Tutorial 9: More Nonlinear Programming

GIAN Short Course on Optimization:
Applications, Algorithms, and Computation

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Modify `TaxBeer.mod` ... under which scenario is beer not taxed?

Write AMPL models for the following (simple) MPECs:

(P_1) $\quad$ $\underset{x,y}{\text{minimize}} \, (x-1)^2 + (y-1)^2$ $\quad$ subject to $\quad 0 \le x \perp y \ge 0$

(P_2) $\quad$ $\underset{x,y}{\text{minimize}} \, (x - 1)^2 + y^3 + y^2$ $\quad$ subject to $0 \le y \perp x \ge 0$

(P_3) $\quad$ $\underset{x,y}{\text{minimize}} \, f_i(x, y)$ $\quad$ subject to $0 \le y \perp y - x \ge 0$

with $f_1(x, y) = (x - 1)^2 + y^2$ and $f_2(x, y) = x^2 + (y - 1)^2$

- Formulate each model using `complements` and use `knitro`
- Formulate the model as an NLP
- Try the penalization approach, looping over the penalty

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Consider the MPEC

$$(P_4) \quad \begin{cases} \underset{x}{\text{minimize}} \;\; x_1 + x_2 \\ \text{subject to } x_2^2 \geq 1 \\ \qquad\qquad 0 \leq x_1 \perp x_2 \geq 0 \end{cases}$$

write an AMPL model, and start it at $(\epsilon, 1 - \epsilon)$.

Consider MPEC with and without slacks ...

$$(P_)5 \quad \begin{cases} \underset{z}{\text{minimize}} \;\; -x_1 - \tfrac{1}{2}x_2 \\ \text{subject to } x_1 + x_2 \leq 2 \\ \qquad\qquad 0 \leq x_1^2 - x_1 \perp x_2 \geq 0 \,. \end{cases}$$

write an AMPL model and show that slacks are needed