

実社会での線形計画問題

各社の success stories

- ❧ Xpress (FICO)
- ❧ Gurobi (Gurobi)
- ❧ CPLEX (IBM ILOG)

Optimization soars at American Airlines

success story: optimization



Client	American Airlines, serving nearly 100 million passengers annually
Challenge	Increase revenue and reduce costs in a highly competitive, low-margin industry and difficult economic environment
Solution	FICO™ Xpress Optimization Suite
Results	Optimized processes that lead to increased revenue, reduced costs and improved customer service

- ❧ ... for the people who work behind the scenes at American Airlines and American Eagle, success also depends on a long and complex list of other factors—scheduling flights, juggling connections, working around bad weather and assigning crew for nearly 4,000 flights a day.
- ❧ Armando Silva, managing director of operations research at American Airlines: “In today’s economic environment, and particularly in the airline industry where margins are very small, maximizing revenue and reducing cost is a big deal.”
- ❧ “In a business with challenges that are as complex and large as ours, you have to rely on optimization. And that kind of optimization is something you can’t do by hand or with a simple tool.”

Optimization drives \$19 million gains at Avis

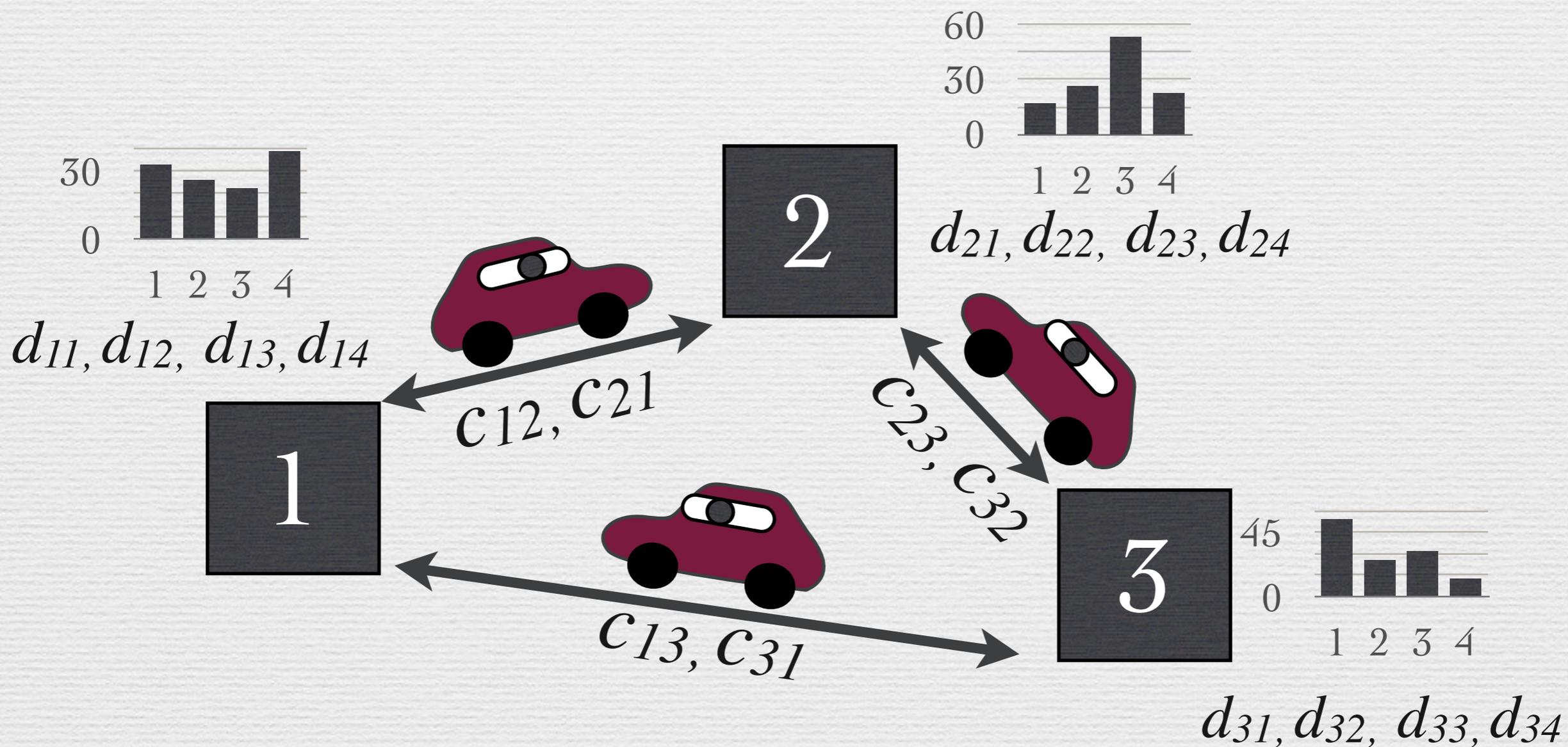
success story: optimization



Client	Avis Europe, a leading car rental company in Europe, Africa, the Middle East and Asia
Challenge	Maximize the use of every automobile in the company fleet
Solution	FICO™ Xpress Optimization Suite
Results	Two-point increase in fleet utilization, translating into an economic impact of \$19 million.

- Each year, Avis Europe serves more than 8 million customers at more than 3,800 locations via the Avis and Budget Brands. It's Europe's No. 2 car-rental agency, controlling 17.7% of the €8.81 billion market in 2007, which comprised 1.2 million vehicles and 44 million rentals.
- "Every Friday at 7 a.m., one transporter of cars would go from London Heathrow to Mayfair, due to demand in downtown London on weekends," says the director of backoffice and station systems, Avis Europe. "That's what we always did—but there was no way to evaluate if we could do better."
- The program then created precise recommendations for fleet distribution and utilization. "It tells us, for example: On Friday morning, bring only four cars from Heathrow to Mayfair, and bring another four from Stansted Airport."
- "To boost profitability, it could tell us not to accept any rental reservations made for less than three days during specific time periods— Christmas, for example,"

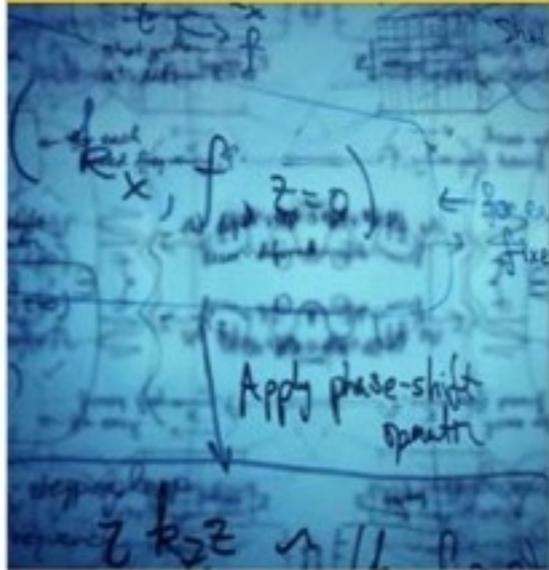
- レンタカーオフィス $i = 1, 2, \dots, I$
- 考慮対象の期間 $k = 1, 2, \dots, K$
- オフィース i での k 期の需要予測 d_{ik}
- オフィース i から j への輸送コスト c_{ij}



$$\begin{aligned}
& \text{minimize} && \sum_{k=0}^{K-1} \sum_{i=1}^I \sum_{j=1}^I c_{ij} y_{ijk} \\
& \text{subject to} && x_{i0} = a_{i0} \quad (i = 1, \dots, I) \\
& && x_{i,k+1} = x_{ik} - \sum_{j=1}^I y_{ijk} + \sum_{j=1}^I y_{jik} \\
& && \quad (i = 1, \dots, I; k = 0, \dots, K-1) \\
& && x_{ik} \geq d_{ik} \quad (i = 1, \dots, I; k = 1, \dots, K) \\
& && x_{ik} \geq 0 \quad (i = 1, \dots, I; k = 1, \dots, K) \\
& && y_{ijk} \geq 0 \quad (i, j = 1, \dots, I; k = 0, \dots, K-1)
\end{aligned}$$

Honeywell schedules big profits for its clients with FICO Xpress Optimization Suite

success story: optimization



Client	Honeywell Process Solutions, a division of Honeywell International
Challenge	Finding a partner with world-class optimization software that's transparent to the end user
Solution	FICO™ Xpress Optimization Suite
Results	A partner committed to innovation; an optimization software solution for improved scheduling decisions that can have a multi-million dollar impact for manufacturers

- Long before gasoline is pumped into your car it flows through a highly orchestrated production process.
- Yet, for many oil-refineries and other companies in the continuous process industries, the production schedule is created through a surprisingly low-tech approach: Humans working manually with spreadsheets.
- Honeywell has sold over 30 copies of Production Scheduler worldwide in the continuous process industries. “We would not have been able to build Production Scheduler without Xpress, and we would not have had the sales we’ve had without Xpress,” comments Mr. Kelly, Solutions Architect, Honeywell Process Solutions, a division of Honeywell International.

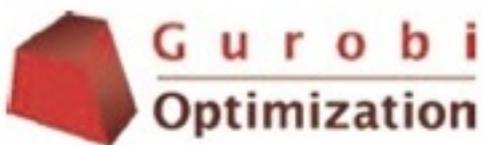
Prime Time: The NFL optimizes its playing schedule

success story: optimization



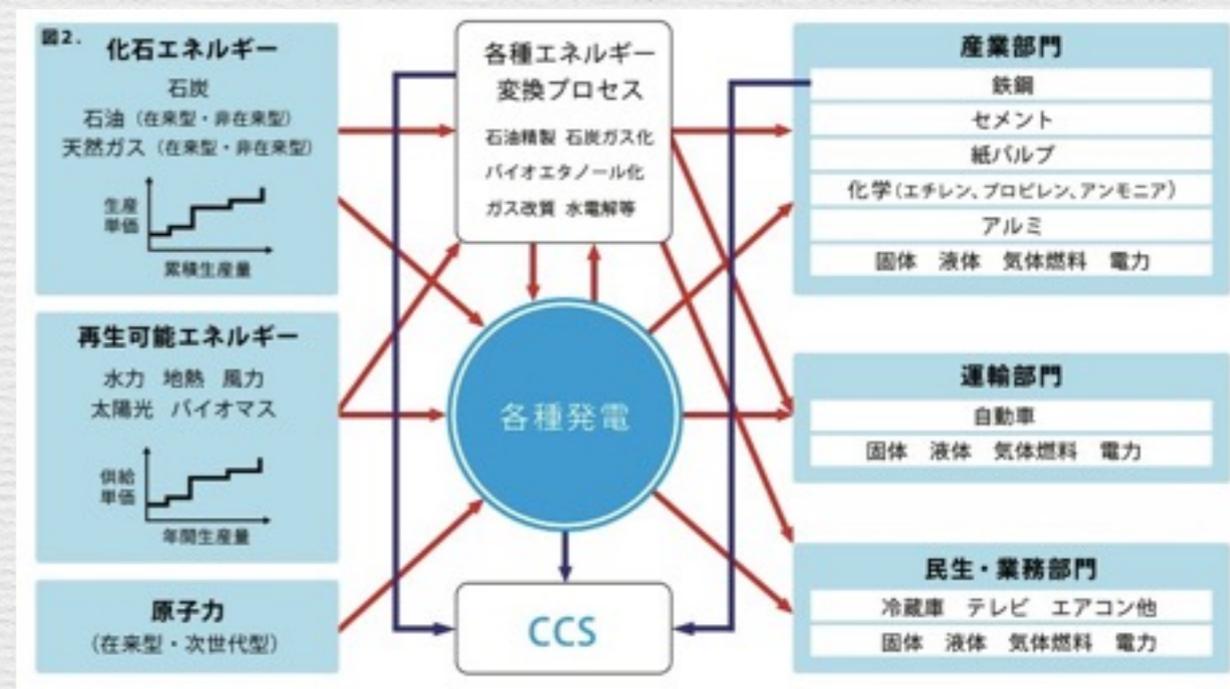
Client	The National Football League (NFL)
Challenge	Develop a game schedule that maximizes television ratings and accommodates the teams and their fans.
Solution	FICO™ Xpress Optimization Suite
Results	The NFL can address stadium availability issues, minimize the competitive impact of travel, and deliver television schedules that allow the most fans to watch the biggest games.

- ❧ The NFL's 32 teams play 16 games over 17 weeks at different stadiums across the country. And for every game that's played, television exposure is the key to business success.
- ❧ Countless factors must be taken into account to arrive at an optimal playing schedule: stadium availability, travel time, days between games, television placement and more.
- ❧ In order to find the best schedule for the season's 256 games, the tool would have to consider 7,000 game options, while accounting for some 20,000 variables and 50,000 constraints.
- ❧ ... each team is being treated fairly, including the number of consecutive home or road games, travel schedules and the number of days off between games ...



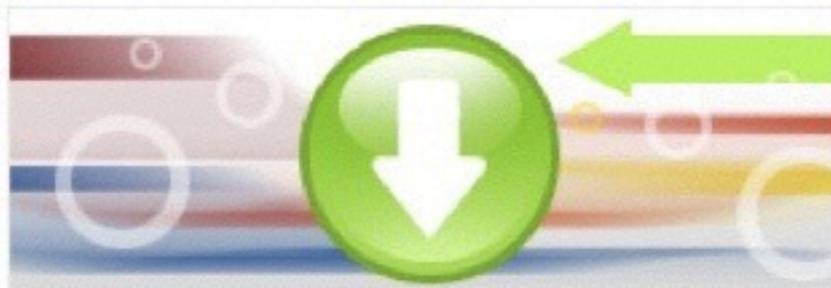
地球温暖化問題対策への最適化技術の適用

- 10年後、20年後における削減目標を定めた際に、これを最も安い費用で達成するためには、現在利用可能、もしくは将来実用化が期待される様々な技術をどのように組み合わせたら良いか等を検討しています。
- システム研究グループのモデルは、世界の様々な国を、将来の複数の時点で個別に評価できるようにしているため、変数の数は膨大になり、400万個以上になります。こうした膨大な数の変数を含むモデルから、CO2排出削減等の制約の下で最も安い費用となる技術の組み合わせを最適化技術によって求めます。



IBM ILOG CPLEX Optimizer

High-performance mathematical programming solver for linear programming, mixed integer programming, and quadratic programming



Trial: CPLEX Optimization Studio
Including CPLEX Optimizer and OPL.
Try for 90 days.



Optimization success stories from our
Customers. Videos from Sabre, Twenty-First
Century, FlexTrade and five other customers.

Major retailer Evaluating inventory strategies

Overview

■ Objective:

A retailer with billions in annual sales had seven distribution centers (DCs) to serve its stores. The retailer was growing rapidly through acquisitions and organic growth. This produced a hybrid inventory strategy with some stock-keeping units (SKUs) stored at all the DCs and others at only a few centralized locations. The assignment of SKUs was largely based on the practices of the acquired companies. The retailer wanted to determine whether its



Computer Parts Maker Optimized Distribution Strategy

Overview

■ Objective:

One of the world's largest manufacturers of disk drives and magnetic disks, and a leader in storage area network (SAN) solutions, launched a CEO-driven, company-wide initiative to streamline its supply chain operations and increase its profitability. The company manufactured products in Asia and used an intermediate network of distributor facilities to

