Deliang Wei

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EDUCATION

East China Normal University	Shanghai, China
B.Sc. in Mathematics and Applied Mathematics;	*Sep 2015 – Jun 2019*
Ph.D. candidate in Mathematics; under the supervision of Prof. Fang Li;	*Sep 2019 – Present*
Chinese University of Hong Kong	Hong Kong, China
Research Assistant in Mathematics; under the supervision of Prof. Tieyong Zeng;	*Dec 2022 – Feb 2023*

RESEARCH INTERESTS AND EXPERIENCES

School of mathematics	East China Normal University
Ph.D. candidate	*Sep 2019 – Present, Full-time*

- Interested in plug-and-play algorithms for image inverse problems. Implemented various image processing tasks, including denoising, deblurring, super resolution, and medical imaging. Conducted a general review on convex analysis, first-order optimization methods, monotone operator theory, while staying updated on the state-of-the-art iterative image processing methods, especially the plug-and-play (PnP) methods with deep denoisers and convergence guarantee.
- Participated in the project '*Intelligent Basic Model Based on Harmonic (Symplectic) Game Dynamics*', and developed an efficient second-order method with predictions for differential games like GANs.
- Developed a convergent PnP method based on an adaptively averaged Douglas-Rachfold splitting method for Rician noise removal and Cauchy noise removal.
- Developed a convergent PnP algorithm (DeepSPIM) based on a semi-proximal ADMM framework and gradient step denoiser assumption for sparse-view CT reconstruction. Applied for an invention patent.
- Proposed a new convergent PnP method with weaker assumptions (pseudo-contractiveness) on the deep denoisers. Developed a special training strategy based on holomorphic transformation and functional calculi to ensure the assumptions while not compromising network performance. The paper has been accepted by ICML 2024.
- Proposed a Hamiltonian and spectral regularized denoiser for PnP-ADMM method on Poisson inverse problems. The denoiser is proved to be conversative, with contractive residual. We prove the convergence of PnP-ADMM with any convex fidelity term without requiring a Lipschitz gradient of the fidelity, or strong convexity. The paper is under open review.

PUBLICATION LIST

- Wei D, Chen P, Li F. Learning pseudo-contractive denoisers for inverse problems[J]. *arXiv:2402.05637,* 2024. Accepted by International Conference on Machine Learning (ICML) 2024, to appear.
- Wei D, Li F, Shen X, Zeng T. DeepSPIM: Deep Semi-Proximal Iterative Method for Sparse-View CT Reconstruction with Convergence Guarantee[J]. *CSIAM Transactions on Applied Mathematics,* 2024, to appear.
- Wei D, Weng S, Li F. Nonconvex Rician noise removal via convergent plug-and-play framework[J]. *Applied Mathematical Modelling*, 2023, 123: 197-212. https://doi.org/10.1016/j.apm.2023.06.033
- Wei D, Li F, Weng S. Cauchy Noise Removal via Convergent Plug-and-Play Framework with Outliers Detection[J]. *Journal of Scientific Computing*, 2023, 96(3): 76. https://doi.org/10.1007/s10915-023-02303-5
- Wei D, Chen P, Li F, et al. Efficient second-order optimization with predictions in differential games[J]. *Optimization Methods and Software*, 2023: 1-26. https://doi.org/10.1080/10556788.2023.2189715

INVENTION PATENT

- A semi-proximal based low dose electronic computed tomography imaging method. Under review.

SKILLS

Languages:	Chinese, English
Technologies:	MATLAB, Pytorch, Linux
Teaching:	Teaching assistant for the real analysis class
	Organizer of the monotone operator seminar