Buddhi Kothalawala
Ph.D. Candidate & Senior Software Engineer

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Summary

Ph.D. candidate in Computer Science (ANU) specializing in branch-and-bound algorithms, combinatorial optimization, and constraint programming, with peer-reviewed publications at SIGMOD 2026, CP 2025, and ADC 2025. Research background spans combinatorial optimization and machine learning, including deep learning work on low-resource NLP using RNNs, bidirectional LSTMs, and online learning algorithms recognised with the ICTA Award for Best Computer Science Final Year Research Project. Brings 3+ years of production software engineering experience in C++, Go, and Java at WSO2, bridging deep algorithmic research with real-world system development.

Education

The Australian National University, Canberra, Australia
Ph.D. in Computer Science (Reading) (Expected 2026)

- **Thesis**: Algorithmic Advances in Exact Maximum Common Subgraph (MCS) Computation

- **Research Focus**: Novel branch-and-bound algorithms enhanced with reinforcement learning

- **Funding**: ANU PhD Scholarship (International) + HDR Fee Remission Merit Scholarship

University of Colombo School of Computing, Colombo, Sri Lanka
Bachelor of Science in Computer Science (Honors), 2019

- **GPA**: 3.79/4.00

- **Thesis**: Online Learning for Solving Data Availability Problem in Natural Language Processing

- **Recognition**: ICTA Award for Best Computer Science Final Year Research Project (2018)

IELTS Academic, Overall score 7.0, 2021

Research & Publications

Kothalawala, B., Koehler, H., & Farhan M. Accelerating Maximum Common Subgraph Computation by Exploiting Symmetries. (ACM Special Interest Group on Management of Data (SIGMOD) 2026 [CORE A^*, Accepted, In Press])

- Developed a symmetry breaking framework for Maximum Common Subgraph algorithms that substantially outperforms state-of-the-art methods.

- Demonstrated significant speedups on standard MCS benchmarks through comprehensive symmetry-aware pruning, solving more instances with reduced computation time and search space.

Kothalawala, B., Koehler, H., Wang Q. & Farhan M. (2025). From Exploratory Heuristics to Exact Search: Accelerating Maximum Common Subgraph Algorithms. (Australasian Database Conference (ADC)). (Paper) [C++ Code].

- Proposed a novel heuristic mechanism to escape local optima in depth-first branch-and-bound algorithms for maximum common subgraph discovery.

- Developed a principled transitioning criterion from heuristic to exact search with theoretical convergence guarantees and comprehensive experimental validation.

Kothalawala, B., Koehler, H., & Wang Q. (2025). Learning to Bound for Maximum Common Subgraph Algorithms. (The 31st International Conference on Principles and Practice of Constraint Programming (CP)). (CORE A, Paper) [C++ Code].

- Developed a novel reinforcement learning framework achieving maximum possible bound reduction for NP-hard optimization problems
- Empirically demonstrated superior performance over existing branch-and-bound approaches

Kothalawala, B., Weerasinghe, R., & Kumarasinghe, P. (2019). Online Learning for Solving Data Availability Problem in Natural Language Processing. NL4AI@AI*IA. (Paper) (Python Code)

- Addressed model retraining challenges for the low-resource language Sinhalese
- Applied online learning algorithms alongside conditional random fields (CRFs), RNNs, and bi-directional LSTMs to overcome data scarcity in NLP applications

Kothalawala, B., Koehler, H., & Farhan M. Maximal Common Subgraph Counting with Symmetry Breaking. *Manuscript in preparation.*

- Developed a counting framework that corrects counts pruned by symmetry breaking and enumerates pruned subgraphs, enabling accurate enumeration under symmetry-aware search.

Research Interests Combinatorial Optimization, Branch-and-Bound Algorithms, Reinforcement Learning, Constraint Programming, Online Machine Learning, Computational Complexity

Experience

The Australian National University, Canberra, Australia

Ph.D. Candidate & Researcher   June 2022 – Present

- Developing exact solutions for NP-hard combinatorial optimization problems via novel branch-and-bound algorithms enhanced with symmetry breaking and reinforcement learning, with publications at SIGMOD 2026, CP 2025, and ADC 2025.

Academic Tutor   February 2023 – Present

- Taught and mentored 150+ students across Statistical Machine Learning (COMP4670/8600), Relational Databases (COMP2400/6240), and Data Wrangling (COMP3430/8430).

WSO2, Colombo, Sri Lanka

Senior Software Engineer   November 2020 – June 2022

- Owned Ballerina's gRPC, I/O, and Time standard libraries, delivering critical features and authoring technical articles on Medium and DZone to drive community awareness and adoption.

Software Engineer   February 2019 – October 2020

- Led the migration of Ballerina from a monolithic repository into a multi-repository architecture, coordinating across multiple engineering teams and establishing CI/CD pipelines that reduced integration overhead and release cycle times.
- Architected and implemented the Siddhi Kubernetes operator in Go, enabling cloud-native deployment of the stream processing engine across Docker and Kubernetes environments.

Software Engineer Intern   August 2017 – January 2018

- Developed a full-stack internal application for license and repository management using React, Ballerina, and Java, contributing across frontend, backend, and integration layers.

Technical Skills

- **Languages:** C++, Go, Java, Python, Ballerina, SQL
- **Machine Learning & AI:** PyTorch, Reinforcement Learning, Online Learning, Statistical Machine Learning, Constraint Programming, RNN, LSTM
- **Databases:** PostgreSQL, MySQL
- **Cloud & DevOps:** Kubernetes, Docker, K8s Operators, gRPC, Protobuf, NATS, Linux, Performance Tuning
- **Development Tools:** Git, GitHub, Gradle, Maven, CI/CD, Code Reviews, Technical Documentation
- **Specializations:** Branch-and-Bound Algorithms, Combinatorial Optimization, Siddhi Stream Processing, Software Architecture, API Integration

Awards and Recognition

- **ANU PhD Scholarship (International)** - The Australian National University
- **HDR Fee Remission Merit Scholarship** - The Australian National University
- **Sustained Outstanding Contribution Awards** - WSO2 (2019, 2020)
- **ICTA Award** - Best Computer Science Final Year Research Project (2018)

Professional Service & Community Engagement

- **Open Source**: Core contributor to Ballerina programming language and Siddhi streaming ecosystem; StackOverflow community contributor (1K+ reputation)
- **Community Leadership**: Conducted the first Ballerina Language Community Call (1.2K+ views); published technical articles on Medium and DZone with 20K+ views
- **Leadership**: President, WSO2 Toastmasters Club (2020/21); completed three levels of the Toastmasters Dynamic Leadership Pathway
- **Research Supervision**: Mentored a final year project on Compressing Bi-LSTM-based Contextualized Word Embeddings; guided junior developers at WSO2 on best practices and career development
- **Academic Tutoring**: Tutored 150+ students across 3 advanced courses at ANU
- **Conference Presentations**: Presented research at CP 2025 and ADC 2025

References

References available upon request.