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Research Scientist

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1. Education

- **Beihang University**, Ph.D. Candidate in Computer Science (2011-2018)
School of Computer Science and Engineering
Advisor: Prof. Wei Li
- **University of Michigan Ann Arbor**, Visiting Ph. D student in Computer Vision and Machine Learning (2015.9-2016.10)
Computer Science and Engineering
Research advisor: Prof. Jia Deng
- **Beihang University**, M.S. in Computer Science (2010-2011)
School of Computer Science and Engineering
Advisor: Prof. Wei Li
- **Beihang University**, B.S. in Computer Science (2006-2010)
School of Computer Science and Engineering

2. Research Interests

Machine learning: Optimization and Normalization Techniques on Deep Learning, Semi-Supervised Learning, Active Learning, Manifold Learning, Adversarial Examples, Kernel Methods

Computer Vision: Human Pose Estimation, Object Detection and Segmentation, Image Style Transfer

Multimedia Annotation and Retrieval: Large Scale Annotation, Hash Based Nearest Neighbor Search

3. Papers and Publications

Papers (peer-reviewed):

- **Lei Huang**, Jie Qin, Li Liu, Fan Zhu, Ling Shao. Layer-wise Conditioning Analysis in Exploring the Learning Dynamics of DNNs. *European Conference on Computer Vision (ECCV)*, **Oral (104/5025, rate:2%)**, 2020.

- **Lei Huang**, Li Liu, Fan Zhu, Diwen Wan, Zehuan Yuan, Bo Li, Ling Shao. Controllable Orthogonalization in Training DNNs. *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, **Oral & Best Paper Nomination (26/5865, rate:0.44%)**, 2020.
- **Lei Huang**, Lei Zhao, Yi Zhou, Fan Zhu, Li Liu, Ling Shao. An Investigation into the Stochasticity of Batch Whitening. *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, **Oral (335/5865, rate:5.7%)**, 2020.
- **Lei Huang**, Yi Zhou, Fan Zhu, Li Liu, Ling Shao. Iterative Normalization: Beyond Standardization towards Efficient Whitening. *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2019.
- **Lei Huang**, Xianglong Liu, Bo Lang, Admas Wei Yu, Bo Li. Orthogonal Weight Normalization: Solution to Optimization over Multiple Dependent Stiefel Manifolds in Deep Neural Networks. *The Thirty-Second AAAI Conference on Artificial Intelligence (AAAI)*, **Oral**, 2018.
- **Lei Huang**, Dawei Yang, Bo Lang, Jia Deng. Decorrelated Batch Normalization. *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2018.
- **Lei Huang**, Xianglong Liu, Yang Liu, Bo Lang, Dacheng Tao. Centered Weight Normalization in Accelerating Training of Deep Neural Networks. *IEEE International Conference on Computer Vision (ICCV)*, 2017.
- **Lei Huang**, Xianglong Liu, Jie Qin, Fan Zhu, Liu Liu, L Shao, Projection Based Weight Normalization: Efficient Method for Optimization on Oblique Manifold in DNNs. *Pattern Recognition*. 2020. (SCI, Q1, IF=5.898)
- **Lei Huang**, Xianglong Liu, Binqiang Ma, Bo Lang, Online semi-supervised annotation via proxy-based local consistency propagation, *Neurocomputing*, Volume 149, Part C, Pages 1573-1586, 3 February 2015. (SCI, Q1, IF=4.072)
- **Lei Huang**, Yuqing Ma, Xianglong Liu. A general non-parametric active learning framework for classification on multiple manifolds. *Pattern Recognition Letters*, 2019. (SCI, IF=2.810)
- **Lei Huang**, Yang Liu, Xindong Wang, Xianglong Liu, Bo Lang. Graph-based active Semi-supervised learning a new perspective for relieving multi-class annotation labor. *IEEE International Conference on Multimedia and Expo (ICME)*, 2014.
- **Lei Huang**, Yang Wang, Xianglong Liu, Bo Lang. Efficient Semi-supervised Annotation with Proxy-based Local Consistency Propagation. *IEEE International Conference on Multimedia and Expo (ICME)*, 2013.
- **Lei Huang**, Yang Liu. BUAA AUDR at ImageCLEF 2012 Photo Annotation Task. *CLEF Online Working Notes*, 2012.
- Diwen Wan, Fumin Shen, Li Liu, Fan Zhu, **Lei Huang**, Mengyang Yu, HengTao Shen, Ling Shao. Deep Quantization Generative Networks. *Pattern Recognition*. 2020. (SCI, Q1, IF=5.898, the first author is under my supervision for this paper)

- Lei Zhao, Xiaohui Wang, **Lei Huang**. An Efficient Agreement Mechanism in CapsNets By Pairwise Product, European Conference on Artificial Intelligence (ECAI), 2020. (the first author is under my supervision for this paper)
- Huan Xiong, **Lei Huang**, Mengyang Yu, Li Liu, Fan Zhu, Ling Shao. On the Number of Linear Regions of Convolutional Neural Networks. International Conference on Machine Learning (ICML), 2020.
- Yuming Shen, Jie Qin, **Lei Huang**, Li Liu, Fan Zhu, Ling Shao. Invertible Zero-Shot Recognition Flows. *European Conference on Computer Vision (ECCV)*, 2020.
- Yi Zhou, Xiaodong He, **Lei Huang**, Li Liu, Fan Zhu, Shanshan Cui, Ling Shao. Collaborative Learning of Semi-Supervised Segmentation and Classification for Medical Images. *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2019.
- Xianglong Liu, **Lei Huang**, Cheng Deng, Jiwen Lu, Bo Lang. Multi-View Complementary Hash Tables for Nearest Neighbor Search. *IEEE International Conference on Computer Vision (ICCV)*, 2015.
- Xianglong Liu, **Lei Huang**, Cheng Deng, Bo Lang, Dacheng Tao. Query-Adaptive Hash Code Ranking for Large-Scale Multi-View Visual Search. *IEEE Trans. Image Processing* 25(10): 4514-4524 (2016). (SCI, Q1, IF=6.79)
- Bo Wu, Yang Liu, Bo Lang, **Lei Huang**. DGCNN: Disordered Graph Convolutional Neural Network Based on the Gaussian Mixture Model. *Neurocomputing, Volume 321, Pages 346-356*, 2018. (SCI, Q1, IF=4.072)
- Yang Liu, **Lei Huang**, Xianglong Liu, Bo Lang. A novel rotation adaptive object detection method based on pair Hough model. *Neurocomputing* 194: 246-259 (2016). (SCI, Q1, IF=4.072)
- Lei Zhao, **Lei Huang**. Exploring Dynamic Routing As A Pooling Layer. *Proceedings of the IEEE International Conference on Computer Vision (ICCV) Workshops*, 2019
- Zepeng Gu, Bo Lang, Tongyu Yue, **Lei Huang**. Learning Joint Multimodal Representation Based on Multi-fusion Deep Neural Networks. *The 24th International Conference on Neural Information Processing (ICONIP)*, 2017, **Oral**.
- Yang Liu, **Lei Huang**, Siqi Wang, Xianglong Liu, Bo Lang. Efficient Segmentation for Region-Based Image Retrieval Using Edge Integrated Minimum Spanning Tree. *The 23rd International Conference on Pattern Recognition (ICPR)*, 2016
- Tianxu Ji, Xianglong Liu, Cheng Deng, **Lei Huang**, Bo Lang. Query-Adaptive Hash Code Ranking for Fast Nearest Neighbor Search. *ACM Multimedia, short paper*, 2014.
- Hualei Shen, Dianfu Ma, Yongwang Zhao, Hailong Sun, Sujun Sun, Rongwei Ye, **Lei Huang**, Bo Lang, Yan Sun. MIAPS: a web-based system for remotely accessing and presenting medical images. *Computer Methods and Programs in Biomedicine* (2014) 266-283.
- Mengyun Wang, Xianglong Liu, **Lei Huang**, Bo Lang, Hailiang Yu. Ontology-based Concept Similarity Integrating Image Semantic and Visual Information. *The 4th*

International Workshop on Advances in Semantic Information Retrieval, 2014.

- Xianglong Liu, Bo Lang, Wei Yu, Junwu Luo, **Lei Huang**. AUDR: An Advanced Unstructured Data Repository, *The 6th International Conference on Pervasive Computing and Applications (ICPCA)*, 2011.

Papers (pre-print):

- Wei Li, Zehuan Yuan, Dashan Guo, **Lei Huang**, Xiangzhong Fang, and Changhu Wang. Deformable Tube Network for Action Detection in Videos. arXiv preprint arXiv:1907.01847, 2019. Submit to IEEE Transactions on Multimedia (SCI, Q1, IF=5.452)
- Bin Wen, Jie Luo, Xianglong Liu, **Lei Huang**. Unbiased Scene Graph Generation via Rich and Fair Semantic Extraction. preprint (arXiv: 2002.00176), 2020
- Adams Wei Yu, **Lei Huang**, Qihang Lin, Ruslan Salakhutdinov, Jaime Carbonell. Block-normalized Gradient Method: an Empirical Study for Training Deep Neural Network. preprint (arXiv:1712.03563), 2017.

Patent

- Medical image segmentation and severity grading using neural network architectures with semi-supervised learning techniques. Inception Institute of Artificial Intelligence. Yi Zhou, Xiaodong He, **Lei Huang**, Li Liu, Fan Zhu, Shanshan Cui, Ling Shao. (USA) Patent No: US 10,430,946 B1
- Wei Li, **Lei Huang**, Bo Lang. A wiki-based method of Image Classification evolutionary mechanisms. *Patent No.ZL201110201849.1(China)*.

Computer Software Copyright

- Wei Li, Bo Lang, **Lei Huang**. Dynamic Evolution of Image Classification System (DEICS). *Application No.2010SRBJ5853(China)*. (First Author as Student)
- Wei Li, Bo Lang, **Lei Huang**. Web Based Unstructured Data Manage System for Big Data. *Application No.2010SRBJ5853(China)*. (First Author as Student)
- Wei Li, Bo Lang, **Lei Huang**. Advanced Unstructured Data Repository for Enterprise. *Application No.2011SR103608(China)*. (First Author as Student)

4. Awards

Scholarships and honors

- CVPR 2020 best paper nomination. 2020
- China Scholarship Council (CSC) Scholarship, 2015.
- The China National Scholarship for Ph.D. candidate, 2014.
- The “Guanghua” Scholarship, 2013.
- Outstanding graduate, Beihang University. 2010
- The Third Class Scholarship for Academic Performance in Beihang University, 2009

- The Third Class Scholarship for Contest Excellence in Beihang University, 2008
- The Second Class Scholarship for Excellent Freshman in Beihang University, 2006.

Contest

- 2nd Class Prize, the 2nd Beihang University Dancing Contest, 2010.
- 3rd Class Prize, the 19th *FengRu* Contest (the highest tier contest about science and technology in Beihang University), 2009.
- 2nd Class Prize, the 1st Beihang University Dancing Contest, 2008.
- 2nd Class Prize, ACM Programming Contest of Beihang University, 2008.
- 3rd Class Prize, the 18th Mathematics Contest for College Students in Beijing, 2007.
- 3rd Class Prize, the 24th National Physics Contest for College Students in China, 2007.
- 2nd Class Prize, Beihang University Mathematics Contest, 2007.

5. Professional Experience

Program committee

- Co-Organizer: The First Workshop on Statistics Deep Learning in Computer Vision, in conjunction with ICCV 2019.

Reviewer

- Journal of Machine Learning Research (JMLR)
- International Journal of Computer Vision (IJCV)
- IEEE Transactions on Neural Networks and Learning Systems (TNNLS)
- IEEE Transactions on Cybernetics
- Pattern Recognition (PR)
- Neurocomputing
- Frontiers of computer science
- International Journal of Machine Learning and Cybernetics
- Computer Vision and Pattern Recognition (CVPR): 2016, 2019, 2020
- International Conference on Computer Vision (ICCV): 2019
- European Conference on Computer Vision (ECCV): 2020
- Winter Conference on Applications of Computer Vision (WACV): 2020
- Neural Information Processing Systems (NeurIPS): 2016, 2020
- AAAI Conference on Artificial Intelligence (AAAI): 2019, 2020
- International Joint Conferences on Artificial Intelligence (IJCAI): 2017,

2020

- ACM Multimedia: 2019, 2020
- Pacific-Rim Conference on Multimedia (PCM): 2015

Talks

- July 3th, 2020, “Towards feature whitening and weight orthogonalization in training DNNs”, Multimedia Signal and Intelligent Information Processing Laboratory, Tsinghua University.
- June, 26th, 2020, “How feature whitening and weight orthogonalization affects the DNNs?”, NLSDE, BeiHang Univeristy.
- June, 22th, 2020, “Batch whitening: generalize normalization beyond standardization in training DNNs”, Vision Forum for International Young Scholars, BeiHang University .
- September 8th, 2018, “Normalization Methods for Training Deep Neural Networks: Theory and Practice”. European Conference on Computer Vision (ECCV) 2018, Tutorial. Munich, Germany
- April 25th, 2018, “Normalization Techniques in Training Deep Neural Networks”. Toutiao AI Lab, Beijing
- February 28th, 2018. “Orthogonal Weight Normalization: Solution to Optimization over Multiple Dependent Stiefel Manifolds in Deep Neural Networks”. Institute of Information Engineering, Chinese Academy of Sciences, Beijing.
- December 21th, 2017. “Deep Neural Networks: Modelling and Training”. JD.com, Beijing.
- October 19th, 2017. “Weight normalization techniques in training of deep neural networks”. Advanced Computing Research Laboratory, Institute of Computing Technology Chinese Academy of Sciences, Beijing.
- August 17th, 2017. “Normalization techniques in deep learning”. Multimedia Signal and Intelligent Information Processing Laboratory, Tsinghua University, Beijing
- November 1th, 2014. “Graph-based active Semi-Supervised Learning: a new perspective for relieving multi-class annotation labor”. ICT International Exchange Workshop 2014, Laboratory of Advanced Research B, University of Tsukuba, Japan

Research and Development

- 2018.01-2018.04, Human pose estimation. Research Intern, JD.com

- 2013.09-Present, Multi View Hash Tables for Nearest Neighbor Search.
(*National Natural Science Foundation of China, Grant No. 61370125*).
- 2015.09-Present, Semi-supervised learning Based for Large Scale Data
(Innovation Foundation of BUAA for PhD Graduates.).
- 2011.09-2015.05
The student leader of unstructured data management system (*The National Major Research Plan of Infrastructure Software, Grant No.2010ZX01042-002-001-00*)
- 2010.03-2011.09
The member of unstructured data management system (*The National Major Research Plan of Infrastructure Software, Grant No.2010ZX01042-002-001-00*)

6. IT Skills

Programing: Java, Matlab, Python, Lua, C/C++, JavaScript, PHP, C#
Deep Learning Platform: Torch, PyTorch, Caffe, TensorFlow, Theano
Miscellaneous: Hadoop, Hbase, Lucene, eXist, My Sql