

Joel Mackenzie

📍 Brisbane, Queensland, Australia

🌐 <https://jmmackenzie.io>

✉ joel.mackenzie@uq.edu.au

Education

Doctorate of Philosophy (Computer Science).

February 2016 – October 2019

PhD Thesis: *Managing Tail Latency in Large Scale Information Retrieval Systems.*

RMIT University, Melbourne, Australia.

Bachelor of Computer Science, Hons (First Class).

February 2012 – November 2015

Honours Thesis: *Efficiency-Effectiveness Trade-offs for Location Aware Search.*

RMIT University, Melbourne, Australia.

Work Experience

The University of Queensland – Lecturer

January 2022 – Present

Teaching and Research in Computer Science, focusing on Information Retrieval and Data Science.

The University of Melbourne – Postdoctoral Research Fellow

February 2020 – January 2022

Worked with Prof. Alistair Moffat on the ARC Discovery Project *Efficient Compression and Querying Techniques for Massive Text Collections.*

RMIT University – Research Assistant

October 2019 – February 2020

Worked with Prof. Shane Culpepper on a number of Information Retrieval research projects.

Microsoft Research – Research Intern

June 2018 – September 2018

Worked with the SQL and the Language and Information Technologies teams to understand user behavior in the email search domain. Involved analysis of user behavior logs from a set of human intelligence tasks related to email search.

Envato – Assistant Search Engine Analyst (Intern)

January 2016 – April 2016

Worked with the Discovery team to continue improving search effectiveness across some of Envato's most popular marketplaces. Involved creating tooling for analysis of query logs to gain insights into the search behaviour of users on Envato market.

Teaching Experience

The University of Queensland

- ♦ Algorithms & Data Structures – Course coordinator and Lecturer. Semester 2, 2023.
- ♦ Introduction to Data Science – Course coordinator and Lecturer. Semester 1, 2023.
- ♦ Advanced Database Systems – Course coordinator and Lecturer. Semester 2, 2022.

RMIT University

- ♦ Database Systems – Tutor and lab assistant. Semester 1, 2015, and Semester 1, 2019.
- ♦ Information Retrieval – Tutor. Semester 1, 2017, and Semester 1, 2018.
- ♦ Programming Fundamentals – Head tutor. Semester 1, 2018.
- ♦ Computing Theory – Tutor. Semester 1, 2015.
- ♦ Operating Systems Principles – Tutor and lab assistant. Semester 2, 2014.

Research Interests

I am primarily interested in the discipline of Information Retrieval, including efficient indexing and retrieval, ranking, evaluation, and user behavior. I also have an interest in data structures and algorithms.

Publications

A. Moffat and J. Mackenzie: **How Much Freedom Does An Effectiveness Metric Really Have?** In *Journal of the Association for Information Science and Technology (JASIST)*, January, 2024. Journal paper.

J. Mackenzie and A. Moffat: **Lossy Compression Options for Dense Index Retention.** In *Proceedings of the 1st Annual International ACM SIGIR Conference on Research and Development in Information Retrieval in the Asia Pacific Region (SIGIR-AP 2023)*, November, 2023. Long paper.

J. Mackenzie, S. Zhuang, and G. Zuccon: **Exploring the Representation Power of SPLADE Models.** In *Proceedings of the 2023 ACM SIGIR International Conference on the Theory of Information Retrieval (ICTIR 2023)*, July, 2023.

Z. Li and J. Mackenzie: **Profiling and Visualizing Dynamic Pruning Algorithms.** In *Proceedings of the 46th International ACM Conference on Research and Development in Information Retrieval (SIGIR 2023)*, July, 2023. Demo paper.

S. Bruch, J. Mackenzie, M. Maistro, and F. M. Nardini: **ReNeuIR at SIGIR 2023: The Second Workshop on Reaching Efficiency in Neural Information Retrieval.** In *Proceedings of the 46th International ACM Conference on Research and Development in Information Retrieval (SIGIR 2023)*, July, 2023. Workshop overview.

J. Mackenzie and A. Moffat: **Index-Based Batch Query Processing Revisited.** In *Proceedings of the 45th European Conference on Information Retrieval (ECIR 2023)*, April, 2023. Long paper (reproducibility track).

A. Moffat and J. Mackenzie: **Efficient Immediate-Access Dynamic Indexing.** In *Information Processing and Management (IPM)*, 2023, Journal Paper.

J. Mackenzie and A. Trotman and J. Lin: **Efficient Document-at-a-Time and Score-at-a-Time Query Evaluation for Learned Sparse Representations.** In *ACM Transactions on Information Systems (TOIS)*, 2022, Journal Paper.

A. Moffat and J. Mackenzie: **Immediate-Access Indexing Using Space-Efficient Extensible Arrays.** In *Proceedings of the 26th Australasian Document Computing Symposium (ADCS 2022)*, December, 2022.

J. Mackenzie, A. Mallia, A. Moffat, and M. Petri: **Accelerating Learned Sparse Indexes Via Term Impact Decomposition.** In *Findings of the Association for Computational Linguistics: EMNLP 2022 (EMNLP Findings 2022)*, December, 2022. Full paper.

J. Mackenzie, M. Petri, and A. Moffat: **Tradeoff Options for Bipartite Graph Partitioning.** In *IEEE Transactions on Data Engineering (TKDE)*, 2022. Journal paper.

J. Mackenzie, M. Petri, and L. Gallagher: **IOQP: A simple Impact-Ordered Query Processor written in Rust.** In *Proceedings of the 3rd International Conference on Design of Experimental Search and Information Retrieval Systems (DESIRE 2022)*, August, 2022. Full paper.

D. La Barbera, K. Roitero, J. Mackenzie, D. Spina, G. Demartini, and S. Mizzaro: **Brisbane–Udine–Melbourne at CLEF2022 CheckThat! Lab: A Composite Deep Learning Approach to Fake News Detection using Evidence Retrieval.** In *Working Notes of CLEF 2022 - Conference and Labs of the Evaluation Forum (CLEF 2022)*, September, 2022. Notebook paper.

A. Moffat, J. Mackenzie, P. Thomas, and L. Azzopardi: **A Flexible Framework for Offline Effectiveness Metrics.** In *Proceedings of the 45th International ACM Conference on Research and Development in Information Retrieval (SIGIR 2022)*, July, 2022. Long paper.

A. Mallia, J. Mackenzie, T. Suel, and N. Tonellotto: **Faster Learned Sparse Retrieval with Guided Traver-**

sal. In *Proceedings of the 45th International ACM Conference on Research and Development in Information Retrieval (SIGIR 2022)*, July, 2022. Short paper.

A. Trotman, J. Mackenzie, P. Parameswaran, and J. Lin: **A Common Framework for Exploring Document-at-a-Time and Score-at-a-Time Retrieval Methods**. In *Proceedings of the 45th International ACM Conference on Research and Development in Information Retrieval (SIGIR 2022)*, July, 2022. Demo paper.

J. Mackenzie and D. Spina: **Report on the 25th Australasian Document Computing Symposium (ADCS 2021)**. In *SIGIR Forum*, 2022. Event report.

J. Mackenzie, M. Petri, and A. Moffat: **Efficient Query Processing Techniques for Next-Page Retrieval**. In *Information Retrieval Journal (IRJ)*, 2022. Journal paper.

J. Mackenzie, M. Petri, and A. Moffat: **Anytime Ranking on Document-Ordered Indexes**. In *ACM Transactions on Information Systems (TOIS)*, 2022. Journal paper.

A. Moffat and J. Mackenzie: **Conferences, Journals, Preprints, and Reviewer Expectations**. In *SIGIR Forum*, 2021. Opinion paper.

J. Mackenzie and A. Moffat: **Cost-Effective Updating of Distributed Reordered Indexes**. In *Proceedings of the 25th Australasian Document Computing Symposium (ADCS 2021)*, December, 2021. [Best paper award](#).

J. Mackenzie, M. Petri, and A. Moffat: **A Sensitivity Analysis of the MSMARCO Collection**. Unpublished technical report, 2021. Available: <https://arxiv.org/abs/2112.03396>.

J. Lin, X. Ma, J. Mackenzie, and A. Mallia: **On the Separation of Logical and Physical Ranking Models for Text Retrieval Applications**. In *Proceedings of the Second Biennial Conference on Design of Experimental Search and Information Retrieval Systems (DESIRES 2021)*, September, 2021. Short paper.

J. Mackenzie, M. Petri, and A. Moffat: **Faster Index Reordering with Bipartite Graph Partitioning**. In *Proceedings of the 44th International ACM Conference on Research and Development in Information Retrieval (SIGIR 2021)*, July, 2021. Short paper.

L. Azzopardi, J. Mackenzie, and A. Moffat: **ERR is not C/W/L: Exploring the Relationship Between Expected Reciprocal Rank and Other Metrics**. In *Proceedings of the 2021 ACM SIGIR International Conference on the Theory of Information Retrieval (ICTIR 2021)*, July, 2021. [Best paper award](#).

J. Mackenzie and A. Moffat: **Modality Effects When Simulating User Querying Tasks**. In *Proceedings of the 2021 ACM SIGIR International Conference on the Theory of Information Retrieval (ICTIR 2021)*, July, 2021.

R. Benham, J. Mackenzie, J. S. Culpepper, and A. Moffat: **Different Keystrokes for Different Folks: Visualizing Crowdsourcing Querying Behavior**. In *Proceedings of the 6th ACM SIGIR Conference on Human Information Interaction and Retrieval (CHIIR 2021)*, March, 2021. Demo paper.

J. Mackenzie and A. Moffat: **Examining the Additivity of Top- k Query Processing Innovations**. In *Proceedings of the 29th ACM International Conference on Information and Knowledge Management (CIKM 2020)*, October, 2020. Long paper.

J. Mackenzie, R. Benham, M. Petri, J. R. Trippas, J. S. Culpepper, and A. Moffat: **CC-News-En: A Large English News Corpus**. In *Proceedings of the 29th ACM International Conference on Information and Knowledge Management (CIKM 2020)*, October, 2020. Resource paper.

J. Mackenzie, Z. Dai, L. Gallagher, and J. Callan: **Efficiency Implications of Term Weighting for Passage Retrieval**. In *Proceedings of the 43rd International ACM Conference on Research and Development in Information Retrieval (SIGIR 2020)*, July, 2020. Short paper.

J. Lin, J. Mackenzie, C. Kamphuis, C. Macdonald, A. Mallia, M. Siedlaczek, A. Trotman, and A. de Vries: **Supporting Interoperability Between Open-Source Search Engines with the Common Index File Format**. In *Proceedings of the 43rd International ACM Conference on Research and Development in Informa-*

tion Retrieval (SIGIR 2020), July, 2020. Demo paper.

R. Benham, J. Mackenzie, A. Moffat, and J. S. Culpepper: **Boosting Search Performance Using Query Variations**. In *ACM Transactions on Information Systems (TOIS)*, October, 2019. Journal paper.

A. Mallia, M. Siedlaczek, J. Mackenzie, and T. Suel: **PISA: Performant Indexes and Search for Academia**. In *Proceedings of the Open-Source IR Replicability Challenge (OSIRRC 2019)*, July, 2019. Workshop paper.

M. Petri, A. Moffat, J. Mackenzie, J. S. Culpepper, and D. Beck: **Accelerated Query Processing Via Similarity Score Prediction**. In *Proceedings of the 42nd International ACM Conference on Research and Development in Information Retrieval (SIGIR 2019)*, July, 2019. Long paper.

J. Mackenzie, K. Gupta, F. Qiao, A. H. Awadallah, and M. Shokouhi: **Exploring User Behavior in Email Re-Finding Tasks**. In *Proceedings of the 2019 World Wide Web Conference (WWW 2019)*, May, 2019. Long paper.

J. Mackenzie, A. Mallia, M. Petri, J. S. Culpepper, and T. Suel: **Compressing Inverted Indexes with Recursive Graph Bisection: A Reproducibility Study**. In *Proceedings of the 41st European Conference on Information Retrieval (ECIR 2019)*, April, 2019. Long paper (reproducibility track).

L. Gallagher, J. Mackenzie, and J. S. Culpepper: **Revisiting Spam Filtering in Web Search**. In *Proceedings of the 23rd Annual Australasian Document Computing Symposium (ADCS 2018)*, December, 2018. Short paper.

R. Benham, L. Gallagher, J. Mackenzie, B. Liu, X. Lu, F. Scholer, A. Moffat, and J. S. Culpepper: **RMIT at the 2018 TREC CORE Track**. In *Proceedings of the 27th Text REtrieval Conference (TREC 2018)*, November, 2018. Notebook paper.

R. Benham, J. S. Culpepper, L. Gallagher, X. Lu, and J. Mackenzie: **Towards Efficient and Effective Query Variant Generation**. In *Proceedings of the First Biennial Conference on Design of Experimental Search and Information Retrieval Systems (DESIRE 2018)*, August, 2018. Long paper.

J. Mackenzie, C. Macdonald, F. Scholer, and J. S. Culpepper: **On the Cost of Negation for Dynamic Pruning**. In *Proceedings of the 40th European Conference on Information Retrieval (ECIR 2018)*, March, 2018. Short paper.

J. Mackenzie, J. S. Culpepper, R. Blanco, M. Crane, C. L. A. Clarke, and J. Lin: **Query Driven Algorithm Selection in Early Stage Retrieval**. In *Proceedings of the 11th International ACM Conference on Web Search and Data Mining (WSDM 2018)*, February, 2018. Long paper.

J. Mackenzie, F. Scholer, and J. S. Culpepper: **Early Termination Heuristics for Score-at-a-Time Index Traversal**. In *Proceedings of the 22nd Annual Australasian Document Computing Symposium (ADCS 2017)*, December, 2017. Long paper. [Runner up best paper award](#).

L. Gallagher, J. Mackenzie, R. Benham, R-C. Chen, F. Scholer, and J. S. Culpepper: **RMIT at the NTCIR-13 We Want Web Task**. In *Proceedings of the 13th NTCIR Conference on Evaluation of Information Access Technologies (NTCIR 2017)*, December, 2017. Notebook paper.

R. Benham, L. Gallagher, J. Mackenzie, T. T. Damessie, R-C. Chen, F. Scholer, A. Moffat, and J. S. Culpepper: **RMIT at the 2017 TREC CORE Track**. In *Proceedings of the 26th Text REtrieval Conference (TREC 2017)*, November, 2017. Notebook paper.

J. Mackenzie: **Managing Tail Latencies in Large Scale IR Systems**. In *Proceedings of the 40th International ACM Conference on Research and Development in Information Retrieval (SIGIR 2017)*, August, 2017. Extended abstract.

M. Crane, J. S. Culpepper, J. Lin, J. Mackenzie, and A. Trotman: **A Comparison of Document-at-a-Time and Score-at-a-Time Query Evaluation**. In *Proceedings of the 10th International ACM Conference on Web Search and Data Mining (WSDM 2017)*, February, 2017. Long paper.

J. Mackenzie, R-C. Chen, and J. S. Culpepper: **RMIT at TREC 2016 LiveQA Track**. In *Proceedings of the*

25th Text REtrieval Conference (TREC 2016), November, 2016. Notebook paper.

J. Mackenzie, F. M. Choudhury, and J. S. Culpepper: **Efficient Location-Aware Web Search**. In *Proceedings of the 20th Annual Australasian Document Computing Symposium (ADCS 2015)*, December, 2015. Long paper. [Best paper award](#).

Publicity

Amazon Science Blog: Article titled “*More efficient and reliable retrieval of distributed data*” features our 2021 ACM TOIS publication “*Anytime Ranking on Document-Ordered Indexes*.”

Awards and Funding

The University of Queensland New Staff Research Grant (2022): \$50,000.

The University of Melbourne Early Career Seed Funding (2021): \$20,000.

Best Paper Award: ADCS 2021, ICTIR 2021, ADCS 2017 (Runner up), ADCS 2015.

RMIT CIDDA CReD Research Excellence Award: For “*Exploring User Behavior in Email Re-Finding Tasks*” (WWW 2019).

RMIT TIGER/BDDA Group Student Paper Award: For “*Query Driven Algorithm Selection in Early Stage Retrieval*” (WSDM 2018).

SIGIR Travel Award: SIGIR 2017, WSDM 2017.

Australian Postgraduate Award: PhD scholarship from 2016 to 2019.

RMIT Vice Chancellors List Award (Top 2% of higher education university-wide): 2014, 2015.

Service

General Chair

Australasian Document Computing Symposium (ADCS) 2021.

Program Chair

Australasian Document Computing Symposium (ADCS) 2022.

Demo Chair

International ACM Conference on Research and Development in Information Retrieval (SIGIR) 2024.

Proceedings Chair

International ACM SIGIR Conference on Information Retrieval in the Asia Pacific (SIGIR-AP) 2023.

ACM SIGIR Conference on Human Information Interaction and Retrieval (CHIIR) 2021.

International ACM Conference on Web Search and Data Mining (WSDM) 2019.

SIGIR Artifact Evaluation Committee (AEC)

Member: 2021–Present.

Area Chair

International Conference on Computational Linguistics (COLING) 2022.

Program Committee Member or Reviewer

Australasian Document Computing Symposium (ADCS): 2016–2019.

International ACM Conference on Information and Knowledge Management (CIKM): 2016–2023.

European Conference on Information Retrieval (ECIR): 2021–2024.

Empirical Methods in Natural Language Processing (EMNLP): 2020–2022.

The Journal of Information Science: 2019.

ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD): 2021.

International ACM Conference on Research and Development in Information Retrieval (SIGIR): 2019–2024.

International Symposium on String Processing and Information Retrieval (SPIRE): 2019, 2022.

IEEE Transactions on Knowledge and Data Engineering (TKDE): 2022.

ACM Transaction on Information Systems (TOIS): 2020.

The International Journal on Very Large Databases (VLDB): 2017.

Workshop on Insights from Negative Results in NLP: 2022 (at ACL).

International ACM Conference on Web Search and Data Mining (WSDM): 2021–2023.

The World Wide Web Conference (TheWebConf, *aka* WWW): 2022–2023.

I also review grants for the Australian Research Council.