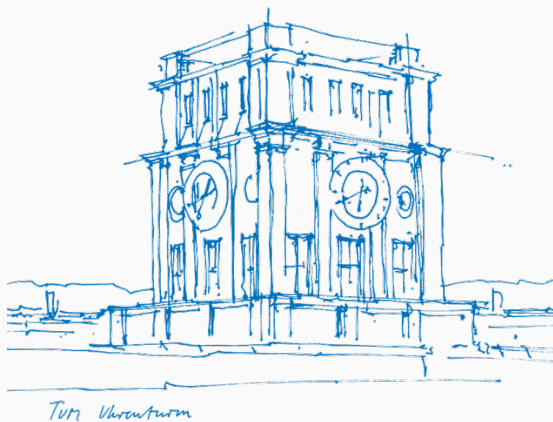


Computer Course Linear Programming

Introduction to GurobiPy



TUM Uhrenturm

Stefan Kober

14-15 October 2021

Technical University of Munich

Organizational Things

What to expect

What this course offers:

- ▶ praxis-oriented introduction to python and gurobipy
- ▶ lots of examples
- ▶ preparation for further lectures, case studies and theses

What this course does not offer:

- ▶ detailed installation instructions
- ▶ the time needed to become an expert in python and gurobipy

Schedule

- ▶ Thursday:
 - ▶ Introduction to Python
 - ▶ Introduction to Gurobi
- ▶ Friday:
 - ▶ Features Python (advanced input and output methods)
 - ▶ Features Gurobi (advanced variable types and output interpretation)

Schedule

10:15 first slot

11:45 lunch break

13:15 second slot

14:45 coffee break

15:15 third slot

Work in teams!



Outlook



Structure of Gurobi

Basics

Linear Programming

Modelling

Output Interpretation

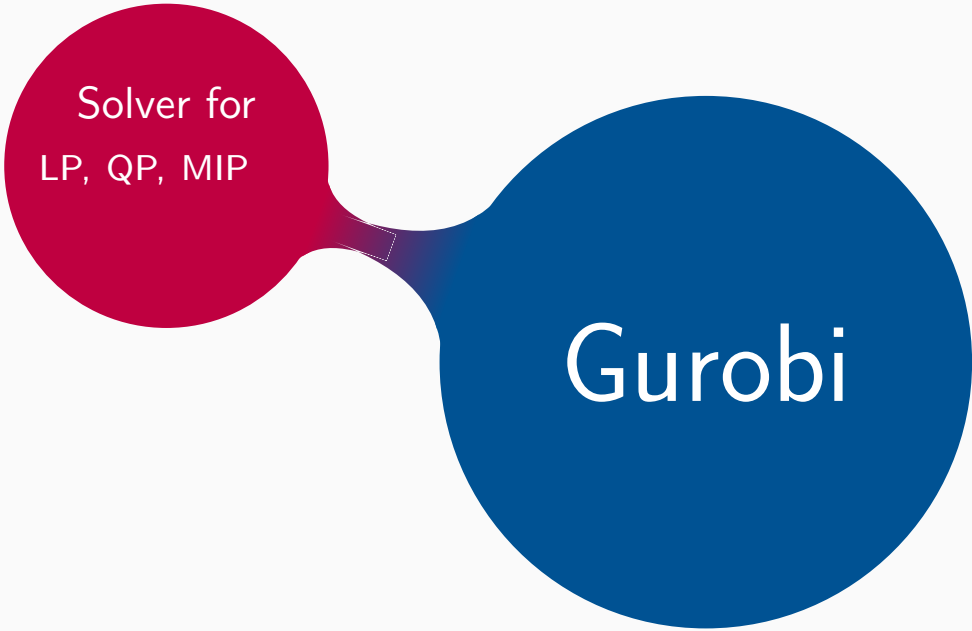
Advanced Input Methods

Advanced Gurobi Datatypes

Visualization

Structure of Gurobi

What is Gurobi?

A diagram consisting of two overlapping circles. The left circle is red and contains the text 'Solver for LP, QP, MIP'. The right circle is blue and contains the text 'Gurobi'. The circles overlap in the center, with a small white rectangular area visible in the intersection.

Solver for
LP, QP, MIP

Gurobi

What is Gurobi?

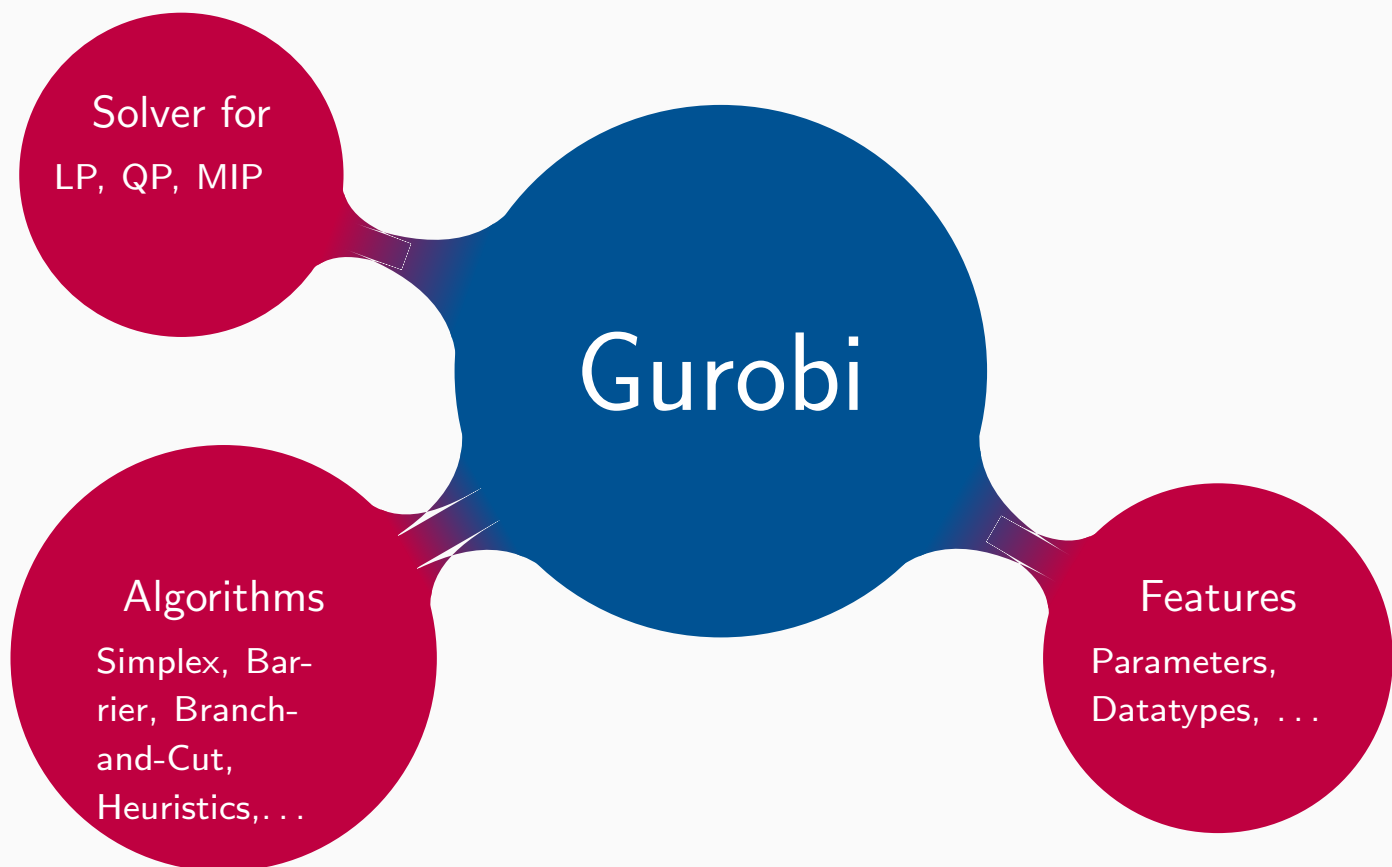


Gurobi

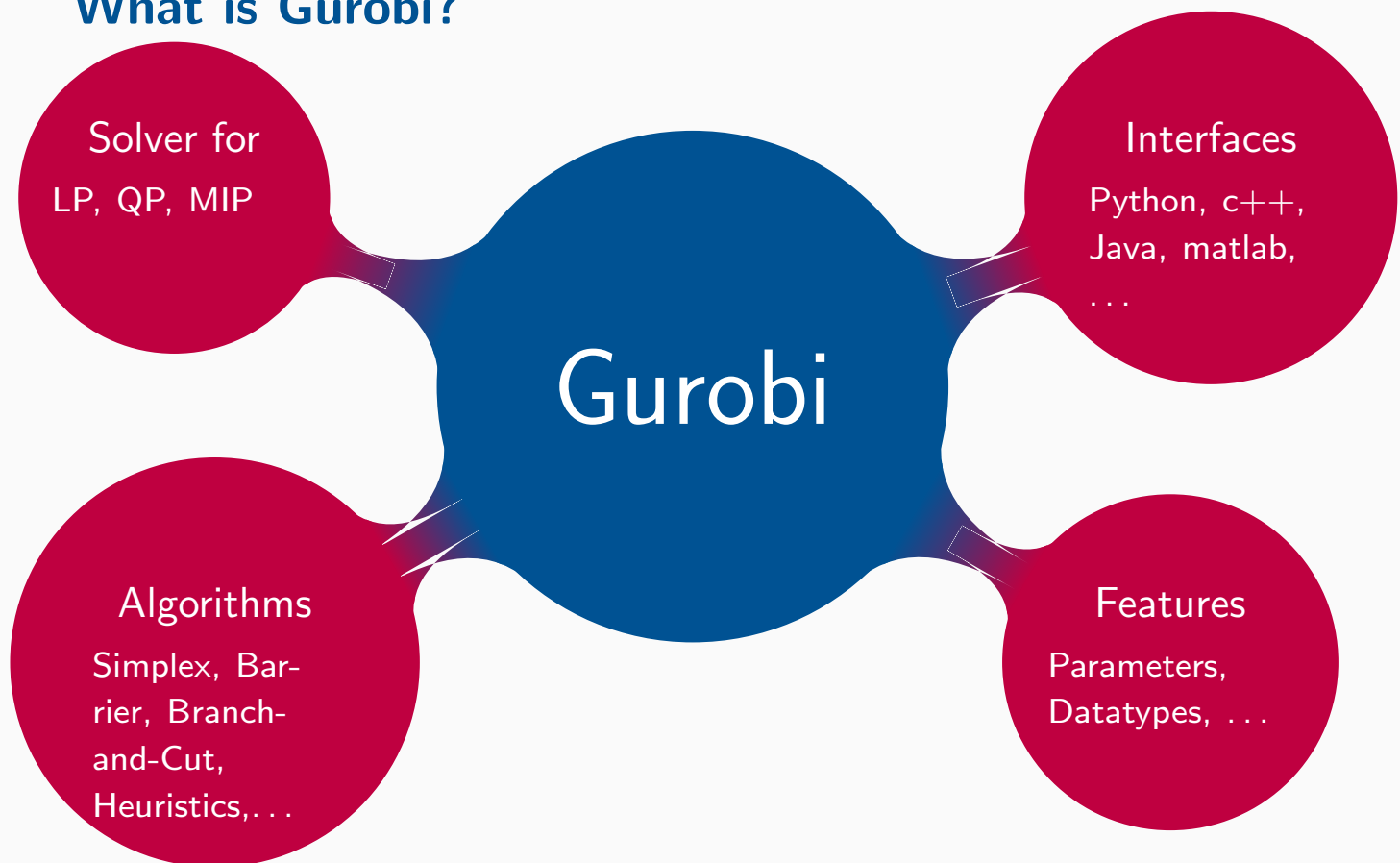
Solver for
LP, QP, MIP

Algorithms
Simplex, Bar-
rier, Branch-
and-Cut,
Heuristics, . . .

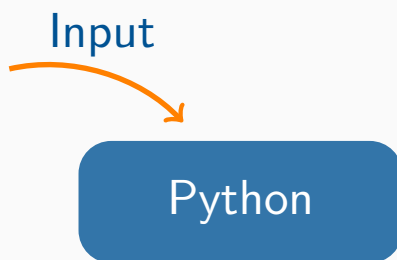
What is Gurobi?



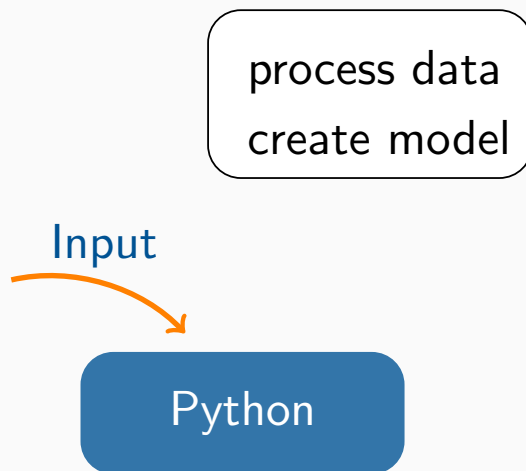
What is Gurobi?



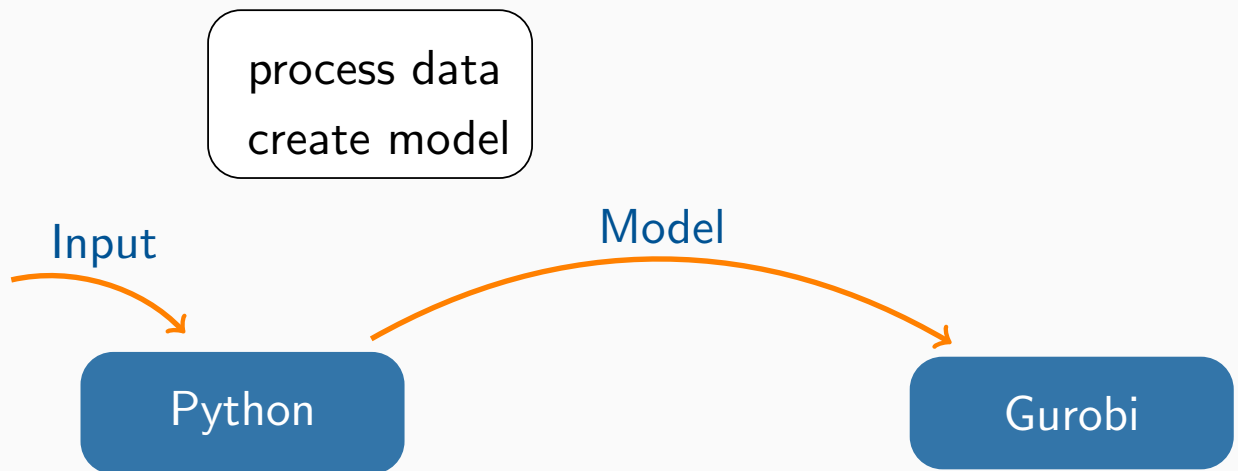
How can we use Gurobi?



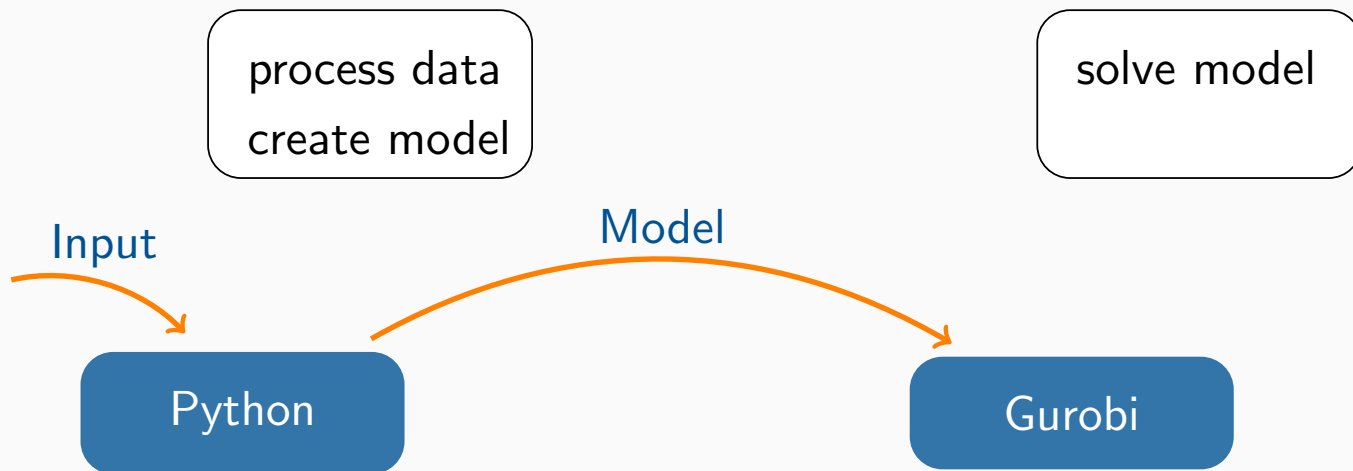
How can we use Gurobi?



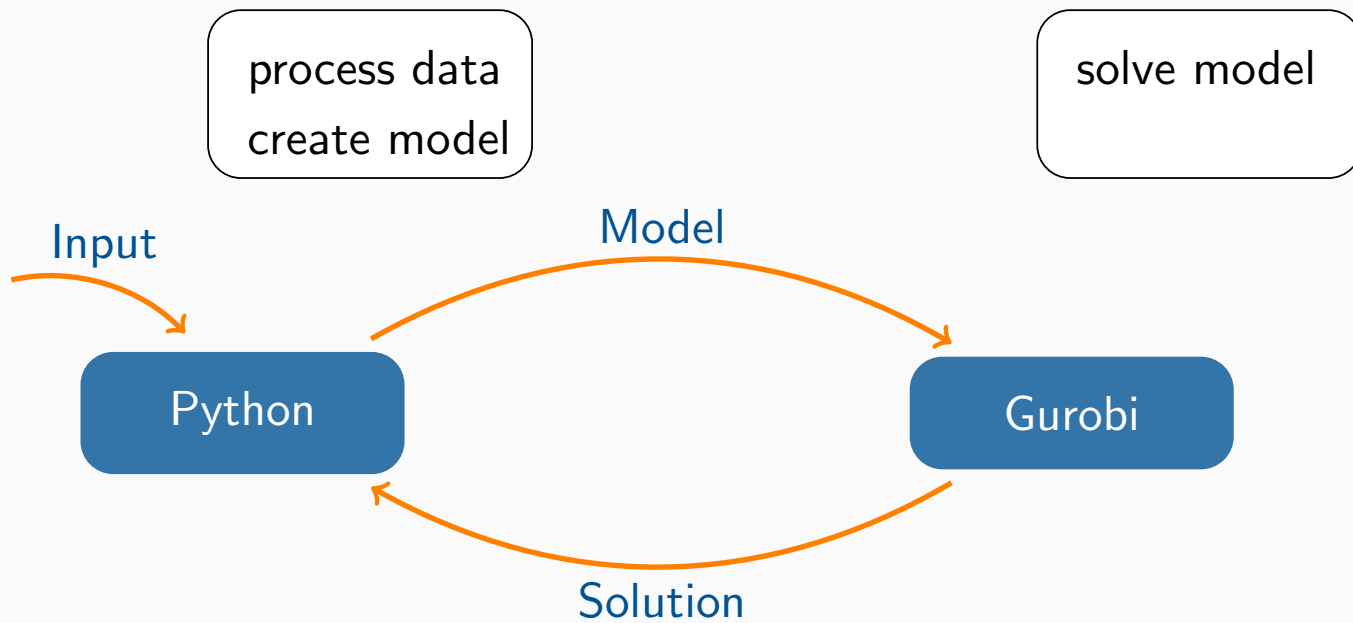
How can we use Gurobi?



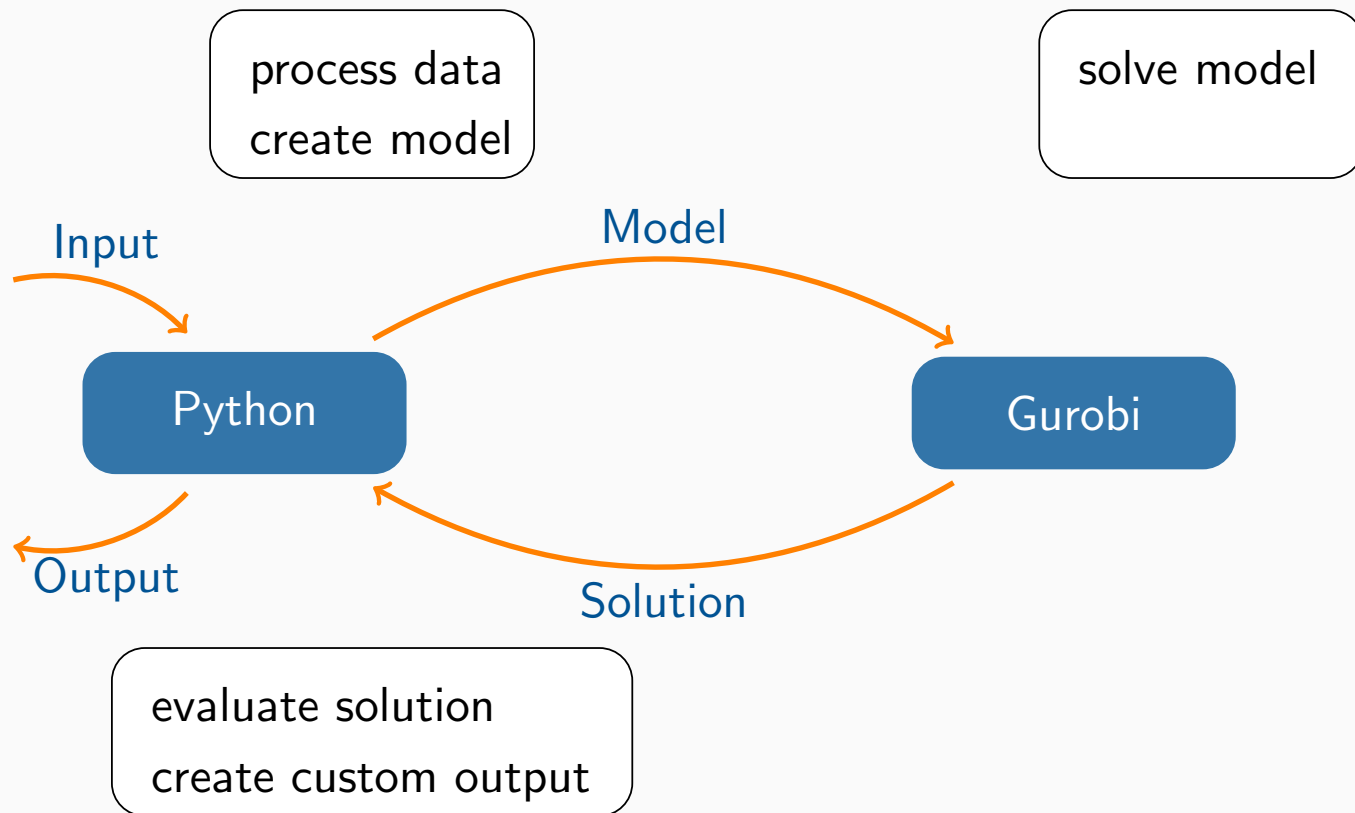
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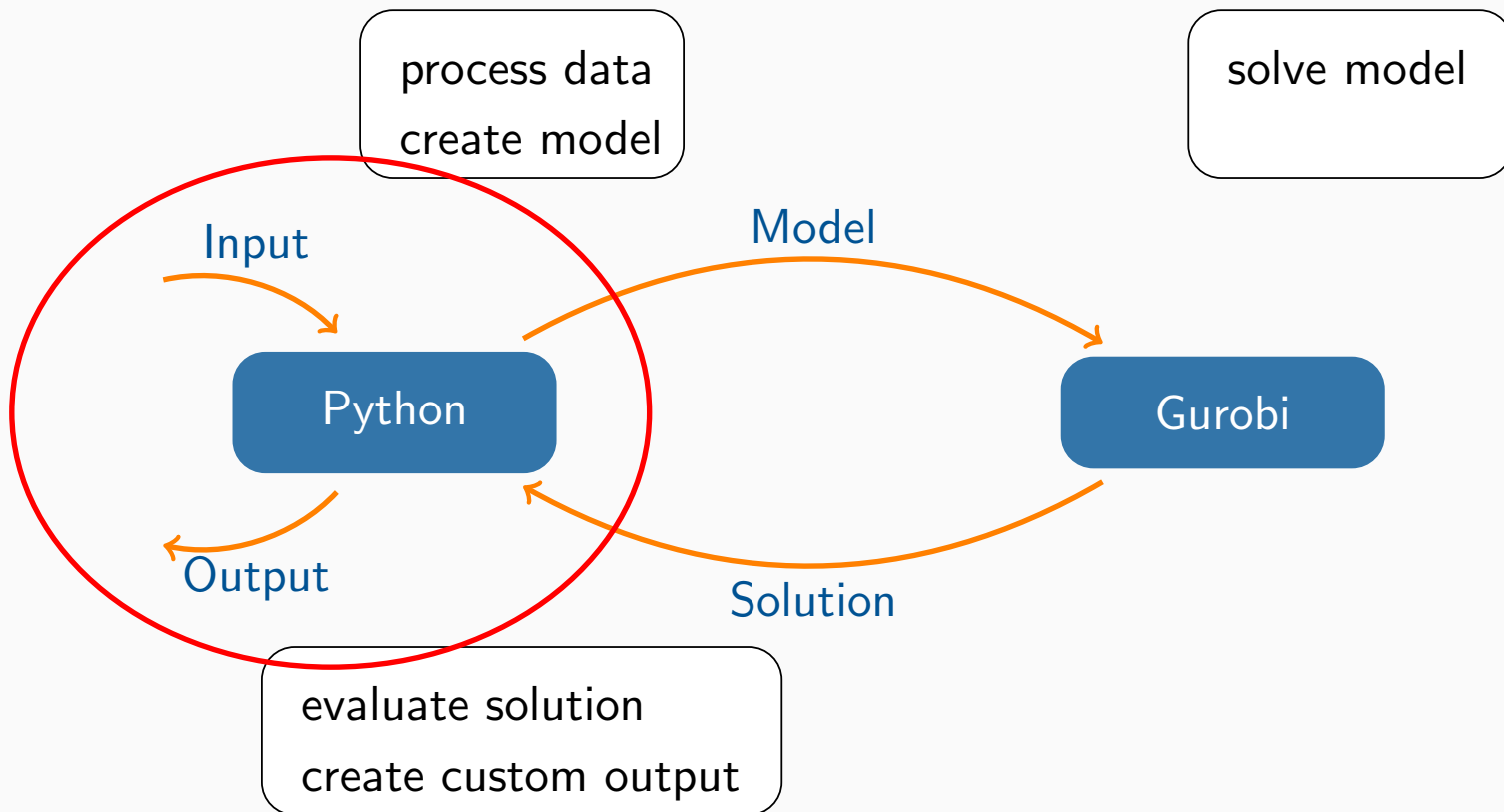
How can we use Gurobi?



How can we use Gurobi?



How can we use Gurobi?



Credits

The materials used in this course have been developed and improved by

- ▶ Melanie Herzog
- ▶ Anja Kirschbaum
- ▶ Fabian Klemm
- ▶ Michael Ritter
- ▶ Matthias Silbernagel
- ▶ Paul Stursberg
- ▶ Stefan Kober

Basics

Python

- ▶ open source
- ▶ most popular programming language
- ▶ object-oriented, procedural, functional
- ▶ interactive
- ▶ easy to learn

Advantages

- ▶ high-level
 - ▶ direct interpretation of objects
 - ▶ readable and accessible
- ▶ many useful libraries (graphs, visualization, computations, data management, . . .)

Limits

- ▶ slow running times
- ▶ somewhat restricted
- ▶ possibly not best choice for large object oriented project

Basic Knowledge

- ▶ Datatypes
 - ▶ integer, float, string
 - ▶ list, tuple, dict, set
- ▶ Indentation
- ▶ Output
 - ▶ print
 - ▶ formatted print
- ▶ Imports