Optimization and Applications: Some Recent Research

by

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Broad Areas of Research (last two years)

- Practical Vehicle Routing/Logistics
  - Si Chen, Bob Shuttleworth, Chris Groer, Namrata Cornick, Damon Gulczynski, Xia Wang
- Heuristic Search in Combinatorial Optimization
  - William Mennell, Xia Wang, John Silberholz, Daliborka Stanojevic, Ioannis Gamvros, Andy Hall, Inbal Yahav, Yupei Xiong, K-H. Loh

Real-World Focus

- Most of my research in vehicle routing/logistics is motivated by real-world problems
  - UPS (Baltimore), RouteSmart Technologies (Columbia)
  - We have access to real-world data
- I helped four Ph.D. students obtain paid summer internships this past summer
  - UPS (2), BAE Systems (1), UMMC (1)
- Let me describe one research project (Groer, Golden, Wasil)

The Billing Cycle Vehicle Routing Problem

- The problem was described to us by RouteSmart Technologies
- Over time, a utility company's meter-reading routes become inefficient, imbalanced, and fractured
- Utilities wish to remedy this situation by shifting customers to different billing days and routes subject to certain constraints
- We began with a real-world data set of 17,775 customers

Imbalanced Routes

- Each customer is assigned to one of 20 billing days
- Three meter readers are working each day
- The number of customers visited each day varies between 400 and 1300
- Daily route length varies similarly
- A utility company in this situation has several goals

Goals/Constraints of the Utility Company

- Create more efficient routes for each day of the billing cycle
- Balance the workload across the billing cycle, in terms of customers serviced and total route length
- Regulatory and customer service considerations prevent the utility company from shifting a customer's billing day by more than a few days from one month to the next
- These were put in place to eliminate variation in customers' bills due to utility company policies

Concluding Remarks

- We use techniques from the following Ph.D. courses to solve this problem
  - BMGT 830: LP
  - BMGT 831: Networks
  - BMGT 833: IP
- Can we recover efficient routes and balanced workdays?
- If so, how many months does it take?