Zhichao Lu

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Bio

Zhichao Lu is currently a post-doctoral research associate at SUSTech. He received Ph.D degree in ECE from MSU in 2020, under the supervision of Prof. Kalyanmoy Deb, where he studied bilevel optimization, multi-objective optimization, and neural architecture search. His current research focus is on developing efficient and automated ML/DL algorithms and systems, with the overarching goal of making AI accessible to everyone.

Education

Michigan State University, East Lansing, Michigan, USA

Ph.D in Electrical and Computer Engineering   Sep 2014 - Aug 2020
- Advisor: Prof. *Kalyanmoy Deb*

Michigan State University, East Lansing, Michigan, USA

B.S in Electrical and Computer Engineering   Sep 2009 - Dec 2013
- Graduated with honor; GPA: 3.86 / 4.0

Work Experience

Post-doc Research Associate, **Southern University of Science and Technology**, China   Oct 2020 – Now
- Evolutionary machine learning, notably machine learning assisted evolutionary algorithms, automated machine learning, and in particular evolutionary neural architecture search.

Research Intern, **Siemens PLM Software**, E. Lansing, MI, USA   May 2018 – Aug 2018
- Large-scale combinatorial optimization algorithm research, with a particular application to the capacitor placement problem on a circuit board. Mentor: *Ranny Sidhu*

Selected Publications

1. "Neural Architecture Transfer"
   Zhichao Lu, G. Sreekumar, E. Goodman, W. Banzhaf, K. Deb, and V. N. Boddeti
   IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), 2021.

2. "Multi-Objective Evolutionary Design of Deep Convolutional Neural Networks for Image Classification"
   Zhichao Lu, I. Whalen, Y. Dhebar, K. Deb, E. Goodman, W. Banzhaf and V. N. Boddeti
   IEEE Transactions on Evolutionary Computation (TEVC), 2021.

3. "NSGA-Net: Neural Architecture Search using Multi-Objective Genetic Algorithm"
   Zhichao Lu, I. Whalen, V. N. Boddeti, Y. Dhebar, K. Deb, E. Goodman, and W. Banzhaf
   Genetic and Evolutionary Computation Conference (GECCO), 2019.
   Best Paper Award (Evolutionary machine learning track).

4. "NSGANetV2: Evolutionary Multi-Objective Surrogate-Assisted Neural Architecture Search"
   Zhichao Lu, K. Deb, E. Goodman, W. Banzhaf, and V. N. Boddeti
   European Conference on Computer Vision (ECCV), 2020.
   Oral presentation (Top 2% of 5,000+ submissions).

5. "MUXConv: Information Multiplexing in Convolutional Neural Networks"
   Zhichao Lu, K. Deb, and V. N. Boddeti
   IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2020.

Research Grants

National Natural Science Foundation of China (Youth Program), PI   2022 − 2023
- "Surrogate-Assisted Evolutionary Multi-Objective Deep Neural Architecture Search"
  Award amount: CNY 160,000

Shenzhen Science and Technology Program (Postdoctoral Start-up), PI   2022 − 2023
- "Computational Intelligence based Multi-Objective Deep Neural Architecture Search"
  Award amount: CNY 300,000

China Postdoctoral Science Foundation (General Program), PI   2021 − 2022
- "Research and Applications of Evolutionary Multi-Objective Deep Neural Architecture Search"
  Award amount: CNY 80,000

Huawei Technologies Co., Ltd, Co-PI   2020 − 2021
- "Evolutionary Computation Based Deep Neural Architecture Search for Microchips"
  Award amount: CNY 1,280,000. Co-authored with Ran Cheng (PI) and Cheng He (Co-PI).

Other Publications (*equal contribution, #corresponding author, +under my supervision)

Manuscripts in Submission

1. "TFormer: A Transmission-Friendly ViT Model for IoT Devices"
   Zhichao Lu, C. Ding, F. Xu, V. N. Boddeti, S. Wang, and Y. Yang
   IEEE Transactions on Parallel and Distributed Systems (TPDS), 2022.

2. "LoNAS: Low-Cost Neural Architecture Search Using a Three Stage Evolutionary Algorithm"
   Z. Zhu, W. Fang, S. Zhu, J. Sun, X. Wu and Zhichao Lu
   IEEE Computational Intelligence Magazine (CIM), 2022.

3. "Resource-Friendly Feature Extraction for IoT Devices"
   C. Ding, Y. Li, Zhichao Lu, S. Wang, and S. Guo
   IEEE Transactions on Mobile Computing (TMC), 2022.

4. "NLMB: A Non-Learnable and Multi-Branching Module for Multi-Task Learning"
   C. Ding, Zhichao Lu[#], S. Wang, R. Cheng, and V. N. Boddeti
   IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), 2022.

5. "MoSegNAS: Surrogate-assisted Multi-objective Neural Architecture Search for Real-time Semantic Segmentation"
   Zhichao Lu, R. Cheng, S. Huang[+], H. Zhang[+], C. Qiu and F. Yang
   IEEE Transactions on Artificial Intelligence (TAI), 2022.

6. "Automated Design of Feature Pyramid Networks towards Real-time Semantic Segmentation"
   Zhichao Lu*, S. Huang*[+], R. Cheng, K. C. Tan, C. Qiu, and F. Yang
   European Conference on Computer Vision (ECCV), 2022.

Journal Publications

1. "Towards Transmission-friendly and Robust CNN Models over Cloud and Device"
   C. Ding, Zhichao Lu[#], F. Xu, V. N. Boddeti, Y. Li, and J. Cao
   IEEE Transactions on Mobile Computing (TMC), 2022.

2. "Minimizing Expected Deviation in Upper-level Outcomes Due to Lower-level Decision-making Uncertainty in Hierarchical Problems"
   K. Deb, Zhichao Lu, I. Kropp, J. Hernandez-Suarez, R. Hussein, S. Miller, and A. Nejadhashemi
   IEEE Transactions on Evolutionary Computation (TEVC), 2022.

3. "A General Framework for Enhancing Relaxed Pareto Dominance Methods in Evolutionary Many-Objective Optimization"
   S. Zhu, L. Xu, E. Goodman, K. Deb and Zhichao Lu
   Natural Computing, 2022.

4. "Accelerating Multi-Objective Neural Architecture Search by Random-Weight Evaluation"
   S. Hu[+], R. Cheng, C. He, Zhichao Lu, J. Wang, M. Zhang
   Complex & Intelligent Systems, 2021.

5. "A New Many-Objective Evolutionary Algorithm based on Generalized Pareto Dominance"
   S. Zhu, L. Xu, E. Goodman and Zhichao Lu
   IEEE Transactions on Cybernetics (TCYB), 2021.

6. "Bilevel Optimization based on Iterative Approximation of Multiple Mappings"
   A. Sinha, Zhichao Lu, K. Deb, and P. Malo
   Journal of Heuristics, 2020.

7. "Uncertainty Handling in Bilevel Optimization for Robust and Reliable Solutions"
   Zhichao Lu, K. Deb, and A. Sinha
   International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems, 2018.

Conference Publications

1. "VLMixer: Unpaired Vision-Language Pre-training via Cross-Modal CutMix"
   T. Wang, W. Jiang, Zhichao Lu, F. Zheng, R. Cheng, C. Yin, and P. Luo
   International Conference on Machine Learning (ICML), 2022.

2. "FaPN: Feature-aligned Pyramid Network for Dense Image Prediction"
   S. Huang$^+$, Zhichao Lu, R. Cheng, and C. He
   IEEE/CVF International Conference on Computer Vision (ICCV), 2021.

3. "End-to-End Dense Video Captioning with Parallel Decoding"
   T. Wang$^+$, R. Zhang, Zhichao Lu, F. Zheng, R. Cheng, and P. Luo
   IEEE/CVF International Conference on Computer Vision (ICCV), 2021.

4. "Multi-objective Neural Architecture Search with Almost No Training"
   S. Hu$^+$, R. Cheng, C. He, and Zhichao Lu
   Evolutionary Multi-Criterion Optimization (EMO), 2021.

5. "The (M-1)+1 framework of relaxed Pareto dominance for evolutionary many-objective optimization"
   S. Zhu, L. Xu, E. Goodman, K. Deb, and Zhichao Lu
   Evolutionary Multi-Criterion Optimization (EMO), 2021.

6. "NSGA-Net: Neural Architecture Search using Multi-Objective Genetic Algorithm (Extended Abstract)"
   Zhichao Lu, I. Whalen, V. N. Boddeti, Y. Dhebar, K. Deb, E. Goodman, and W. Banzhaf
   International Joint Conference on Artificial Intelligence (IJCAI), 2020. (Invited Paper)

7. "Balancing Survival of Feasible and Infeasible Solutions in Constraint Evolutionary Optimization Algorithms"
   Zhichao Lu, K. Deb, and H. Singh
   IEEE Congress on Evolutionary Computation (CEC), 2018.

8. "Solving a Supply-chain Management Problem using a Bilevel Approach"
   Zhichao Lu, K. Deb, E. Goodman, and J. Wassick
   Genetic and Evolutionary Computation Conference (GECCO), 2017.

9. "Handling Practicalities in Agricultural Policy Optimization for Water Quality Improvements"
   B. Barnhart, Zhichao Lu, M. Bostian, A. Sinha, K. Deb, L. Kurkalova, M. Jha, and G. Whittaker
   Genetic and Evolutionary Computation Conference (GECCO), 2017.

10. "Finding Reliable Solutions in Bilevel Optimization Problems under Uncertainties"
    Zhichao Lu, K. Deb, and A. Sinha
    Genetic and Evolutionary Computation Conference (GECCO), 2016.
    Best Paper Nomination (Real-world application track).

11. "Handling Decision Variable Uncertainty in Bilevel Optimization Problems"
    Zhichao Lu, K. Deb, and A. Sinha
    IEEE Congress on Evolutionary Computation (CEC), 2015.

12. "Towards Optimal Ship Design and Valuable Knowledge Discovery under Uncertain Conditions"
    K. Deb, Zhichao Lu, C. B. McKesson, C. C. Trumbach, and L. DeCan
    IEEE Congress on Evolutionary Computation (CEC), 2015.

BOOK CHAPTERS

1. K. Deb, A. Sinha, P. Malo, Zhichao Lu, Approximate Bilevel Optimization with Population-Based Evolutionary Algorithms. In: Dempe S., Zemkoho A. (eds) Bilevel Optimization. Springer Optimization and Its Applications, vol 161. Springer, Cham, 2020. (ISBN 978-3-030-52118-9)

Honors and Awards

MICCAI Glaucoma grAding from Multi-Modality imAge (GAMMA) Challenge Excellent Award	2021
CVPR ActivityNet Event Dense-Captioning Challenge Runner Up	2021
SUSTech Presidential Outstanding Postdoctoral Award	2021
MSU College of Engineering GOF Fellowship	2020
GECCO Best Paper Award (Evolutionary Machine Learning Track)	2019
MSU Graduate School Dissertation Completion Fellowship	2019
GECCO Best Paper Award Nomination (Real-world Application Track)	2016
MSU Engineering Distinguished Fellowship	2014

Invited Talks

South China University of Technology — Dec 2021
- "A Preliminary Exploration of Evolutionary Deep Learning Paradigm"
  Host: Han Huang

Hong Kong University of Science and Technology — July 2021
- "Towards Automated and Efficient Machine Learning Systems – An Evolutionary Multi-Objective Approach"
  Host: Jiguang Wang

Nature Inspired Computing and Engineering (NICE) Group Seminar — June 2021
- "Evolutionary Multi-Objective Neural Architecture Search"
  Host: Handing Wang

ECCV main conference, virtual. — Aug 2020
- "NSGANetV2: Evolutionary Multi-Objective Surrogate-Assisted Neural Architecture Search"

CVPR NAS Workshop, virtual. — June 2020
- "Neural Architecture Transfer"

CVPR NAS Workshop, virtual. — June 2020
- "MUXConv: Information Multiplexing in Convolutional Neural Networks"

MSU CSE Multi-Group Seminar, East Lansing, USA — Jan 2020
- "Evolutionary Multi-Objective Neural Architecture Search"

Professional Activities

Conference Organizers:
- EMO 2021: *Online Platform Co-Chair*, International Conference Series on Evolutionary Multi-Criterion Optimization, Shenzhen, China.
- EMO 2019: *Local Organizing Committee*, International Conference Series on Evolutionary Multi-Criterion Optimization, East Lansing, MI, USA.

Conference Program Committee/Reviewer:
- IEEE Conference on Computer Vision and Pattern Recognition (CVPR)
- Genetic and Evolutionary Computation Conference (GECCO)
- IEEE Congress on Evolutionary Computation (CEC)
- International Conference Series on Evolutionary Multi-Criterion Optimization (EMO)

Journal Reviewer:
- IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
- IEEE Transactions on Evolutionary Computation (TEVC)
- IEEE Transactions on Medical Imaging (TMI)
- IEEE Transactions on Multimedia (TMM)
- IEEE Transactions on Circuits and Systems for Video Technology (TCSVT)
- IEEE Transactions on Artificial Intelligence (TAI)
- IEEE Computational Intelligence Magazine (CIM)

Teaching

Graduate Teaching Assistant, Michigan State University   Fall 2015
- ECE 202: Circuits and Systems II

Mentorship and Advising

Mentees who co-authored above listed publications are indicated with ∗

1. Shihua Huang* (SUSTech)   Research Assistant, 2020-2022
    - Joining MSU CSE as a Ph.D Student in 2022 Fall.
2. Shengran Hu* (SUSTech)   Research Assistant, 2020-2022
    - Joining UBC CSE as a Ph.D Student in 2022 Fall.
3. Teng Wang* (HKU)   Ph.D student, 2020-current
4. Gautam Sreekumar* (MSU)   Ph.D student, 2019-2020
5. Haoming Zhang* (SUSTech)   MS student, 2020-current
6. Rui Zhang (SUSTech), now at Huawei   MS student, 2020-current
7. Hu Zhang (SUSTech), now at Huawei   MS student, 2020-current

Refernces

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