Bo Li, PhD student in machine learning

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Summary

I am a highly motivated, organised and dedicated PhD student with proven mathematical and coding skills and a desire to learn more. I have **6+ years** of experience using machine learning and deep learning for analysing various data types (medical images, Raman spectra, and videos). I am eager to contribute my skills to push the boundaries of what's possible and shape the future of AI.

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 federated learning" *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** and T. Alstrøm, "On uncertainty estimation in active learning for medical image segmentation," in *Proceedings of 2020 International Conference on Machine Learning (ICML): Workshop on Uncertainty and Robustness in Deep Learning*, 2020

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
3d Model: Basic level for Blender

Work Experience

2019 – 2020 Belgium

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

- *Develop deep neural networks for detecting anomalies in surveillance videos under adverse weather, [6], [8]*
- *Develop distillation-learning based hardware-efficient framework for traffic counting [5]*

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**, Y. Esfandiari, M. N. Schmidt, T. S. Alstrøm, and S. U. Stich, "Synthetic data shuffling accelerates the convergence of federated learning under data heterogeneity," *Transactions on Machine Learning Research*, 2024, ISSN: 2835-8856. URL: https://openreview.net/forum?id=c5o4HUypqm.

2. **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.

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. S. Leroux*, **B. Li***, 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.

6. S. Leroux*, **B. Li***, 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.

7. **B. Li**, M. N. Schmidt, and T. S. Alstrøm, "Raman spectrum matching with contrastive representation learning," *Analyst*, 2022. DOI: 10.1039/D2AN00403H.

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