# Guangyuan Hao

(+86) 15562268690 | guangyuanhao@outlook.com

## Education

**The Hong Kong University of Science and Technology** — *Hong Kong, China*

Master of Philosophy in Individualized Interdisciplinary Program (Artificial Intelligence) — *Sept. 2020 - Sept. 2022*

- Supervisor: Prof. Dit-Yan Yeung
- Work closely with Prof. Hao Wang (Rutgers University)
- Research interests: causal discovery and inference, domain adaptation, trustworthy machine learning
- Overall GPA: $3.95/4.30$

**University of Electronic Science and Technology of China** — *Chengdu, China*

B.E. in Information Display and Optoelectronic Technology — *Sept. 2012 - Jul. 2016*

- Overall GPA: $3.97/4.00, 91.28/100$ Ranking: $1^{st}/184$
- All math and theoretical physics courses GPA: $94.6/100$

## Experience

**Research Assistant at the Chinese University of Hong Kong and Mohamed bin Zayed University of Artificial Intelligence, working with Prof. Jiji Zhang and Prof. Kun Zhang.** — *Hong Kong & Abu Dhabi*

*Nov. 2022-Now.*

- Conduct research projects about the intersection of causality and machine learning.

## Papers

**Natural Counterfactuals With Necessary Backtracking** — *Hong Kong & Abu Dhabi*

**Guang-Yuan Hao***, Jiji Zhang*, Hao Wang, Kun Zhang, ICML 2023 Workshop on Counterfactuals in Minds and Machines (* indices equal contribution; Oral Presentation); Submitted to ICLR 2024 — *Dec. 2022 - May. 2023*

- Paper Motivation: To develop a general framework of what we call natural counterfactuals, which are both more flexible and more realistic than the standard framework.
- Proposed a novel optimization framework for generating natural counterfactuals. By combining a naturalness constraint with a principle of minimal change that discourages unnecessary backtracking, we seek to strike a best balance between natural and non-backtracking counterfactuals.
- Presented a detailed method in the general framework and test it empirically. The empirical results, on both simulated and real data, demonstrate the efficacy of our method.

**Composite Active Learning: Towards Multi-Domain Active Learning with Theoretical Guarantees** — *Hong Kong, China*

**Guang-Yuan Hao**, Hengguan Huang, Haotian Wang, Jie Gao, Hao Wang, Submitted to AAAI 2024 (Feedback: Accept*1 and Weak Accept *3) — *Dec. 2021 - May. 2022*

- Paper Motivation: To identify and solve the problem of multi-domain active learning.
- Proposed Composite Active Learning (CAL) as the first general deep AL method for addressing the problem of multi-domain active learning.
- Provided theoretical guarantees that CAL with our budget assignment strategy achieves a better upper bound on the average error of all domains.
- Conducted experiments on both synthetic and real-world datasets with detailed ablation studies, showing that CADOL significantly improves performance over the state of the art for multi-domain active learning.

**Taxonomy-Structured Domain Adaptation** — *Hong Kong, China*

Tianyi Liu, Zihao Xu, Hao He, **Guang-Yuan Hao**, Guang-He Lee, Hao Wang, ICML 2023 — *Nov. 2022 - May. 2023*

- Paper Motivation: To identify the problem of adaptation across taxonomy-structured domains and develop taxonomy structured domain adaptation (TSDA) as the first general DA method to address this problem.
- Proved that a natural extensio of typical DA methods fails to take advantage of domain similarity reflected in a domain taxonomy and degenerates to uniform alignment. Further proved that TSDA retains typical DA methods' capability of uniform alignment when the domain taxonomy is non-informative, and balances domain similarity and domain invariance for other taxonomies.
- Empirical results show that our TSDA improves upon state-of-the-art DA methods on both synthetic and real world datasets.

**Domain-Indexing Variational Bayes: Interpretable Domain Index for Domain Adaptation** *Hong Kong, China*

Zihao Xu*, **Guang-Yuan Hao ***, Hao He, Hao Wang, ICLR 2023 (* indices equal contribution; Spotlight Presentation) *Dec. 2021 - Sept. 2022*

- Paper Motivation: To identify the problem of inferring domain indices as latent variables in domain adaptation.
- Provided a rigorous definition of "domain index", and develop the first general method, dubbed variational domain indexing (VDI), for inferring such domain indices.
- Provided theoretical guarantees that VDI's final objective function is equivalent to inferring the optimal domain indices.
- Conducted experiments on both synthetic and real-world datasets, showing that VDI can infer non-trivial domain indices, thereby significantly improving performance over state-of-the-art DA methods.

**DyLex: Incorporating Dynamic Lexicons into BERT for Sequence Labeling** *Shenzhen, China*

Baojun Wang*, Zhao Zhang*, Kun Xu*, **Guang-Yuan Hao**, Yuyang Zhang, Lifeng Shang, Linlin Li, Xiao Chen, Xin Jiang, Qun Liu, EMNLP 2021, Long Paper (* indicates equal contribution) *Nov. 2020 - Jan. 2021*

- Paper Motivation: to improve sequence labeling of BERT by combining existing lexicons.
- Proposed a general framework for effectively introducing external lexical knowledge into sequence labeling tasks, and devised a novel knowledge denoising module to make full use of large-scale lexicons.
- Our framework outperforms strong baselines and achieves SOTA results on multiple different sequence labeling tasks. Our framework has already supported dynamic updates of lexicons to facilitate industrial deployment.
- See details at https://aclanthology.org/2021.emnlp-main.211.pdf and https://github.com/huawei-noah/noah-research/tree/master/NLP/dylex.
- I accomplished most of the experiments and detailed experimental analysis in this paper.

**MIXGAN: Learning Concepts from Different Domains for Mixture Generation** *Guangzhou, China*

**Guang-Yuan Hao**, Hongxing Yu, Weishi Zheng, IJCAI, 2018 (Oral Presentation) *Oct. 2017 - Feb. 2018*

- Paper Motivation: to make an interesting attempt on mixture generation, i.e., absorbing different image concepts (e.g., content and style) from different domains, and thus generating a new domain which the proposed model never observes in the training stage.
- Proposed an unsupervised method to generate new domains by learning and mixing different concepts from different domains. The experimental results demonstrate the effectiveness of MIXGAN, while the related state-of-the-art models fail to generate new domains.
- Other Applications: image-to-image translation and learning a joint distribution of two domains.
- See details at https://github.com/GuangyuanHao/MIXGAN and https://www.ijcai.org/proceedings/2018/306.

## Honors & Awards

2020-2022 **Postgraduate Studentship**, The Hong Kong University of Science and Technology

2015 **China National Scholarship**, 1%, the Ministry of Education, China

2015 **Outstanding Graduates**, 1%, University of Electronic Science and Technology of China

2014 **Sekorm First-class Scholarship**, 2%, SEKORM LIMITED

2013 **People's First-class Scholarship**, 10%, University of Electronic Science and Technology of China

## Skills

**Programming and Related:** Linux, Python, PyTorch, TensorFlow, LaTeX , MATLAB, VHDL, ABAQUS

**Hobbies:** Long Run, Boxing, Reading