PIC 16, Winter 2018

Lecture 8W: SciPy II - Optimization

Wednesday, February 28, 2018

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Announcements

- Office Hours 12:30 – 2:30

Intended Learning Outcomes

By the end of the assignment, students are expected to be able to:

• solve systems of nonlinear algebraic equations,

• fit curves to data, and

• optimize functions (subject to constraints).

Activities

- Finish assignment 7F

- Start assignment 8W or 8Wb (extra credit)

- Use nonlinear programming to find a magic square:

  - Use each integer between 1 and 3^2 exactly once

  - All rows, columns, and diagonals must sum to the same value

2	7	6	→ 15
9	5	1	→ 15
4	3	8	→ 15

15 ↘   15 ↓   15 ↓   15 ↓   15 ↘

15   15   15   15   15

UCLA

Nonlinear Programming

objective function   decision variable(s)

$$\min_{z} f(z)$$

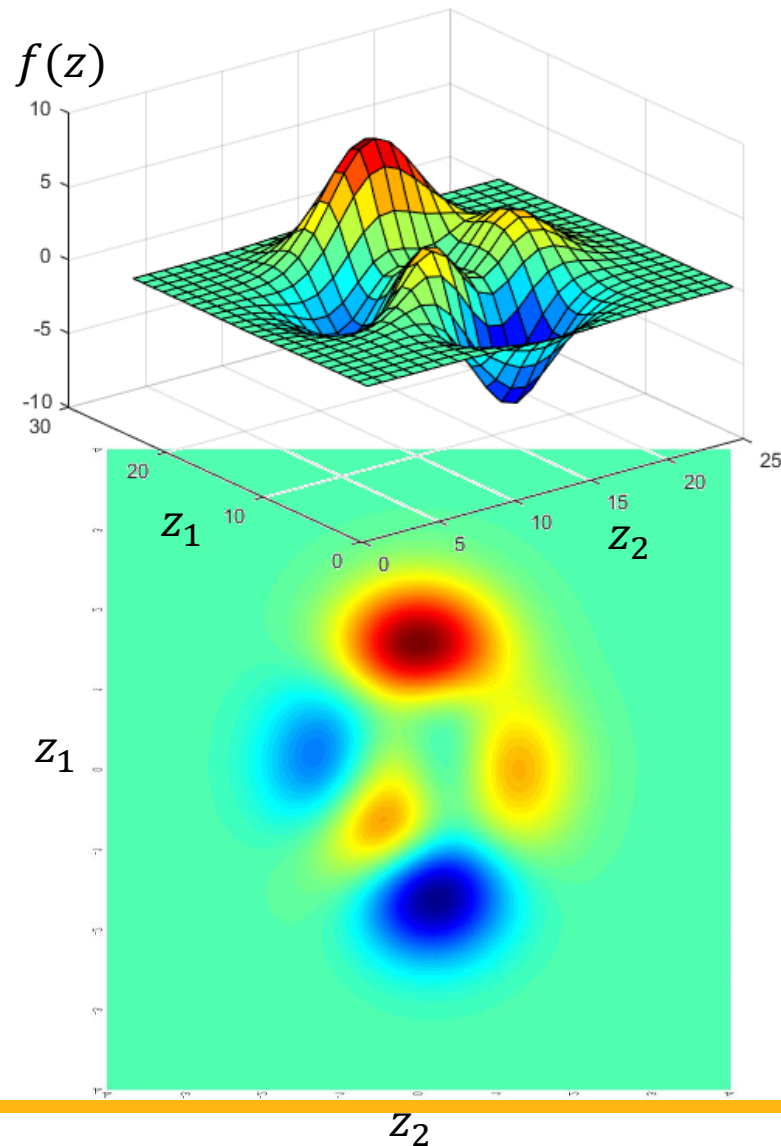s.t.

simple bounds
$$l \leq z \leq u$$

linear equality
$$A_{eq} z = b_{eq}$$

linear inequality
$$A_{ineq} z \leq b$$

nonlinear equality
$$g(z) = 0$$

nonlinear inequality
$$h(z) \leq 0$$

"such that"/"subject to"

$f(z)$

z_1

z_2

z_1

z_2

Nonlinear Programming (SciPy)

$$\min_{x} f(x)$$

s.t.

simple bounds
$$l \leq x \leq u$$

nonlinear inequality
$$g(x) \geq 0$$

nonlinear equality
$$h(x) = 0$$

Different conventions, same idea.

https://docs.scipy.org/doc/scipy/reference/
generated/scipy.optimize.minimize.html