GUROBI OPTIMIZATION | The World's Fastest Solver

Introduction to Optimization Through the Lens of Data Science

Parts 1-4

GUROBI: ALWAYS FREE FOR ACADEMICS

AVAILABLE ON: Udemy

Taught by Dr. Joel Sokol (lead instructor), developed in partnership with Gurobi Optimization

Course Description

This course serves as a starting point to learn mathematical optimization and will delve into the foundational principles of optimization as applied to real-world, data-driven problems. This course will focus on understanding what optimization is, how it is used to solve complex problems, and the components of mathematical optimization models, all taught with hands-on learning examples completed using Gurobi's Python API. Learners will see how optimization and data science methods, like machine learning, can complement each other.

This course will introduce the mathematical notation needed to formulate optimization problems and how to code in gurobipy by showing how problem statements go from words to math to code, bit by bit.

Learning Objectives

By completing this course, learners should be able to:

- Identify problems that mathematical optimization is appropriate for.
- Understand and articulate the building blocks of an optimization model and recognize common problem archetypes.
- Take written problem statements, create a mathematical formulation, and write corresponding code to solve and interpret optimization models.

Hands-on Course Work

Course work is provided through PDF files, data files (.json), and scripting/notebook files (.py and .ipynb). No course work will be submitted or graded, and solution files will be provided.

Course Topics

Part 1

See optimization in action using the Burrito Optimization Game and be exposed to a wide variety of successful use cases. Learn the building blocks of mathematical optimization and get comfortable with the key concepts required to create your first optimization models with supplemental material for establishing best practices going forward.

Part 2

Dive deeper into the relationship between optimization and data science. Work with more complex constraints, understand model reusability, analyze sensitivity, and understand infeasibility. Classify types of optimization problems and see how they are solved at a high level.

Part 3

Model yes/no decisions and complex logical constraints with binary variables and link them to continuous variables. Explore classic optimization model archetypes.

Part 4

The final part of the course puts everything from parts 1 through 3 together: solving real-world examples, working from problem statements to mathematical formulations, to code, and to solutions.