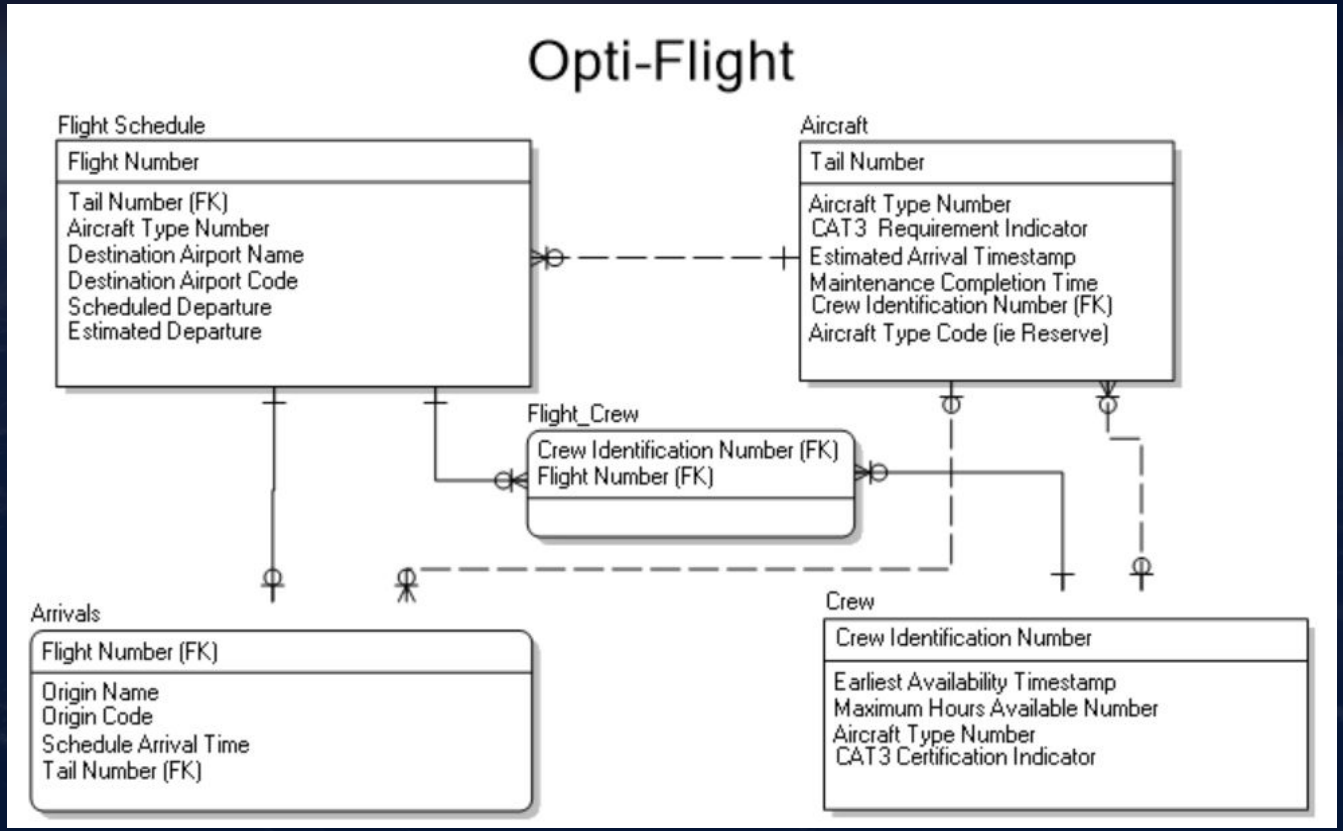
Gurobi is a state-of-the-art **mathematical optimization solver** used in logistics, finance, and energy to find the best solution from millions of possibilities - in real time.



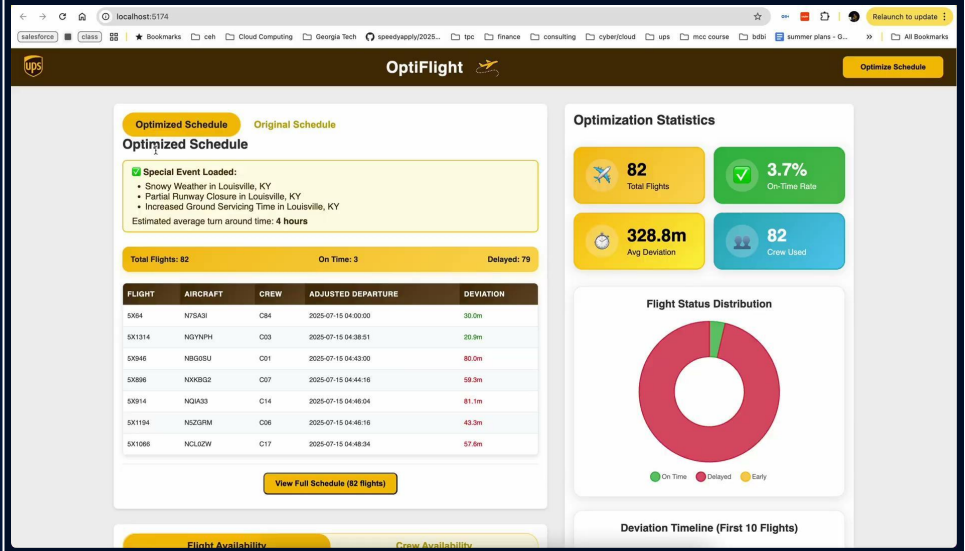
Objective: Maximise Y

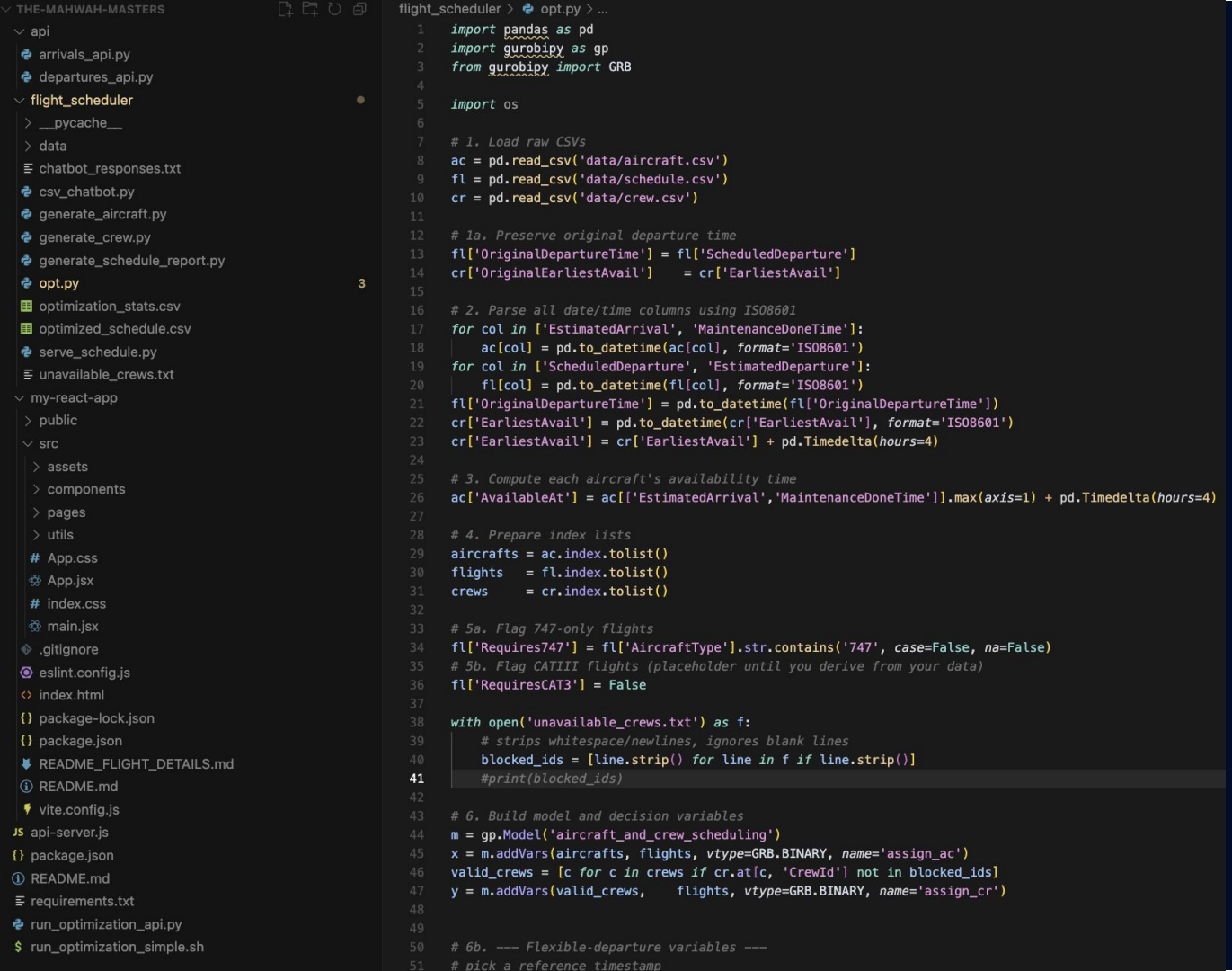
Brief Explanation of Gurobi's methodology

Data Overview



Solution Demo





Repo Overview

- Optimize button on React Frontend

🧠 Backend Orchestration (Flask Server)

- Triggers a shell script to kick off full pipeline

🔗 Step-by-Step Data Flow

1. 📡 Live API Call
2. 🧹 Pre-Optimization (cleans + normalizes flight data)
3. 📈 Optimization Engine (Gurobi)
4. 📤 Post-Processing (parse result to frontend)

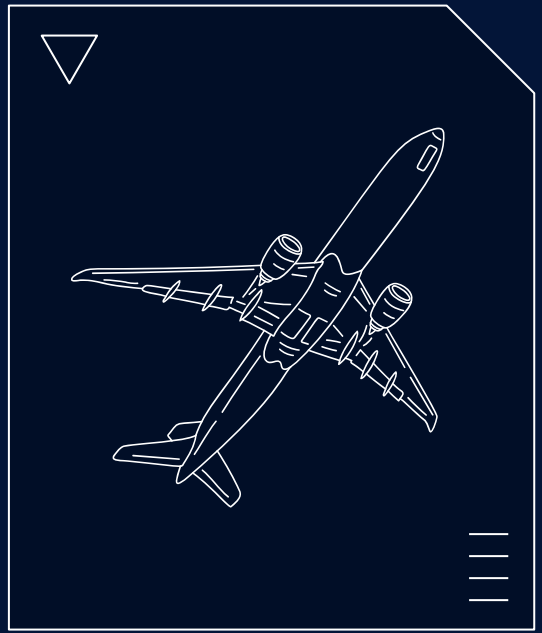
Unlimited Customization

Objectives

Any number of objectives can be considered by the algorithm

Priority Adjustment

Users can edit the weightage of each priority in real time



Crew

Crew unable to make it due to icy roads

Aircraft

Unexpected maintenance

ATC Restrictions

Ground stop until 5 pm

Optimize Schedule

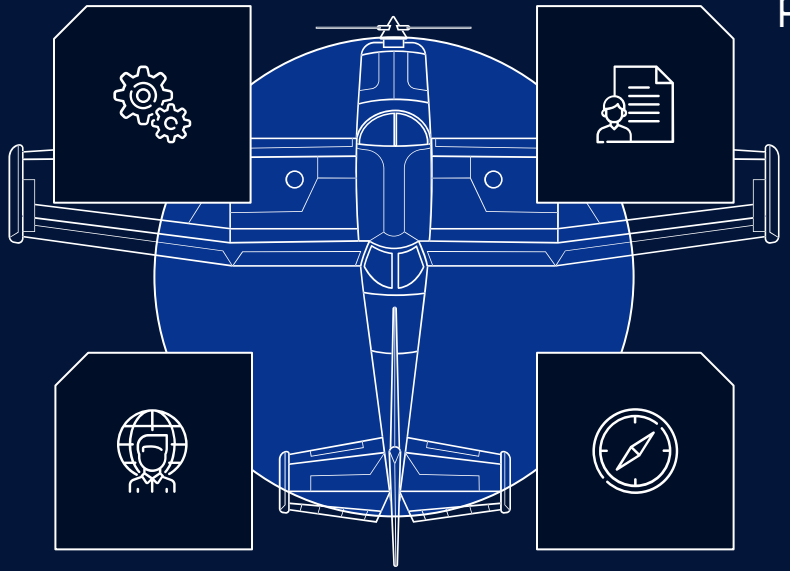
Financial Implication

Before Our Solution	After Our SOlution
Unnecessary departure delays	$10-15M/year in SLA penalties, and reputation value saved
Unnecessary costs for crew/aircraft relocation	Estimated $1–5M/year in operational savings
Thousands of man hours spent	Cuts time spent by over 90% unlocking labor efficiencies

Future Integrations

Ground Systems

Pipeline to automate flight plan submissions



Integrate with ARDAP/ARR

Critical Package Visibility Tool


Thank
you