

lu_deb_sinha

These are the six bilevel programs presented by Lu, Deb and Sinha [1]. The first three test problems are unconstrained, but have sensitive objective functions. The final three test problems are constrained such that the deterministic optimal solution(s) lie on one or more constraint boundary. Below we enumerate these problems and give the equation for case a.

- a: Unconstrained and sensitive objective functions at both levels;
- b: Unconstrained and sensitive objective function at lower-level alone;
- c: Unconstrained and sensitive objective function at upper-level alone;
- d: Uncertainty constraint functions at both levels;
- e: Uncertainty constraint functions at lower-level only;
- f: Uncertainty constraint functions at upper-level only;

$$\begin{aligned} & \underset{x,y}{\text{minimise}} && 2 - \exp\left(-\left(\frac{0.2y - x + 0.6}{0.055}\right)^{0.4}\right) - 0.8 \exp\left(-\left(\frac{0.15y - 0.4 + x}{0.3}\right)^2\right) \\ & \text{subject to} && 0 \leq x \leq 1, \\ & && 0 \leq y \leq 2, \\ & && y \in \arg \min_y \left(2 - \exp\left(-\left(\frac{1.5y - x}{0.055}\right)^{0.4}\right) - 0.8 \exp\left(-\left(\frac{2y - 3 + x}{0.5}\right)^2\right) \right). \end{aligned}$$

References

- [1] Zhichao Lu, Kalyanmoy Deb, and Ankur Sinha. Finding reliable solutions in bilevel optimization problems under uncertainties. In *Proceedings of the Genetic and Evolutionary Computation Conference 2016*, GECCO '16, page 941–948, New York, NY, USA, 2016. Association for Computing Machinery.