# Yichen Xu

# Education Background

#### **Bachelor of Computer Science**

at Beijing University of Posts and Telecommunications

Beijing, China Sep 2018–Jun 2022, expected

- 1. Overall GPA: 3.85/4.0, 92.74/100 (ranking 1st/396).
- 2. *Awards and honors:* National Scholarship (two consecutive years; only the top 1% students will be awarded the scholarship); Merit Student (three consecutive years); 1st Prize in NSCSCC 2020 (MIPS CPU Design Contest); 1st Prize in National Mathematics Contest.

#### Publications $\Im \nabla$

- [1] Y. Xu, A. Boruch-Gruszecki, and L. Parreaux, "Implementing Path-Dependent GADT Reasoning for Scala 3", in *Scala Symposium 2021*, 2021.
- [2] Y. Xu, Y. Zhu, F. Yu, Q. Liu, and S. Wu, "Disentangled Self-Attentive Neural Networks for Click-Through Rate Prediction", CIKM '21, Nov. 2021.
- [3] Y. Zhu, Y. Xu, H. Cui, C. Yang, Q. Liu, and S. Wu, "Structure-Aware Hard Negative Mining for Heterogeneous Graph Contrastive Learning", in *KDD Workshop on Deep Learning on Graphs: Method and Applications*, 2021.
- [4] Y. Zhu, Y. Xu, Q. Liu, and S. Wu, "An Empirical Study of Graph Contrastive Learning", in *Proceedings of the Neural Information Processing Systems Track on Datasets and Benchmarks*, vol. 34, Curran Associates, Inc., 2021.
- [5] Y. Zhu, Y. Xu, F. Yu, Q. Liu, S. Wu, and L. Wang, "Graph Contrastive Learning with Adaptive Augmentation", in *Proceedings of The Web Conference 2021*, ser. WWW '21, Ljubljana, Slovenia: Association for Computing Machinery, Apr. 2021, ISBN: 9781450370233.
- [6] Y. Zhu, Y. Xu, F. Yu, Q. Liu, S. Wu, and L. Wang, "Deep Graph Contrastive Representation Learning", in *ICML Workshop on Graph Representation Learning and Beyond*, 2020.
- [7] Y. Zhu, Y. Xu, F. Yu, S. Wu, and L. Wang, "CAGNN: Cluster-Aware Graph Neural Networks for Unsupervised Graph Representation Learning", *arXiv.org*, Sep. 2020. arXiv: 2009.01674v1 [cs.LG].

# **Research Experience**

**Research Intern** *at Programming Methods Laboratory, Ecole Polytechnique Fédérale de Lausanne*  Lausanne, Switzerland Jan 2021–Current

- Project 1: Adding path-dependent GADT reasoning to Scala 3 compiler
  - \* Added GADT reasoning for path-dependent types in the Scala 3 compiler; fixed various bugs and made improvements in the type system of the compiler along the way; contributed 7 PRs and opened 6 issues.
  - \* Published and presented one paper as the first author in Scala Symposium 2021.
- Project 2: Improving the theory model of Scala
  - \* Researching the theory model of the Scala language, Dependent Object Types (DOT), with my primary focus on the formalization of GADT reasoning.
  - \* Completed the Coq soundness proof of a calculus extended from DOT. The calculus extends pDOT with subtyping inversion rules that enable the calculus to model GADT reasoning better. Designed an auxiliary subtyping relation in order to prove the soundness.
  - \* Working on the design and mechanization of cDOT, a calculus that extends DOT with a constraint language. The calculus brings stronger reasoning capability to DOT's type system, and can help reveal the essence of GADT reasoning in the Scala 3 compiler.

#### **Research Intern**

#### at Institute of Automation, Chinese Academy of Sciences

Jun 2019-Jun 2021 Major research interest lies in the fields of graph representation learning (with an emphasis on self supervised learning and contrastive learning).

- Project 1: Cluster-Aware Graph Neural Networks. Devised a self-supervised graph representation method that utilizes clustering labels to train graph neural networks in a self-supervised manner. The paper is currently in submission to ACM TIST.
- Project 2: Graph Contrastive Learning. Researched contrastive learning for graphs, where we first generate graph views with graph augmentations and then learn representations with contrastive objectives. Developed four papers as the co-first or the second author (accepted by GRL+ ICML Workshop, WWW 2021, SDM 2022 and NeurIPS 2021 respectively).

### Selected Projects

#### fscala2c

- A compiler that compiles a subset of Scala to C. Basic functional programming and object-oriented programming functionalities and main language features are included in the subset. The Hindley-Milner algorithm is implemented for type checking and inferencing.
- Used Scala to develop the compiler. Learned about closure conversions to compile first-class function values into C. Practiced my knowledge in type theory, compiler construction and functional programming.

#### Sircle

- A functional interpreted language, inspired by Haskell and Scala.
- Used Scala to develop its interpreter. Practiced my knowledge in programming language theory.

#### EasterCache

easter-mips/EasterCache

- A full-featured and high-performance MIPS cache, communicating with memory via AXI bus in wrap mode. It includes a victim cache and supports write buffering, with all parameters configurable.
- Used Chisel3 to implement it. Dived deeply into digital hardware design (especially for CPUs), FPGAs and computer architecture. Part of our team's CPU at NSCSCC 2020, the MIPS CPU design contest.

### Skills

- Programming Especially experienced in Haskell, Scala, Python, C++, Verilog and C; comfortable with JavaScript, Coq, Agda and Clojure. Experienced in programming under Unix-like environments (macOS and Linux). An experienced Emacs user. Experienced and interested in Functional Programming.
- **Programming Language Theory and Formal Methods** Understand fundamental concepts in type theory. Understand basic theories in software verification (like formal logic, Hoare logic and operational semantics). Learned the first and the second volume of Software Foundations by myself (Logical Foundations and Programming Language Foundations).
- Machine learning Experienced in PyTorch, PyTorch Geometric, NNI, Scikit-Learn and NumPy; comfortable with Tensorflow. Have a good knowledge of theories and methods about machine learning on graphs, and understand common and important concepts in other domains as well.
- Hardware Design and Computer Architecture Experienced in FPGA programming with Verilog, SystemVerilog and Chisel3. Familiar with CPU design; experienced in cache design.

# Other Information

- English Proficiency: TOEFL 109 (R 30, L 28, S 24, W 27)
- Social Functions: A former member of Microsoft Student Technology Club, the former president of BUPT's Google Club, a Microsoft Learn Student Ambassador, a peer reviewer at ECML-PKDD 2020.

#### Beijing, China

linyxus/fscala2c

linyxus/CoordML