

Bo Li, PhD student in machine learning

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lyn1874 Bo Li Scholar
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Available from Feb-2024



Summary

I am a highly motivated, organised and dedicated Ph.D. (expected graduation in **Jan 2024**) with proven mathematical and coding skills, and a desire to learn more. I have **7+ years** of experience using machine learning and deep learning for analysing various data types (medical images, Raman spectra, and videos). I am particular interested in **analyzing real-world datasets** and am eager to contribute my skills and knowledge to translate ideas more effectively, leveraging AI to tailor solutions for specific needs.

Skills:

Machine/Deep learning Optimization Federated learning Uncertainty estimation
Anomaly detection PyTorch & Python Computer vision Spectroscopy analysis Data visualization

Highlighted publications

- 1 B. Li*, X. Jiang*, M. N. Schmidt, T. S. Alstrøm, and S. U. Stich, "An improved analysis of per-sample and per-update clipping" in *Proceedings of the International Conference on Learning Representations, ICLR 2024*
- 2 B. Li, M. N. Schmidt, T. S. Alstrøm, and S. U. Stich, "On the effectiveness of partial variance reduction in federated learning with heterogeneous data," in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), Jun. 2023*, <https://arxiv.org/pdf/2212.02191.pdf>
- 3 B. Li, M. N. Schmidt, T. S. Alstrøm, "Raman Spectrum Matching with Contrastive Representation Learning" in *Analyst*, 2022, <https://arxiv.org/abs/2202.12549>
- 4 B. Li, S. Leroux, P. Simoens, "Decoupled appearance and motion learning for efficient anomaly detection in surveillance video," in *Computer Vision and Image Understanding*, vol. 210, p. 103 249, 2021 <https://github.com/lyn1874/daml>

Awards

2022 – 2023 **Otto Mønsted Foundation funding**
2016 – 2018 **Danish Innovation Scholarship under DABAI**

Skills

Languages Native Chinese, Proficient English, Basic Dutch (A1)
Coding Python, PyTorch, R, Bash script, MATLAB, TensorFlow, Linux, GitHub, AWS, Plotly, Keras, Jupyter notebook, Basic level for React

Work Experience

2019 – 2020 **Researcher** Ghent University - Imec, Supervisor: Dr. Sam Leroux, Prof. Pieter Simones
Belgium

- Develop deep neural networks for detecting anomalies in surveillance videos under adverse weather, [7], [8]
- Develop distillation-learning based hardware-efficient framework for traffic counting [6]

Work Experience (continued)

- 2018 – 2018
Denmark
- **Research Assistant** Technical University of Denmark, Supervisor: *Prof. Tommy Alstrøm*
- Explore uncertainty calibration within active learning for medical image segmentation
 - Develop region-based acquisition strategy to reduce labelling effort [9]
- 2018 – 2022
Denmark
- **Teaching Assistant** Technical University of Denmark
- Deep learning, 2021, 2023 • Bayesian machine learning, 2022 • Advanced data analysis, 2018

Education

- 2021 – 2024
Denmark
- **PhD, Technical University of Denmark** Applied Mathematics and Computer Science
Topic: *Federated Machine Learning for Raman spectra and Surface-Enhanced Raman spectra (SERS)*
- 2022 – 2023
Germany
- **Visiting PhD student, CISPA** Helmholtz Center for Information Security
Topic: *Accelerating the convergence of federated learning algorithms under high data heterogeneity*
- 2016 – 2018
Denmark
- **M.Sc., Technical University of Denmark** Mathematical Modelling and Computation
Thesis: *Active multitask learning for object recognition in images using deep neural networks*
- 2012 – 2016
China
- **B.Sc., Jilin University** Financial Engineering
Thesis: *The analysis of monetary factor in the context of capital market*

All publications

- 1 **B. Li***, X. Jiang*, M. N. Schmidt, T. S. Alstrøm, and S. U. Stich, “An improved analysis of per-sample and per-update clipping,” in *In Proceedings of the International Conference on Learning Representations, ICLR 2024*, 2024.
- 2 **B. Li**, Y. Esfandiari, M. N. Schmidt, T. S. Alstrøm, and S. U. Stich, *Synthetic data shuffling accelerates the convergence of federated learning under data heterogeneity*, 2023. arXiv: 2306.13263 [cs.LG].
- 3 **B. Li**, M. N. Schmidt, T. S. Alstrøm, and S. U. Stich, “On the effectiveness of partial variance reduction in federated learning with heterogeneous data,” in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, Jun. 2023, pp. 3964–3973.
- 4 **B. Li**, G. Zappalá, E. Dumont, *et al.*, “Nitroaromatic explosives’ detection and quantification using an attention-based transformer on surface-enhanced raman spectroscopy maps,” *Analyst*, 2023. 🔗 URL: <http://dx.doi.org/10.1039/D3AN00446E>.
- 5 **B. Li**, M. N. Schmidt, and T. S. Alstrøm, “Raman spectrum matching with contrastive representation learning,” *Analyst*, 2022. 🔗 DOI: 10.1039/D2AN00403H.
- 6 **B. Li***, S. Leroux*, and P. Simoens, “Automated training of location-specific edge models for traffic counting,” *Computers Electrical Engineering*, vol. 99, p. 107 763, 2022, ISSN: 0045-7906.
- 7 **B. Li***, S. Leroux*, and P. Simoens, “Multi-branch neural networks for video anomaly detection in adverse lighting and weather conditions,” in *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)*, Jan. 2022, pp. 2358–2366.
- 8 **B. Li**, S. Leroux, and P. Simoens, “Decoupled appearance and motion learning for efficient anomaly detection in surveillance video,” *Computer Vision and Image Understanding*, vol. 210, p. 103 249, 2021, ISSN: 1077-3142.
- 9 **B. Li** and T. Alstrøm, “On uncertainty estimation in active learning for image segmentation,” in *Proceedings of 2020 International Conference on Machine Learning: Workshop on Uncertainty and Robustness in Deep Learning*, 2020.

Projects supervision

- 1 2023, Project supervision: *Explore the quality of the estimated uncertainty using federated learning*
- 2 2023, Bachelor thesis: *Explore representation learning in federated learning*, Victor T. Olesen, and Rasmus S. Mikkelsen
- 3 2022, Project: *Federated machine learning*, Asger L. Schultz, Søren W. Holm, and Gustav L. Moesmand
- 4 2021, Project: *Unsupervised representation learning*, Till A. Aczel, Victor T. Olesen, Rasmus S. Mikkelsen, and David B. Ludvigsen
- 5 2021, Master thesis: *Segmentation of cardiac structures based on MRI data using neural networks with analysis and evaluation of anatomical implausible segmentation errors (coding support)*, Katrine M. Ejlev and Michala Z. Blicher

Referees

1. Associate Professor Tommy S. Alstrøm, Technical University of Denmark, ✉ tsal@dtu.dk
2. Associate Professor Mikkel N. Schmidt, Technical University of Denmark, ✉ mnsc@dtu.dk