Globally injective and bijective neural operators

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Recently, there has been great interest in neural operators [2], which learn operators between infinite-dimensional function spaces. Given their discretization-invariance property, neural operators have been remarkably successful, especially in learning solution operators for partial differential equations (PDEs). In this talk, we show that injective neural operators are universal approximators of continuous operators. This holds substantial relevance to inverse problems in PDEs, as injective neural operators can serve invertible surrogate models for solution operators, which, in general, is not injective due to ill-posnedss of inverse problems. This talk bases on [1], which is a joint work with Michael Puthawala (South Dakota State University), Matti Lassas (University of Helsinki), and Maarten V. de Hoop (Rice University).

References

[1] Takashi Furuya, Michael Puthawala, Matti Lassas, and Maarten V de Hoop. Globally injective and bijective neural operators. *arXiv preprint arXiv:2306.03982*, 2023.

[2] Nikola Kovachki, Zongyi Li, Burigede Liu, Kamyar Azizzadenesheli, Kaushik Bhattacharya, Andrew Stuart, and Anima Anandkumar. Neural operator: Learning maps between function spaces. *arXiv preprint arXiv:2108.08481*, 2021.

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