Hui Tang

|Advisor: South China University of Technology - Gorilla Lab - Kui Jia
|Intention Job: Postdoc fellow |Mail: ee.ht.tang@outlook.com |Tel: 18813297846 |WeChat: ny111245

Education

2018.09-2023.06	South China University of Technology	Information and Communication Engineering	Ph.D.	Top1
2014.09-2018.06	South China University of Technology	Information Engineering	Bachelor	Top1

Major Project Experience

- **Research on Unsupervised Domain Adaptation for Image Classification and Semantic Segmentation Based on Deep Clustering and Adversarial Alignment (First Author)**
  - **Structurally Regularized Deep Clustering (CVPR2020 Oral):** (1) Proposed the assumption of structural domain similarity, including two concepts: domain-wise discrimination and class-wise closeness. (2) Based on the assumption, proposed to directly uncover the intrinsic discrimination of target data, rather than learning over-aligned features, to avoid damaging the intrinsic target discriminative structures. (3) Proposed deep discriminative target clustering in both output and feature spaces to generate pseudo labels deviating less from network predictions and encouraging cluster balance, to supervise model training. In the feature space, modeled the predicted class probability distribution using the distance between instances and learnable cluster centroids. (4) Based on the assumption, proposed structural source regularization by replacing pseudo labels with true labels and network joint training, with each source sample weighted by its importance to the target domain. (5) Addressed the issue that adversarial feature alignment could damage the intrinsic target discrimination, and improved the recognition accuracy by 3.2% on the Office-Home benchmark.
  - **Hybrid Model of Structurally Regularized Deep Clustering (TPAMI2021):** (1) For regularized discriminative clustering, inherited structurally regularized deep clustering. (2) For regularized generative clustering, proposed to generate cluster centroids in the deep feature space to model the predicted class probability distribution and implemented structural source regularization by making the centroids common to the source and target domains. Proposed self-attentive feature interaction generative learning to modulate the intrinsic target structures, with set transformer and multi-head attention adopted to learn the centroids from features, to further modulate the feature space learning from the perspective of self-adaptive generation. (3) Extended to semantic segmentation and proposed a third notion of layout-wise consistency, implemented by adversarial training on weighted self-information maps. Proposed local supervision perceived source regularization to make each pixel on downsampled feature maps correspond to multiple categories from the local receptive field of segmentation maps. (4) Systematically studied the inductive setting for unsupervised domain adaptation and comprehensively evaluated different methods in both the inductive and transductive settings. (5) Solved the question that the drawback of previous methods would be more serious in inductive domain adaptation and improved over the conference version by 1.5% on the VisDA-2017 benchmark.
- **Research on Semi-Supervised Learning for Image Classification Based on Sample Selection (First Author)**
  - **Moderately Confident Sample Filtering (CVPR2022):** (1) Proposed to utilize moderately confident samples. (2) Based on the principle of local optimization landscape consistency, proposed Taylor expansion inspired filtration framework, relying on the Taylor expansion of the loss function to inspire the key measurement index of sample filtration, i.e., gradient and feature of finite orders. (3) Derived two novel filters from this framework: gradient synchronization filter selecting samples with similar optimization dynamics to the most reliable one, and prototype proximity filter selecting samples near semantic prototypes. (4) Handled the problem of disregarding the useful information from moderately confident samples and improved by 6.89% on CIFAR-100 with 4 labels per class.
- **Research on Learning Characteristics of Synthetic Data for Image Classification and Transfer Learning (CVPR2023, First Author)**
  - On the IID synthetic dataset generated by 3D rendering and domain randomization, compared the traditional fixed-dataset periodic training with a new strategy of training on non-repetitive samples, verified the insights on shortcut learning, PAC generalization, and variance-bias trade-off, and explored the effects of changing data regimes

and network structures on model generalization.

- Explored the effects of variation factors of an image on model generalization, e.g., object scale, material texture, illumination, camera viewpoint, and background, and in return provided new perceptions for data generation.
- Using simulation-to-real classification adaptation as a downstream task, investigated the performance of synthetic data pre-training by comparing to real data pre-training, and found the promising prospect of synthetic data pre-training and a new paradigm of pre-training on big synthetic data together with small real data.
- Proposed a more large-scale syn-to-real benchmark for classification adaptation (termed S2RDA), and provided a baseline performance analysis for representative approaches.

Academic Achievement

Summary: Published 4 articles in IEEE TPAMI and Elsevier Pattern Recognition, and published 8 articles in CVPR, ICCV, AAAI, and ECCV.

[1] **Hui Tang**, Xiatian Zhu, Ke Chen, Kui Jia, C. L. Philip Chen. Towards Uncovering the Intrinsic Data Structures for Unsupervised Domain Adaptation using Structurally Regularized Deep Clustering. TPAMI, 2021.

[2] **Hui Tang**, Yaowei Wang, Kui Jia. Unsupervised Domain Adaptation via Distilled Discriminative Clustering. PR, 2022.

[3] **Hui Tang**, Kui Jia. Vicinal and Categorical Domain Adaptation. PR, 2021.

[4] Yabin Zhang, Bin Deng, **Hui Tang**, Lei Zhang, Kui Jia. Unsupervised Multi-Class Domain Adaptation: Theory, Algorithms, and Practice. TPAMI, 2020.

[5] **Hui Tang**, Ke Chen, Kui Jia. Unsupervised Domain Adaptation via Structurally Regularized Deep Clustering. CVPR, 2020, Oral.

[6] **Hui Tang**, Kui Jia. Discriminative Adversarial Domain Adaptation. AAAI, 2020.

[7] **Hui Tang**, Lin Sun, Kui Jia. Stochastic Consensus: Enhancing Semi-Supervised Learning with Consistency of Stochastic Classifiers. ECCV, 2022.

[8] **Hui Tang**, Kui Jia. Towards Discovering the Effectiveness of Moderately Confident Samples for Semi-Supervised Learning. CVPR, 2022.

[9] **Hui Tang**, Kui Jia. A New Benchmark: On the Utility of Synthetic Data for Bare Supervised Learning and Downstream Domain Adaptation. CVPR, 2023.

[10] Longkun Zou, **Hui Tang**, Ke Chen, Kui Jia. Geometry-Aware Self-Training for Unsupervised Domain Adaptation on Object Point Clouds. ICCV, 2021.

[11] Yabin Zhang, **Hui Tang**, Kui Jia, Mingkui Tan. Domain-Symmetric Networks for Adversarial Domain Adaptation. CVPR, 2019.

[12] Yabin Zhang, **Hui Tang**, Kui Jia. Fine-Grained Visual Categorization using Meta-Learning Optimization with Sample Selection of Auxiliary Data. ECCV, 2018.

Skill & Interest

- Familiar with the basis of deep learning and computer vision, and the context of transfer learning, domain adaptation, and semi-supervised learning, served as the reviewer of international top conferences and journals many times.
- Proficiency in Python, knowing C++ and Java, familiar with deep learning frameworks like PyTorch and TensorFlow.

Honor & Scholarship

2015 National Scholarship, 2016 National Scholarship, 2017 National Encouragement Scholarship, 2021 Enterprise Scholarship