

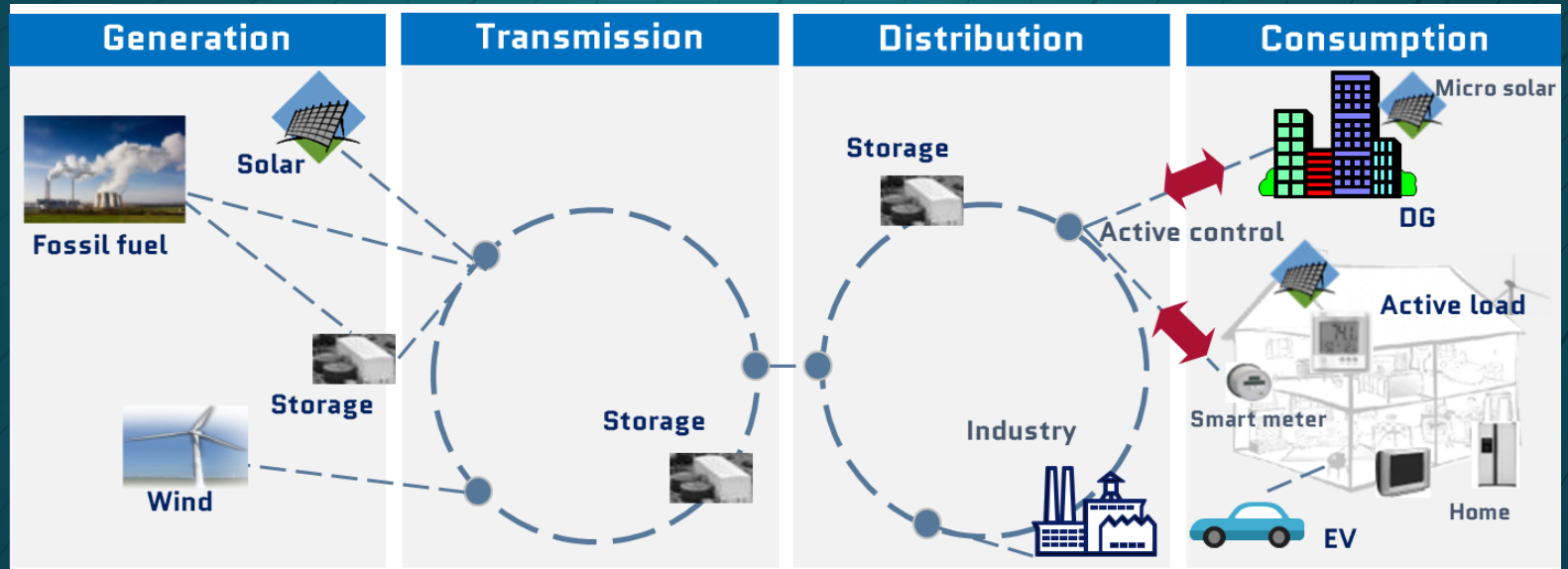
Learning Optimal Power Flow with Infeasibility Awareness

Tackling Climate Change with Machine Learning
ICML 2021

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Joint work with Longfei Liao, Lechao Cheng, Wei Hua

Why optimal power flow



What is optimal power flow

$$\min f(x)$$

$$s.t. \quad g(x) = 0$$

$$h(x) \leq 0$$



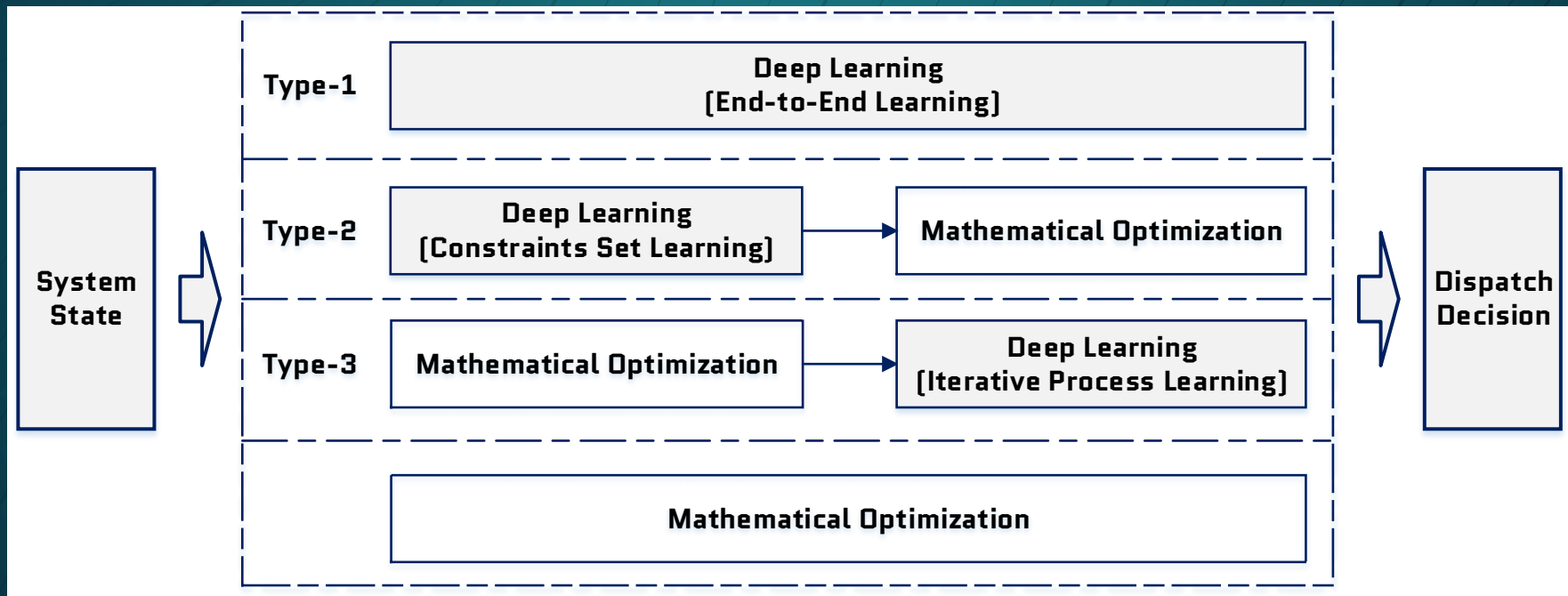
$$\min \sum (\alpha + \beta P_G + \gamma P_G^2)$$

$$s.t. \quad P_G - P_D - B\theta = 0$$

$$-P_L^{\max} \leq X\theta \leq P_L^{\max}$$

$$P_G^{\min} \leq P_G \leq P_G^{\max}$$

Where we have been



What we have missed

Power
demand —

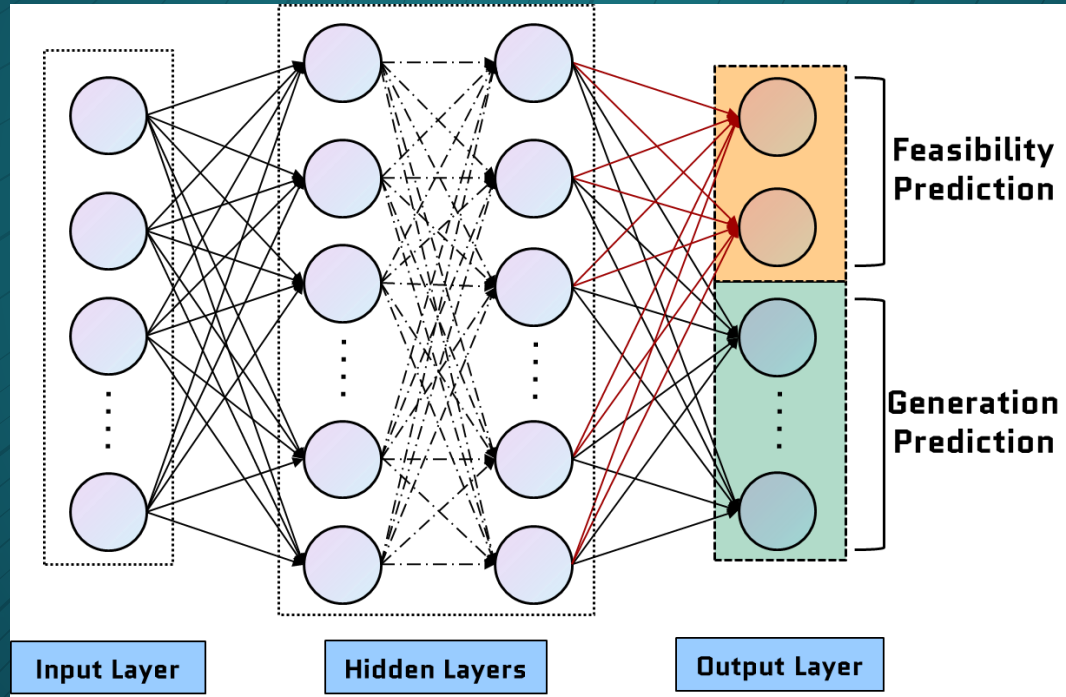
$$\begin{array}{ll}\min & f(x) \\ \text{s.t.} & g(x) = 0 \\ & h(x) \leq 0\end{array}$$

Infeasibility

Feasibility —

Power
generation

→ The idea



Results

Actual	Predicted	
	Feasible	Infeasible
Feasible	8535.6 \pm 2.9	9.4 \pm 2.9
Infeasible	11.1 \pm 4.4	1444.9 \pm 4.4

Results

Method	Cost error	Violation
Traditional	$0.25\% \pm 0.03\%$	$2.7\% \pm 0.1\%$
Multi-task	$0.19\% \pm 0.02\%$	$2.6\% \pm 0.1\%$



Thanks!

Any questions?

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