

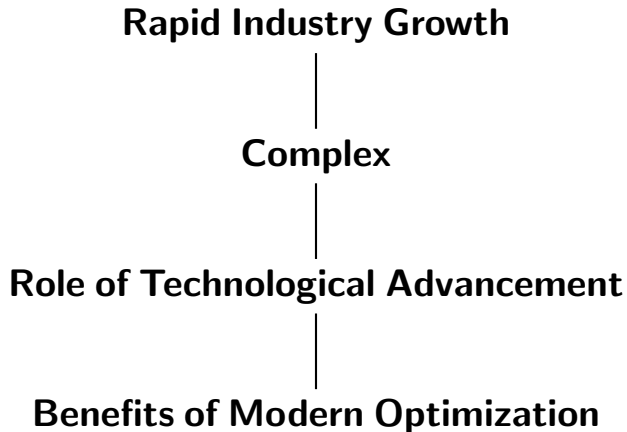
# The Optimization of Flight Routes: Enhancing Connectivity and Reducing Cost

Leveraging Simulation Models for Profitability!

Ian Wald

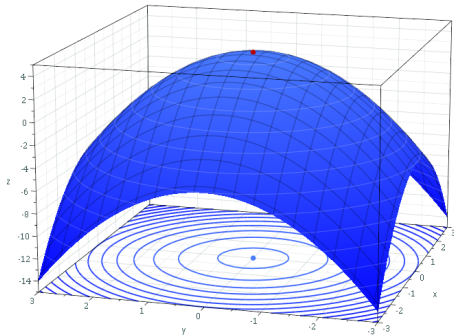
Institute for Computing in Research  
Santa Fe, New Mexico

August 2, 2024



**What variables can airlines manipulate to optimize flight routes across the continental United States to enhance efficiency and maximize profitability for airlines?**

# Challenges in Flight Optimization vs. Standard Optimization



- **Discrete Decision Making:**
  - All-or-nothing routes
  - Incremental adjustments
- **Interdependent Routes:**
  - Changes affect the entire network
  - Isolated variables
- **Strict Operational Constraints:**
  - Fixed capacities and regulations
  - Flexible constraints
- **Real-Time Data Integration:**
  - Adapting to dynamic factors
  - Stable conditions
- **Balancing Profit and Efficiency:**
  - Complex trade-offs
  - Simpler efficiency goals

# Strategy of the Three Algorithms

## Flight Generation

- Generate flights from predefined airports
- Include direct and layover routes
- Calculate distances using Haversine formula

### Stored in:

`generated_flights_new.txt`

## Replace Unprofitable Flights

- Identify and eliminate unprofitable routes
- Reroute passengers to profitable flights
- Ensure capacity limits

### Stored in:

`profitable_flights.txt`

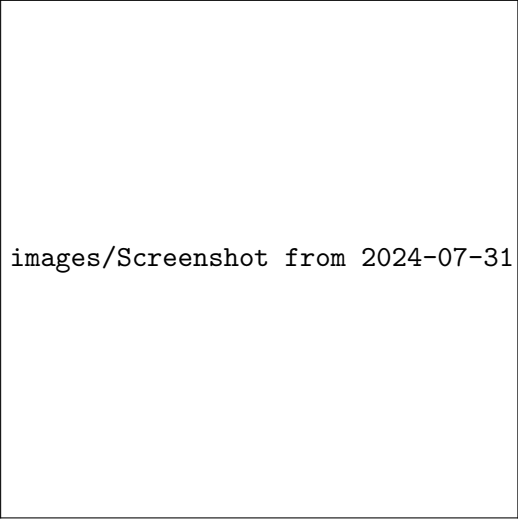
## Route Optimization

- Reorder routes to minimize distance
- Calculate great-circle distances
- Recalculate metrics for optimized routes

### Stored in:

`sorted_flights_new.txt`

# Flight Generation



images/Screenshot from 2024-07-31 16-20-31.png

# Theorem

Theorem (Mass–energy equivalence)

$$E = mc^2$$

# Figure

Uncomment the code on this slide to include your own image from the same directory as the template .TeX file.



An example of the `\cite` command to cite within the presentation:

This statement requires citation [?].

The End

# References



John Smith (2012)

Title of the publication

*Journal Name* 12(3), 45 – 678.