ZHANGJIE CAO

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Education

Tsinghua University *China*
Bachelor of Computer Software *Sept. 2014 - Jul. 2018 (Expected)*
- GPA: 91/100 Ranking: 2/66

Publication & Technical Reports

Zhangjie Cao, Mingsheng Long, Jianmin Wang, Philip S. Yu. **HashNet: Deep Learning to Hash by Continuation**. *International Conference on Computer Vision (**ICCV**)*, 2017.

Zhangjie Cao, Qixing Huang, Ramani Karthik. **3D Object Classification via Spherical Projections**. *International Conference on 3D Vision (**3DV**)*, 2017.

Mingsheng Long, **Zhangjie Cao**, Jianmin Wang, Philip S. Yu. **Learning Multiple Tasks with Multilinear Relationship Networks**. *Neural Information Processing Systems (**NIPS**)*, 2017.

Zhangjie Cao, Mingsheng Long, Qiang Yang. **Transitive Hashing Network for Heterogeneous Multimedia Retrieval**. *AAAI Conference on Artificial Intelligence (**AAAI**)*, 2017. (**Oral Presentation**)

Zhangjie Cao, Mingsheng Long, Chao Huang, Jianmin Wang. **Transfer Adversarial Hashing for Hamming Space Retrieval**. *AAAI Conference on Artificial Intelligence (**AAAI**)*, 2018.

Zhongyi Pei†, **Zhangjie Cao**†, Mingsheng Long, Jianmin Wang. **Multi-Adversarial Domain Adaptation**. *AAAI Conference on Artificial Intelligence (**AAAI**)*, 2018. (†Equal Contribution)

Mingsheng Long, **Zhangjie Cao**, Jianmin Wang, Han Zhu, Michael I. Jordan. **Learning Transferable Visual Features with Very Deep Adaptation Networks**. *IEEE Transactions on Pattern Analysis and Machine Intelligence (**TPAMI**)*. (Under Review)

Zhangjie Cao, Mingsheng Long, Jianmin Wang, Michael I. Jordan. **Partial Transfer Learning with Selective Adversarial Networks**. *Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2018.

Zhangjie Cao, Mingsheng Long, Ziping Sun, Jianmin Wang. **Deep Priority Hashing**. *ACM Multimedia Conference (**ACM MM**)*, 2018.

Zhangjie Cao, Lijia Ma, Mingsheng Long, Jianmin Wang. **Partial Adversarial Domain Adaptation**. *European Conference on Computer Vision (**ECCV**)*, 2018.

Mingsheng Long, **Zhangjie Cao**, Jianmin Wang, Michael I. Jordan. **Conditional Adversarial Domain Adaptation**. *Neural Information Processing Systems (**NIPS**)* 2018. (Under Review)

Experience

National Lab for Big Data Systems, School of Software, Tsinghua University *China*
Mentor: Mingsheng Long
Projects on Deep Learning to Hash *Jan. 2016 - Nov. 2017*

Paper: Transitive Hashing Network for Heterogeneous Multimedia Retrieval
- Proposed a new cross-modal retrieval scenario where no explicit cross-modal relationship exists between query and database.
- Proposed a Transitive Hashing Network (THN), which transfers knowledge between modalities by heterogeneous relationship learning and between domains by homogeneous distribution alignment. A transitive transfer path is built from query to database.
- Achieved huge accuracy boost ($\sim 10\%$ on ImageNet-1000 to Yahoo-QA). Wrote the paper under the supervision of my mentor.

Paper: HashNet: Deep Learning to Hash by Continuation
- Proposed an end-to-end HashNet, the first deep architecture to learn exactly binary codes for image retrieval and compression.
- Enabled back-propagation of deep networks with sign activation function by continuation method, which attacks the ill-posed gradient problem by sequentially optimizing a series of easier networks that converge to the original optimization problem.
- Proposed a weighted likelihood to learn hash codes from data where numbers of similar pairs and dissimilar pairs are imbalanced.
- Implemented HashNet, and reimplemented state-of-the-art methods and wrote the paper under the supervision of my mentor.

Paper: Transfer Adversarial Hashing for Hamming Space Retrieval *June. 2017 - August. 2017*

- Proposed Transfer Adversarial Hashing (TAH), the first model that enables Hamming space retrieval across different domains, enabling $O(1)$ search cost by pruning candidates with hash table lookup within Hamming Radius 2.
- Proposed a novel pairwise cross-entropy loss based on t-distribution to concentrate similar images within small Hamming ball.
- Integrated domain-adversarial network for knowledge transfer between domains, enabling hashing for transfer retrieval tasks.
- Constructed new transfer retrieval datasets from the latest VisDA 2017 domain adaptation challenge dataset, implemented TAH and reimplemented state-of-the-art methods, and wrote the paper under the supervision of my mentor.

Paper: Deep Focal Hashing

- Proposed Deep Focal Hashing (DFH), which achieves state-of-the-art image retrieval performance based on Hamming ranking.
- Extended the Focal Loss (ICCV'17 best student paper) to metric learning with pairwise supervision, which focuses deep hashing models on harder pairs and rarer classes.
- Proposed a Quantization Focal Loss, which focuses deep hashing models on instances more difficult to quantize into hash codes.
- Implemented DFH, reimplemented state-of-the-art methods and wrote the paper under the supervision of my mentor.

National Lab for Big Data Systems, School of Software, Tsinghua University *China*

Mentor: Mingsheng Long

Projects on Domain Adaptation *Sept. 2016 - June. 2018*

Paper: Multi-Adversarial Domain Adaptation

- Proposed to use the probability over classes as the weighting strategy for training multiple adversaries in domain adaptation.
- Implemented Multi-Adversarial Domain Adaptation (MADA), designed and ran experiments and helped to proofread the paper.

Paper: Partial Transfer Learning with Selective Adversarial Networks

- Proposed a new Partial Transfer Learning problem, which focuses on transferring knowledge from big domains to small domains.
- Proposed a Selective Adversarial Network (SAN) with multiple adversarial networks and a weighing mechanism at both instance-level and class-level, which encourages positive transfer of relevant classes and circumvents negative transfer of outlier classes.
- Achieved huge accuracy boost ($\sim 10\%$ on ImageNet-1000 to Caltech-256). Wrote the paper under the supervision of my mentor.

Paper: Partial Adversarial Domain Adaptation

- Proposed Partial Adversarial Domain Adaptation (PADA) with a carefully designed class-level weighing mechanism, which encourages positive transfer of relevant classes and circumvents the influence of negative transfer of outlier classes.
- Achieved huge accuracy boost both on dataset with large domain gap (Office-Home) and large-scale dataset (ImageNet-Caltech). Wrote the paper under the supervision of my mentor.

Paper: Learning Transferable Features with Very Deep Adaptation Networks

- The first work with my mentor. Identified the performance bottleneck caused by poor initialization, and proposed a progressive strategy to stabilize training across the classification loss and the adaptation loss, achieving significant accuracy improvement.
- Implemented the proposed Very Deep Adaptation Network (VDAN) and reimplemented state-of-the-art methods in Caffe.
- Designed a series of in-depth experiments for different datasets, methods, and configurations, ran and analyze all experiments.

Paper: Conditional Adversarial Domain Adaptation

- Implemented the proposed Randomized Multilinear Adversarial Networks (RMAN) in both Caffe and Pytorch frameworks.
- Designed and ran experiments and helped proofread the paper.

Paper: Learning Multiple Tasks with Multilinear Relationship Networks

- Implemented in Pytorch the Multilinear Relationship Networks (MRN), the pioneering model that captures tensor relationships.
- Proposed an efficient strategy by Tensor Decomposition to dramatically speedup computation and prevent numerical instability.
- Designed a series of experiments for new datasets and comparison methods, ran all experiments and helped proofread the paper.

Department of Computer Science and Lewis-Sigler Institute of Integrative Genomics, Princeton University *U.S.A*

Mentor: Olga Troyanskaya

Project: Algorithms Using Deep Learning for Noncoding Variants Recognition *July. 2016 - August. 2016*

- Designed new architecture with multiple classifiers builded on each convolutional layers to exploit low level features and solved the gradient vanishing problem of the original network.
- Considering the relation of different chromatin features (labels), I improved the classifying layer with low rank technical.
- The new architecture outperformed existing methods under standard evaluation criteria such as AUC of PR Curve and ROC Curve.

Department of Computer Science, The University of Texas at Austin *U.S.A*

Mentor: Qixing Huang

Paper: 3D Object Classification via Spherical Projections *Feb. 2017 - May. 2017*

- Proposed a spherical representation leveraging depth variation and contour information for 3D objects.
- Developed deep neural networks composing of two parts for depth and contour representation respectively to classify 3D objects.
- Implemented Spherical Projection in caffe framework and carefully designed experiments to compare our method with state of the art methods under standard evaluation criteria on large scale 3D Recognition Dataset.
- Wrote the first version of the paper under the supervision of my mentor.

Honors & Awards

2015 **National Scholarship**, Tsinghua University *China*

2015 **Best Project Award**, Course of Architecture of Computer and Network *China*

2016 **Qualcomm Scholarship**, Tsinghua University *China*

Skills

Programming Python, C/C++, Matlab, Lua, Bash, JAVA, LaTeX, Haskell

Framework Torch with Lua, Caffe with C++, PyTorch with Python

Languages English, Chinese