Carmen S. Chui, Ph.D.

she/her/hers

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http://carmenchui.github.io

Profile

- Extensive background in ontology engineering, knowledge representation, and automated reasoning in various disciplines (anthropology, chemistry, e-commerce, finance, linguistics, manufacturing, and mathematics).
- Familiarity with UML, FOL, DL, RDF/S, OWL, SPARQL, SWRL, SHACL.
- Excellent communication, teamwork, writing, and management skills developed through previous academic and industry positions.
- Canadian citizen fluent in English with working proficiency in French.

Education

Ph.D. in Industrial Engineering, University of Toronto, June 2019.

M.A.Sc. in Industrial Engineering, University of Toronto, November 2013.

B.A.Sc. (with Honours) in Industrial Engineering, University of Toronto, June 2011.

Experience

Senior Business Data Architect — Toronto, ON
The Bank of Nova Scotia (Scotiabank) — *December 2020 – present*

- Part of the Customer Insights, Data & Analytics (CIDA) team in the corporate Data Office.
- Developing ontologies and knowledge graphs as part of the initiative to standardize how data is described and organized across the bank.

Postdoctoral Fellow — Toronto, ON
University of Toronto (UofT), Royal Bank of Canada (RBC) — *April 2019 – November 2020*

- Supervised by Prof. Michael Grüninger of the Semantic Technologies Lab and Janette Wong at RBC.
- Collaborated with RBC's Data & Analytics (DNA) and Location Intelligence (LI) teams to analyze, develop, and apply ontologies for various business intelligence projects:

May 2020 – Nov. 2020	Worked with the Advanced Analytics Team in RBC to examine ways how ontologies and machine learning can help with preparing and extracting relevant data for various consumption needs in the bank. Developed an ontology and semantic parsing framework for a proof-of-concept (POC) artificial intelligence engine to do query expansion.
May 2020 – Nov. 2020	Explored the use of the Financial Industry Business Ontology (FIBO) for quality checking loans data, as well as determining whether FIBO can be extended via ontology modules for the Bank's needs.
July 2019 – August 2019	(Supervised by James Liao at RBC) Developed a prototype to convert raw loan end-of-day-contract datasets into RDF using open-source tools, and to map the Bank's loan concepts as RDF classes and properties.

April 2019 – June 2020 Developed a kinship ontology in first-order logic (Common Logic) based on work done in anthropology for business intelligence projects. Results published at FOIS 2020.

Graduate Research Assistant Toronto, ON
University of Toronto *September 2011 – March 2019*

- Specified the metadata and formalize logical methods to relate ontologies to one another within the COmmon Logic Ontology REpository (COLORE) project.
- Verified and validated ontologies using formal logical techniques and mathematical theories (algebra, geometry, graph theory).
- Published results at the FOIS, FOMI, JOWO and KEOD conferences and workshops, and in the Applied Ontology journal.
- Assisted with local International Association for Ontology & Its Application (IAOA) events.

Teaching Assistant Toronto, ON
University of Toronto *September 2011 – April 2018*

- In addition to proctoring faculty-wide examinations, I was also the head TA for the Introduction to Mechanical & Industrial Engineering (MIE191), Design & Analysis of Information Systems (MIE350), Knowledge Modelling & Management (MIE457), and Enterprise Modelling (MIE1505) courses.

Research Theses

[Th1] **C. Chui**. "A Molecular Structure Ontology for Medicinal Chemistry". Ph.D. Thesis. University of Toronto, June 2019. URL: `http://hdl.handle.net/1807/97001`.

- Adviser: Michael Grüninger
- Committee: Gary Bader, Mark S. Fox, Michael Grüninger, L.H. Shu
- External Appraiser: Michel Dumontier, Maastricht University

[Th2] **C. Chui**. "Axiomatized Relationships between Ontologies". M.A.Sc. Thesis. University of Toronto, Nov. 2013. URL: `http://hdl.handle.net/1807/42747`.

- Adviser: Michael Grüninger
- Committee: Mark S. Fox, Michael Grüninger, L.H. Shu

[Th3] **C. Chui**. "Reasoning About Changes". B.A.Sc. Thesis. University of Toronto, June 2011. URL: `http://stl.mie.utoronto.ca/cchui/basc_thesis.pdf`.

- Adviser: Michael Grüninger
- Fourth year undergraduate research thesis completed for MIE498Y

Publications

Google Scholar page: https://scholar.google.ca/citations?user=R1gxO74AAAAJ

DBLP page: http://dblp2.uni-trier.de/pers/hd/c/Chui:Carmen

ORCID: http://orcid.org/0000-0001-9493-5912

Articles in Refereed Journals

[J1] B. Aameri, **C. Chui**, M. Grüninger, T. Hahmann, and Y. Ru. "The FOUnt Ontologies for Quantities, Units, and the Physical World". In: *Applied Ontology* 15.3 (2020). Revised and expanded version of [P3], pp. 313–359. URL: http://doi.org/10.3233/AO-200231.

Refereed Book Chapters

[B1] **C. Chui** and M. Grüninger. "Techniques for Merging Upper Ontologies". In: *Knowledge Discovery, Knowledge Engineering and Knowledge Management - 6th International Joint Conference, IC3K 2014, Rome, Italy, October 21-24, 2014, Revised Selected Papers*. This is an updated and revised version of [P6]. 2014, pp. 273–292. URL: https://doi.org/10.1007/978-3-319-25840-9_18.

Refereed Full Papers in Conference Proceedings

[P1] **C. Chui**, M. Grüninger, and J. Wong. "An Ontology for Formal Models of Kinship". In: *Formal Ontology in Information Systems - Proceedings of the 11th International Conference, FOIS 2020*. 2020, pp. 92–106. URL: http://doi.org/10.3233/FAIA200663.

[P2] M. Grüninger, **C. Chui**, Y. Ru, and J. Thai. "A Mereology for Connected Structures". In: *Formal Ontology in Information Systems - Proceedings of the 11th International Conference, FOIS 2020*. 2020, pp. 171–185. URL: http://doi.org/10.3233/FAIA200670.

[P3] M. Grüninger, B. Aameri, **C. Chui**, T. Hahmann, and Y. Ru. "Foundational Ontologies for Units of Measure". In: *Formal Ontology in Information Systems - Proceedings of the 10th International Conference, FOIS 2018, Cape Town, South Africa, 19-21 September 2018*. Acceptance Rate: 29.2% (14 papers of 48 submissions). **Won Distinguished Paper Award**. 2018, pp. 211–224. URL: https://doi.org/10.3233/978-1-61499-910-2-211.

[P4] **C. Chui** and M. Grüninger. "A Molecular Structure Ontology for Medicinal Chemistry". In: *Formal Ontology in Information Systems - Proceedings of the 9th International Conference, FOIS 2016, Annecy, France, July 6-9, 2016*. Acceptance Rate: 30.9% (25 papers of 80 submissions). 2016, pp. 285–298. URL: http://dx.doi.org/10.3233/978-1-61499-660-6-285.

[P5] **C. Chui** and M. Grüninger. "Mathematical Foundations for Participation Ontologies". In: *Formal Ontology in Information Systems - Proceedings of the Eighth International Conference, FOIS 2014, September, 22-25, 2014, Rio de Janeiro, Brazil*. Acceptance Rate: 29.6% (24 papers of 81 submissions). 2014, pp. 105–118. URL: http://dx.doi.org/10.3233/978-1-61499-438-1-105.

[P6] **C. Chui** and M. Grüninger. "Merging the DOLCE and PSL Upper Ontologies". In: *KEOD 2014 - Proceedings of the International Conference on Knowledge Engineering and Ontology Development, Rome, Italy, 21-24 October, 2014*. Acceptance Rate: 18% (78 submissions). An updated and revised version of this paper appears in [B1]. **Nominated for Best Student Paper Award.** SciTePress, 2014, pp. 16–26. URL: https://doi.org/10.5220/0005027100160026.

[P7] M. Grüninger, T. Hahmann, M. Katsumi, and **C. Chui**. "A Sideways Look at Upper Ontologies". In: *Formal Ontology in Information Systems - Proceedings of the Eighth International Conference, FOIS 2014, September, 22-25, 2014, Rio de Janeiro, Brazil*. Acceptance Rate: 29.6% (24 papers of 81 submissions). 2014, pp. 9–22. URL: https://doi.org/10.3233/978-1-61499-438-1-9.

Refereed Full Papers in Workshop Proceedings

[W1] **C. Chui** and M. Grüninger. "Verification and Modularization of the DOLCE Upper Ontology". In: *Proceedings of the Joint Ontology Workshops 2017 Episode 3: The Tyrolean Autumn of Ontology,*

Bozen-Bolzano, Italy, September 21-23, 2017. Sept. 2017. URL: http://ceur-ws.org/Vol-2050/FOUST_paper_1.pdf.

[W2] M. Grüninger, **C. Chui**, and M. Katsumi. "Upper Ontologies in COLORE". In: *Proceedings of the Joint Ontology Workshops 2017 Episode 3: The Tyrolean Autumn of Ontology, Bozen-Bolzano, Italy, September 21-23, 2017*. Sept. 2017. URL: http://ceur-ws.org/Vol-2050/FOUST_paper_2.pdf.

[W3] B. Aameri, M. Grüninger, and **C. Chui**. "Anti-Modules". In: *Proceedings of the Joint Ontology Workshops 2016 Episode 2: The French Summer of Ontology co-located with the 9th International Conference on Formal Ontology in Information Systems (FOIS 2016)*. Annecy, France, July 2016. URL: http://ceur-ws.org/Vol-1660/womocoe-paper2.pdf.

[W4] **C. Chui**, M. Grüninger, and M. van Berkel. "Ontology Mapping in an e-Commerce Application". In: *Formal Ontologies Meet Industry - 7th International Workshop, FOMI 2015, Berlin, Germany, August 5, 2015, Proceedings*. Acceptance Rate: 61.1% (11 papers of 18 submissions). 2015, pp. 25–38. URL: https://doi.org/10.1007/978-3-319-21545-7_3.

Technical Reports

[R1] **C. Chui**, M. Grüninger, and J. Wong. *Related Parties Ontology: Kinship and Household*. Tech. rep. Internal RBC Report. University of Toronto, Royal Bank of Canada (RBC), May 2020.

[R2] **C. Chui**. *Converting EODC Data into RDF*. Tech. rep. Internal RBC Report. University of Toronto, Royal Bank of Canada (RBC), Aug. 2019.

Manuscripts in Preparation

[M1] **C. Chui** and M. Grüninger. "Ontological Foundations for Medicinal Chemistry". To be submitted to the Journal of Cheminformatics (*J. Cheminformatics*).

Scholarly Presentations & Talks

[T1] *A Molecular Structure Ontology for Medicinal Chemistry*. Presented to The Matter Lab in the Department of Chemistry at the University of Toronto. June 2020. Slides: http://carmenchui.github.io/talks/202006_matter.pdf

[T2] *Approaching Ontology Challenges Posed by LINCS*. Presented the Linked Infrastructure for Networked Cultural Scholarship (LINCS) project committee. May 2020. Slides: http://carmenchui.github.io/talks/202005_lincs.pdf

[T3] *Ontology Project Update – Part 1*. (RBC Internal Presentation) Presented to RBC's Data & Analytics (DNA) Team. Mar. 2020.

[T4] *Ontology Project Update – Part 2*. (RBC Internal Presentation) Presented an Active Client Ontology and Kinship Ontology to RBC's Data & Analytics (DNA) Team. May 2020.

[T5] *Ontology Project Update*. (RBC Internal Presentation) Presented summary of projects pertaining to semantic integration, data quality, and the modularization of FIBO to RBC's Chief Data Office (CDO). Sept. 2019.

[T6] *An Ontological Approach to Medicinal Chemistry*. Presented to The Lautens Research Group in the Department of Chemistry at the University of Toronto. July 2017. Slides: http://carmenchui.github.io/talks/201707_lautens.pdf

[T7] *A Molecular Structure Ontology for Medicinal Chemistry*. Presented [P4] at the 9th International Conference on Formal Ontology in Information Systems (FOIS 2016) Conference in Annecy, France. July 2016. Slides: `http://carmenchui.github.io/talks/201607_fois_most.pdf`

[T8] *Anti-Modules*. Presented [W3] at the Joint Ontology Workshop (JOWO 2016). July 2016. Slides: `http://carmenchui.github.io/talks/201607_residue.pdf`

[T9] *Merging the DOLCE and PSL Upper Ontologies*. Presented [P6] at the 6th International Conference on Knowledge Engineering and Ontology Development (KEOD 2014). Oct. 2014. Slides: `http://carmenchui.github.io/talks/201410_keod.pdf`

[T10] *Breaking Down DOLCE: Overview of the Verification of the DOLCE Ontology*. Presented at the inaugural Toronto Ontology Festival (TOFFEE 2012). Nov. 2012. Slides: `http://carmenchui.github.io/talks/201211_toffee_dolce.pdf`

[T11] *Overview of Current Research Projects*. Presented at the Toronto Semantic Web Meetup Group: What's Happening in the Semantic Technologies Lab? Event. Oct. 2012.

[T12] *Reasoning with Ontology Mappings*. Presented at the MIE Scientific Writing Course (run by Debby Repka) at the University of Toronto. July 2012. Slides: `http://carmenchui.github.io/talks/201206_mappings.pdf`

Awards, Grants & Honours

Distinguished Paper Award at FOIS 2018 for [P3] 2018
UofT Doctoral Completion Award ($3,000.00) 2017
Department of Mechanical & Industrial Engineering Fellowship (totalling $48,861.00) 2011-2019
Graduate Student Endowment Fund, Faculty of Applied Science & Engineering ($20,000) 2014
Nominated for Best Student Paper award at KEOD 2014 for [P6] 2014
UofT Mechanical And Industrial Engineering Admission Scholarship ($1,000) 2007
UofT Faculty Of Applied Science And Engineering Admission Scholarship ($1,000) 2007
Certificate of Distinction, CEMC Euclid Mathematics Contest 2007

Professional Development

Prospective Professors in Training (PPIT) Program Certificate, University of Toronto, 2018.

Teaching Fundamentals (TF) Certificate, University of Toronto, 2012.

Professional Activities & Associations

EDM Council, 2019–present.

International Association for Ontology & Its Applications (IAOA), 2011–present.

ONTOLOG Forum, 2011–present.

Ontario Society of Professional Engineers (OSPE), 2011–present.

Institute of Industrial Engineers (IIE), 2011–present.

Technical Skills

Programming & Markup Languages:

CSS, HTML, Java, JavaScript, PHP, Python, SQL, TEX, Visual Basic, and XML.

Knowledge Modelling & Representation Languages:

Business Process Model and Notation (BPMN), Common Logic (CL), Description Logic (DL), First-Order Logic (FOL), Integration DEFinition (IDEF), Web Ontology Language (OWL), Petri Nets, Prolog, Resource Description Framework/Schema (RDF/S; Knowledge Graph), Shapes Constraint Language (SHACL), SPARQL Protocol and RDF Query Language (SPARQL), Semantic Web Rule Language (SWRL), Thousands of Problems for Theorem Provers (TPTP), and Unified Modeling Language (UML).

Ontologies:

Basic Formal Ontology (BFO), Descriptive Ontology for Linguistic and Cognitive Engineering (DOLCE), Dublin Core (DC), Financial Industry Business Ontology (FIBO), Friend-of-a-Friend (FOAF), gist, GoodRelations, Process Specification Language (PSL), Schema.org, Simple Knowledge Organization System (SKOS), Suggested Upper Merged Ontology (SUMO).

Theorem Provers, Reasoners, Model Builders, & Ontology Tools:

Paradox, Protégé, Prover9-Mace4, SWI-Prolog, and Vampire.