

bard721

This is a three-variable quadratic bilevel programming problem from [1, Chapter 7, example 7.2.1, page 275]. It has a solution at $(x_1, x_2, y) = (0.8, 0.2, 1)$.

$$\begin{aligned}
 &\underset{x_1, x_2, y}{\text{minimise}} && \frac{1}{2} \left(x_1 - \frac{4}{5} \right)^2 + \frac{1}{2} \left(x_2 - \frac{1}{5} \right)^2 + \frac{1}{2} (y - 1)^2 \\
 &\text{subject to} && 0 \leq x_1 \leq 1, \\
 & && 0 \leq x_2 \leq 1, \\
 & && y \in \arg \min_y \begin{cases} \frac{1}{2} y^2 + y - x_1 y + 2x_2 y, \\ \text{subject to } 0 \leq y \leq 1. \end{cases}
 \end{aligned}$$

			Dimension	Type
Upper-level	x	variables	2	real
	F(x,y)	objective	1	quadratic
	G(x,y)	inequality	4	bounds
	H(x,y)	equality	0	none
Lower-level	y	variables	1	real
	f(x,y)	objective	1	quadratic
	g(x,y)	inequality	2	bounds
	h(x,y)	equality	0	none

References

- [1] Jonathan Bard. *Practical Bilevel Optimization: Algorithms And Applications*, volume 30. Springer Science & Business Media, 09 1998.