# Wenxuan Ding

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## EDUCATION

**The Hong Kong University of Science and Technology** 09/2020 - 05/2024 (expected)
**Bachelor of Engineering in Computer Science**
**Minor in Mathematics**
Overall GPA: 4.045/4.3 Major GPA: 4.170/4.3 Minor GPA: 4.3/4.3 **Rank: 1/112**

**University of Illinois Urbana-Champaign** 08/2022 - 12/2022
**The Grainger College of Engineering, Exchange Student**
GPA: 4.00/4.00

**Related Courses:** Natural Language Processing (A+), Machine Learning (A+), Algorithm (A+), Big Data Mining (A+), Database Management (A), Combinatorial Optimization (A+), System Programming (A+), Probability (A+), Linear Algebra (A+)

## RESEARCH INTERESTS

- My research interests mainly lie in Natural Language Processing, specifically in understanding and expanding knowledge abilities of LLMs, commonsense reasoning, theory of mind and NLP for social good.

## PUBLICATIONS

**Wenxuan Ding***, Shangbin Feng*, Yuhan Liu, Zhaoxuan Tan, Vidhisha Balachandran, Tianxing He, Yulia Tsvetkov. 'Knowledge Crosswords: Geometric Reasoning over Structured Knowledge with Large Language Models'. In *arxiv 2023.*

Weiqi Wang, Tianqing Fang, **Wenxuan Ding**, Baixuan Xu, Xin Liu, Yangqiu Song, Antoine Bosselut. 'CAR: Conceptualization-Augmented Reasoner for Zero-Shot Commonsense Question Answering'. In *Proceedings of EMNLP 2023, findings.*

Haochen Shi, Weiqi Wang, Tianqing Fang, Baixuan Xu, **Wenxuan Ding**, Xin Liu, Yangqiu Song. 'QADYNAMICS: Training Dynamics-Driven Synthetic QA Diagnostic for Zero-Shot Commensense Question Answering'. In *Proceedings of EMNLP 2023, findings.*

## RESEARCH EXPERIENCES

**TsvetShop, University of Washington**
*Advisor: Yulia Tsvetkov, Assistant Professor at UW & Adjunct Professor at CMU* 03/2023 - Present
**Knowledge Crosswords: Geometric Reasoning Over Structured Knowledge with Large Language Models**

- Proposed "geometric reasoning with structured knowledge" and **Knowledge Crosswords** benchmark, a multi-blank QA dataset, where each problem consists of a natural language question representing the geometric constraints of an incomplete entity network and LLMs are tasked with working out the missing entities while meeting all factual constraints
- Conducted extensive experiments to evaluate LLMs and prompting approaches on the **Knowledge Crosswords** benchmark
- Introduced two new instruction-based approaches, Verify-All and Staged Prompting which achieve top performance with ChatGPT and GPT4, and are more robust with hard problems
- Presented further analysis showing geometric reasoning ability of LLMs suffers from various factors and is far from perfect
- Placed the open-source code and data at https://github.com/Wenwen-D/KnowledgeCrosswords

**KnowComp Group, HKUST**
*Advisor: Yangqiu Song, Associate Professor at HKUST* 02/2023 - Present
**CAR: Conceptualization-Augmented Reasoner for Zero-Shot Commonsense Question Answering**

- Co-proposed CAR, a zero-shot commonsense QA framework, which leverages conceptualization to augment CSKBs, improving knowledge coverage and reducing false-negative distractors
- Proposed and implemented a conceptualization-constraint sampling strategy for generating distractors with

concept-level constraints to create informative and fair QA pairs
- Synthesized training data from augmented ATOMIC and AbstractATOMIC with CAR
- Completed the evaluation of the CAR against various baselines, including language models, existing methods, and Large Language Models such as GPT-3.5 and ChatGPT
- Assessed model confidence and variability with training dynamics and demonstrated the superiority of CAR in promoting robustness and boosting OOD generation

**QADYNAMICS: Training Dynamics-Driven Synthetic QA Diagnostic for Zero-Shot Commonsense Question Answering**
- Co-proposed QADYNAMICS, a training dynamics-driven framework for QA diagnosis and refinement
- Participated in in-depth analysis and human evaluation, demonstrating the superior effectiveness of QADYNAMICS in identifying machine-detectable artifacts, uninformative QA pairs, and mislabeled/false-negative options
- Achieved significant performance improvements, outperforming all baselines while utilizing only 33% of synthetic data, even surpassing Language Learning Models such as ChatGPT

## PROJECTS & EXPERIENCES

**Scoliosis X-ray Image Processing and Curvature Analysis with Deep Learning**
*Advisor: Qifeng Chen, Assistant Professor at HKUST* 03/2022 – 05/2022
- Labeled spine outlines of 39 categorized scoliosis X-ray images with LabelMe and applied data augmentation methods to enlarge the dataset
- Implemented U-Net with PyTorch for semantics segmentation and generated segmented and masked images
- Implemented LeNet and VGG-11 for scoliosis classification and achieved an accuracy of 97**%** with LeNet

**Acoustic Based Gesture Recognition with Machine Learning**
*Advisor: Qian Zhang, Chair Professor at HKUST* 09/2021 - 12/2021
- Used Raspberry Pi platform to develop a gesture recognition system
- Collected over 60 pieces of acoustic data and extracted distance information from phase
- Leveraged machine learning technique to categorize samples into 3 types

**Board Game Simulator**
*Advisor: Yau Chat TSOI, Assistant Professor at HKUST* 10/2021 - 12/2021
- Worked as group leader and developed a desktop board game simulator supporting UNO and Doudizhu with C++ and OOP
- Set up GUI with Qt to allow up to four players playing offline
- Handed off well-documented and easily modifiable code

## STANDARDIZED TESTS
- TOEFL: 113 (R30+L30+S25+W28)
- GRE: 329 (V159+Q170) + AW4.0

## SKILLS
- **Programming Languages:** Python, C/C++, Oracle SQL
- **Frameworks & Tools:** PyTorch, HTML, Flask, Git, GDB, LATEX

## HONORS & AWARDS
- Dean's List for all active semesters at HKUST
- University's Scholarship for Continuing Undergraduate Students (top 2%), 2021-2022, 2022-2023
- Chiaphua Industries Limited Scholarships for Chinese Mainland Undergraduate Students, 2021-2022
- VTech Group of Companies Scholarship, 2022-2023