Parsa Kamalipour

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Education

Concordia University **Montreal, QC, Canada**
Master of CS (Thesis-based) in Computer Science, advised by Prof. Hovhannes Harutyunyan *Sep 2024–Present*
- **GPA:** 3.58/4.0
- **Research Topics:** Community Detection, Social Networks Analysis, Algorithms Design, Graph Theory

Vali-e-Asr University of Rafsanjan **Rafsanjan, Iran**
B.Sc. in Computer Engineering, advised by Dr. Fahimeh Dabaghi-Zarandi *Sep 2018–Jun 2023*
- **GPA:** 16.26/20.0 ***Graduated with Honors***

Publications

- *Spider Community Detection: Seeded Geodesic Expansion with Modularity-Guided Refinement and Greedy Merge Matching*
  - H. Harutyunyan, **Parsa Kamalipour** — *Computers (**in revision**), 2026*
- *From Dense Graphs to Meaningful Communities: Assessing Community Quality Using Geodesic Distance Modularity on Metric Backbone-Sparsified Networks*
  - **Parsa Kamalipour**, H. Harutyunyan — *SNAMS 2025 (**accepted**)*
- *LLM-Based Code Translation for Cross-Language Refactoring Mining*
  - I. Hemati Moghadam, M. M. Afkhami, V. Zaytsev, M. H. Ashoori, H. Bazmandegan, and **Parsa Kamalipour** — *Empirical Software Engineering (**in revision**)*
- *Extending refactoring detection to Kotlin: A dataset and comparative study*
  - I. Hemati Moghadam, M. M. Afkhami, **Parsa Kamalipour**, V. Zaytsev — *SANER 2024*, **doi**.
- *Community detection in complex network based on an improved random algorithm using local and global network information*
  - F. Dabaghi-Zarandi, **Parsa Kamalipour** — *Journal of Network and Computer Applications*, 2022. **doi**.

Experiences

Research Experience

Algorithms & Complexity Lab, Concordia University **Montreal, QC, Canada**
Graduate Research Assistant, Supervisor: Prof. Hovhannes Harutyunyan *Aug 2024 – Present*
- Designed the **Spider graph** community detection algorithm combining **geodesic expansion, modularity-guided refinement, and greedy merge matching**.
- Benchmarked Spider on **14** real-world networks (up to **8,035 nodes / 183,663 edges**) against **Leiden, Louvain, and Infomap**, achieving **8–15%** improvement in **NMI, modularity, and F1-score**.
- Applied **metric backbone**, yielding on average **65% edge reduction**, and introduced **Weighted Average Geodesic Distance Modularity (wGDM)** to normalize and balance the original GDM for evaluating local community quality on sparsified graphs.
- Built a reproducible experimental pipeline with fixed random seeds, baseline implementations, and automated evaluation scripts.

Formal Methods and Tools (FMT) Group, University of Twente **Enschede, The Netherlands**
Research Collaborator (Remote), Supervisor: Dr. Iman Hemati Moghadam *Aug 2023 – Mar 2024*
- Implemented the **KotlinCode2Text** parser and integrated it into the **RefDetect** framework for automated refactoring detection.
- Built two refactoring datasets used for empirical evaluation in the *SANER 2024* study.
- Improved analysis reliability and runtime through targeted debugging and algorithmic refinements.
- Explored **LLM-based prompt engineering** for cross-language code translation in refactoring mining.

Department of Computer Engineering, Vali-e-Asr University of Rafsanjan **Rafsanjan, Iran**
Undergraduate Research Assistant, Supervisor: Dr. Fahimeh Dabaghi-Zarandi *Aug 2021 – Mar 2024*
- Developed the **CRLG** community detection framework based on an randomized algorithm using local and global network information.
- Implemented weighted probabilistic seeding and similarity-driven community assignment with heuristic community merging.
- Evaluated on real networks and GN/LFR benchmarks, achieving up to **+10%** improvement over **LCDR, MOACO, Node2vec-SC, NE-N2V, CDASS, and TS** using **NMI, modularity, and density**.

Teaching Experience

Gina Cody School of Engineering and Computer Science, Concordia University **Montreal, QC, Canada**
Graduate Teaching Assistant *Sep 2024 – Present*

- Delivered **tutorials** and **laboratory demonstrations**, **graded assignments and exams**, and provided student support through **Programmer On Duty (POD)** sessions, office hours, and detailed feedback on coursework and projects. Courses:
  - COMP 233: Probability and Statistics for CS (S25,F25)
  - COMP 248: Object-Oriented Programming I (F25,W26)
  - COMP 335: Introduction to Theoretical CS (F24,S25)
  - COMP 339: Combinatorics (F24,F25)
  - COMP 348: Principles of Programming Languages (W25,S25)
  - COMP 465: Design and Analysis of Algorithms (W25)
  - COMP 472: Artificial Intelligence (F25)
  - SOEN 363: Data Systems for Software Eng (W25,F25,W26)
  - COEN 311: Computer Organization and Software (F25,W26)
  - COEN 317: Microprocessor-Based Systems (W26)

Department of Computer Engineering, Vali-e-Asr University of Rafsanjan **Rafsanjan, Iran**
Undergraduate Teaching Assistant *Mar 2021 – Jan 2024*

- Served as **Head TA and Tutorial Leader** for multiple foundational CS courses, mentoring students, coordinating grading, and collaborating with faculty to design assignments and support student projects in various courses.
- Courses: Data Structures, Algorithms Design, Discrete Mathematics, Operating Systems, Information Retrieval, Software Engineering, Database Systems, Artificial Intelligence, Data Mining.

Research Interests

- Design & Analysis of Algorithms
- Graph Theory & its applications
- Machine Learning & Graph Mining
- Social Networks Analysis & Complex Networks

Honors and Awards

2025: **Awarded Concordia Conference and Exposition Allowance** – Concordia University

2024: **DRW Graduate Scholarship in Computer Science** – Concordia University & DRW Company

2024: **Concordia Merit Scholarship (Entrance Scholarship Award)** – Concordia University, School of Graduate Studies

2024: **Financial Research Support (FRS)** – Concordia Faculty of Engineering and Computer Science

2023: **Distinguished Student Award** – Awarded among all students of Vali-e-Asr University

2023: **Top Researcher Award** – Earned this prestige award among all undergraduate students in Kerman Province

Selected Projects

Evaluation of Scalable Training Strategies for Graph Neural Networks **Concordia University, Montréal**
Optimizing Graph Neural Networks for Scalable Community Detection *2024*

- Designed and implemented scalable GNN-based community detection pipelines using **GCN** and **GraphSAGE** architectures with full-batch training, neighbor sampling, and graph partitioning strategies.
- Conducted extensive experiments on **SBM (1K, 10K)**, **CORA**, and **Reddit** datasets, demonstrating that neighbor sampling and graph partitioning enable training on large graphs where full-batch methods fail due to memory constraints.
- Achieved up to **90% accuracy** on SBM (10K nodes) with graph partitioning while reducing memory footprint, and enabled scalable training on Reddit where full-batch methods resulted in out-of-memory failures.
- Analyzed trade-offs between accuracy, training time, and memory usage, providing practical guidelines for scalable GNN deployment in real-world large-scale social networks.

Experimental Study of Network Flow Optimization Algorithms **Concordia University, Montréal**
Minimum-Cost Flow Algorithms on Randomized Source–Sink Networks *2024*

- Implemented the **Successive Shortest Path** algorithm from scratch, including residual graph construction, Bellman–Ford based minimum-cost path extraction, and flow augmentation logic.
- Designed and executed large-scale experimental evaluation on **randomized Euclidean directed graphs** across 28 configurations with varying density (r), capacity bounds, and cost regimes.
- Compared **SSP, Capacity Scaling, Scaling-SSP, and Primal–Dual** algorithms using metrics including total cost, flow value, number of augmenting paths, mean path length, and proportional path length.
- Demonstrated that the **Primal–Dual algorithm consistently achieves optimal minimum cost**, while SSP achieves competitive performance in sparse regimes and degrades in dense graphs.

Skills

Programming	Python, C, C++, C#, Java, MATLAB, Ruby, Unity Engine, Bash, Assembly (x86, ARM), VHDL
ML & Data	NumPy, Pandas, SciPy, Scikit-learn, PyTorch, Matplotlib, Seaborn, NetworkX, iGraph
Graph Mining & Network Science	Community Detection, Link Prediction, Node Classification, Network Embeddings, Graph Algorithms, Social Network Analysis, SNAP & LFR Benchmarks, Large-Scale Network Evaluation
Tools & Databases	Linux, LaTeX, Jupyter, Markdown, Obsidian, Git, Docker, PostgreSQL, MySQL, MongoDB, Neo4j

Languages

Persian: Native **English**: Proficient (C1) **French**: Pre-intermediate (A2)