

SUMMARY

Bentley James Oakes is a post-doctoral researcher with expertise in many aspects of model-driven engineering. His research interests span a wide range of topics including verification of model transformations and cyber-physical systems, the creation of digital twins, and enabling domain experts to easily employ machine learning solutions. His high-quality research covering theoretical foundations as well as industry-driven results has been published in top venues.

Years of teaching experience and collaborations with industrial partners drive his ability to clearly communicate his ideas to both experts and non-experts. His research institution visits in both Europe and North America provide a comprehensive background for working effectively at a local and global scale. He is a native English speaker and has a basic knowledge of French with the goal of fluency within the next few years.

Bentley's in-depth knowledge, hands-on industrial project experience, and passion for delivering high-results provide a crucial advantage for those groups performing outstanding research.

RESEARCH EXPERIENCE

Post-Doctoral Researcher

Sept. 2021 to Present

Université de Montréal - Montréal, Canada

Research topic: Tools and techniques to assist domain experts in utilising machine learning.

Post-Doctoral Researcher

Sept. 2018 to July 2021

University of Antwerp - Antwerp, Belgium

Research topics: Verification of cyber-physical systems, model-driven engineering, multi-paradigm modelling, co-simulation, and digital twins.

Other activities: Mentorship of PhD and master's students, as well as writing project proposals for national and European Union-wide research consortia.

Funding: Flanders Make, the lead strategic research centre for the manufacturing industry in Flanders, Belgium.

Visiting Researcher

May 2018

GEODES Software Engineering Research Group at the Université de Montréal - Montréal, Canada

Research topic: Developing an interface between the AToMPM modelling tool and the ModelVerse modelling repository.

Visiting Researcher**July to Aug. 2016***fortiss GmbH* - Munich, Germany*Research topic:* Formalizing semantics of model transformation languages.*Funding:* fortiss GmbH, the research institute for the Free State of Bavaria.**Visiting Researcher****Oct. to Dec. 2014***General Motors Technical Center* - Warren, USA*Research topics:* Code/model modernization and industrial intellectual property concerns.*Funding:* The Network for the Engineering of Complex Software-Intensive Systems for automotive systems (NECSIS) project of Canada.

TEACHING EXPERIENCE

Guest Lecturer**Nov. 2022***Polytechnique Montréal* - Montréal, Canada*LOG6953DE - Model-Driven Software Engineering**Lecture title: Model/Graph Transformations: Specification and Verification***Teaching Assistant****Fall 2020***University of Antwerp* - Antwerp, Belgium*2001WETMTR - Model-Driven Engineering*

- Created and marked practical assignments utilizing model-driven engineering tools
- Held virtual and in-person lab sessions to assist students with tool usage
- Maintained the modelling tool AToMPM used throughout the course

Course Lecturer/Coordinator**Winter 2015, 2017, and 2018***McGill University* - Montréal, Canada*COMP 202 - Foundations of Programming*

- Developed and presented material for engaging course lectures covering a variety of Java programming topics, targeted towards students with no prior programming experience.
 - Created multiple-choice, short answer, and long-answer questions and marking guides for course assignments and exams.
 - Coordinated with other instructors and teaching assistants to ensure consistency in course material and meet teaching objectives.
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Selected Student Comments:

- *This was the only course this semester which I was always able to focus in and always made an effort to attend. [...] Professor Oakes truly captivated my interest in the course and held it for the entire semester.*
- *Bentley is a great teacher. He speaks very clearly, his slides are concise and to the point.*
- *Professor Oakes was really great. He was always available after class if we needed help and explained things really well to beginning programmers.*
- *Professor Oakes was fantastic. He able to explain things in a clear and straight forward way, always answering questions in class, always proceeding at a manageable pace. He has all of his slides uploaded, he had lecture recordings, pretty much everything we needed to succeed in this course.*

Teaching Assistant**2012 to 2014***McGill University - Montréal, Canada**COMP 202 - Foundations of Programming (x2)**COMP 250 - Introduction to Computer Science (x2)**COMP 251 - Data Structures and Algorithms (x3)*

- Provided constructive criticism on assignments and offering helpful suggestions and resources via online class forums, tutoring appointments, and email.
- Marked exams and assignments in collaboration with other teaching assistants and provided feedback to lecturers.

EDUCATION**Doctor of Philosophy (PhD), Computer Science****2013 to 2019***McGill University - Montréal, Canada**Title: A Symbolic Execution-Based Approach To Model Transformation Verification using Structural Contracts**Supervisors: Hans Vangheluwe and Clark Verbrugge***Master of Science, Computer Science****2011 to 2013***McGill University - Montréal, Canada**Title: Practical and Theoretical Issues of Evolving Behaviour Trees for a Turn-Based Game**Supervisor: Clark Verbrugge***Bachelor of Science, Computer Science****2006 to 2011***University of Manitoba - Winnipeg, Canada**Honours Level, Co-op option with three work-terms:*

- *Electronic Arts Inc., Montréal, Canada* **Fall 2009 and Summer 2010**
Assistant Software Engineer - Prototyping artificial intelligence
- *Blackberry Limited (RIM), Waterloo, Canada* **Winter 2009**
Assistant Software Engineer - Cryptographic communication protocols

SCHOLARSHIPS, FELLOWSHIPS, AND AWARDS

- *Journal of Software & Systems Modeling (SoSyM)* Top 1% Reviewer 2020 and 2021
- Best Student Paper Award at SIMULTECH 2019
for the paper *HintCO – Hint-based configuration of co-simulations*
- NSERC Postgraduate Scholarship - Doctoral (PGS D), 2015 to 2016
Natural Sciences and Engineering Research Council of Canada
- Lorne Trottier Science Accelerator Fellowship, McGill University 2015 and 2016
- Harold H. Helm Fellowship, McGill University 2013 and 2014
- Grad Excellence Award in Computer Science, McGill University 2012 and 2014

PUBLICATIONS

Journal Publications and Book Chapters

- [Oakes2022a] Oakes, B. J., Parsai, A., Meyers, B., David, I., Van Mierlo, S., Demeyer, S., Denil, J., De Meulenaere, P., and Vangheluwe, H. (2022b). A digital twin description framework and its mapping to Asset Administration Shell. *arXiv preprint arXiv:2209.12661*
- [Oakes2022] Oakes, B. J., Famelis, M., and Sahraoui, H. (2022a). Building domain-specific machine learning workflows: A conceptual framework for the state-of-the-practice. *arXiv preprint arXiv:2203.08638*
- [Karaduman2022] Karaduman, B., Oakes, B. J., Eslampanah, R., Denil, J., Vangheluwe, H., and Challenger, M. (2022). An architecture and reference implementation for WSN-Based IoT systems. In *Emerging Trends in IoT and Integration with Data Science, Cloud Computing, and Big Data Analytics*, pages 80–103. IGI Global
- [Oakes2020] Oakes, B. J., Gomes, C., Holzinger, F. R., Benedikt, M., Denil, J., and Vangheluwe, H. (2020). Hint-based configuration of co-simulations with algebraic loops. In *9th International Conference, SIMULTECH 2019 Prague, Czech Republic, July 29-31, 2019, Revised Selected Papers*, volume 1260, pages 1–28. Springer
- [Oakes2018a] Oakes, B. J., Troya, J., Lúcio, L., and Wimmer, M. (2018a). Full contract verification for ATL using symbolic execution. *Software and System Modeling*, 17(3):815–849

Peer-reviewed Conference and Workshop Publications

- [Dhaouadi2022] Dhaouadi, M., Oakes, B. J., and Famelis, M. (2022). End-to-end rationale reconstruction. *arXiv preprint arXiv:2209.00398*
- [Oakes2021b] Oakes, B. J., Meyers, B., Janssens, D., and Vangheluwe, H. (2021a). Structuring and accessing knowledge for historical and streaming digital twins. In *First Workshop on Ontology-Driven Conceptual Modeling of Digital Twins*, pages 1–13
- [Oakes2021a] Oakes, B. J., Moradi, M., Mierlo, S. V., Vangheluwe, H., and Denil, J. (2021b). Machine learning-based fault injection for hazard analysis and risk assessment. In *International Conference on Computer Safety, Reliability, and Security*, pages 178–192. Springer

- [Oakes2021] Oakes, B. J., Parsai, A., Mierlo, S. V., Demeyer, S., Denil, J., Meulenaere, P. D., and Vangheluwe, H. (2021c). Improving digital twin experience reports. In *Proceedings of the 9th International Conference on Model-Driven Engineering and Software Development - Volume 1: MODELSWARD*, pages 179–190. INSTICC, SciTePress
 - [VanAcker2020] Van Acker, B., Oakes, B. J., Moradi, M., Demeulenaere, P., and Denil, J. (2020). Validity frame concept as effort-cutting technique within the verification and validation of complex cyber-physical systems. In *Proceedings of the 23rd ACM/IEEE International Conference on Model Driven Engineering Languages and Systems: Companion Proceedings*, MODELS '20, New York, NY, USA. Association for Computing Machinery
 - [VanMierlo2020] Van Mierlo, S., Oakes, B. J., Van Acker, B., Eslampanah, R., Denil, J., and Vangheluwe, H. (2020). Exploring validity frames in practice. In *Proceedings of the First International Conference, ICSMM 2020, Bergen, Norway, June 25–26, 2020*, pages 131–148. Springer, Cham
 - [Moradi2020] Moradi, M., Oakes, B. J., Saraoglu, M., Morozov, A., Janschek, K., and Denil, J. (2020). Exploring fault parameter space using reinforcement learning-based fault injection. In *2020 50th Annual IEEE/IFIP International Conference on Dependable Systems and Networks Workshops (DSN-W)*, pages 102–109
 - [Bernaerts2019] Bernaerts, M., Oakes, B. J., Vanherpen, K., Aelvoet, B., Vangheluwe, H., and Denil, J. (2019). Validating industrial requirements with a contract-based approach. In *2019 ACM/IEEE 22nd International Conference on Model Driven Engineering Languages and Systems Companion (MODELS-C)*, pages 18–27
 - [Gomes2019] Gomes, C., Oakes, B. J., Moradi, M., Gámiz, A. T., Mendo, J. C., Dutré, S., Denil, J., and Vangheluwe, H. (2019). HintCO – Hint-based configuration of co-simulations. In *Proceedings of the 9th International Conference on Simulation and Modeling Methodologies, Technologies and Applications - Volume 1: SIMULTECH*, pages 57–68. INSTICC, SciTePress. **Winner of the Best Student Paper Award**
 - [Meyers2019] Meyers, B., Gadeyne, K., Oakes, B. J., Bernaerts, M., Vangheluwe, H., and Denil, J. (2019). A model-driven engineering framework to support the functional safety process. In *2019 ACM/IEEE 22nd International Conference on Model Driven Engineering Languages and Systems Companion (MODELS-C)*, pages 619–623
 - [Moradi2019] Moradi, M., Gomes, C., Oakes, B. J., and Denil, J. (2019). Optimizing fault injection in FMI co-simulation through sensitivity partitioning. In *Proceedings of the 2019 Summer Simulation Conference, SummerSim '19*, pages 1–12, San Diego, CA, USA. Society for Computer Simulation International
 - [Oakes2019] Oakes, B. J., Franceschini, R., Van Mierlo, S., and Vangheluwe, H. (2019). The computational notebook paradigm for multi-paradigm modeling. In *2019 ACM/IEEE 22nd International Conference on Model Driven Engineering Languages and Systems Companion (MODELS-C)*, pages 449–454
 - [Oakes2018b] Oakes, B. J., Verbrugge, C., Lúcio, L., and Vangheluwe, H. (2018b). Debugging of model transformations and contracts in SyVOLT. In *Proceedings of the MDEbug Workshop at Model Driven Engineering Languages and Systems (MODELS)*, pages 532–537
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- [Lucio2015] Lúcio, L., Oakes, B. J., Gomes, C., Selim, G., Dingel, J., Cordy, J., and Vangheluwe, H. (2015). SyVOLT: Full model transformation verification using contracts. In *Model Driven Engineering Languages and Systems (MODELS)*, pages 24–27
- [Oakes2015] Oakes, B. J., Troya, J., Lúcio, L., and Wimmer, M. (2015). Fully verifying transformation contracts for declarative ATL. In *Model Driven Engineering Languages and Systems (MODELS)*, pages 256–265
- [Selim2015] Selim, G., Cordy, J., Dingel, J., Lúcio, L., and Oakes, B. J. (2015). Finding and fixing bugs in model transformations with formal verification: An experience report. In *Proceedings of Analysis of Model Transformations Workshop at Model Driven Engineering Languages and Systems*, pages 26–35
- [Selim2014] Selim, G., Lúcio, L., Cordy, J., Dingel, J., and Oakes, B. J. (2014). Specification and verification of graph-based model transformation properties. In *Proceedings of International Conference on Graph Transformation*, pages 113–129. Springer

Technical Reports and Theses

- [Oakes2018] Oakes, B. J. (2018). *A Symbolic Execution-Based Approach to Model Transformation Verification Using Structural Contracts*. PhD thesis, McGill University
 - [Lucio2014] Lúcio, L., Oakes, B. J., and Vangheluwe, H. (2014). A technique for symbolically verifying properties of graph-based model transformations. Technical Report SOCS-TR-2014.1, McGill University
 - [Oakes2014] Oakes, B. J. (2014). Optimizing Simulink models. Technical Report CS-TR-2014.5, McGill University
 - [Oakes2013] Oakes, B. J. (2013). *Practical and Theoretical Issues of Evolving Behaviour Trees for a Turn-Based Game*. PhD thesis, McGill University
 - [Oakes2012a] Oakes, B. J. (2012). Embedding causal block diagrams within behaviour trees. Technical Report COMP 522 - Modelling and Simulation Course Project, McGill University
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SERVICE

Journal Reviewer:

- Journal of Computer Languages 2022
- *Empirical Software Engineering* 2022
- *IEEE Transactions on Automation Science and Engineering* (T-ASE) 2021
- *Journal of Software and Systems Modeling* (SoSyM) 2020 (x2), 2021

Organising Committee Member:

- *Annual Modeling and Simulation Conference* (ANNSIM) 2022, 2023
Cyber-Physical Systems Track Co-Chair
- *Model Driven Engineering Languages and Systems* (MODELS) 2022
Posters Co-Chair

Session Chair:

- *Model-Driven Engineering and Software Development* (MODELSWARD) 2021

Program Committee Member:

- *Workshop on Artificial Intelligence and Model-Driven Engineering* (MDE Intelligence) 2022
- *International Workshop on Models and Evolution* 2022
- *ACM Student Research Competition* 2022
- *Annual Modeling and Simulation Conference* (ANNSIM) 2021, 2022
- *Summer Simulation Conference* 2019, 2020
Cyber-Physical Systems track (2020)
Work-In-Progress track (2019)
- *Spring Simulation Conference* 2020
Symposium on Theory and Foundations of Modeling and Simulation (TMS)

Vice President of Finance

Nov. 2012 - Oct. 2015

Computer Science Graduate Society (CSGS)

McGill University - Montréal, Canada

Role: Coordinating dispersement of society resources and acquiring new sources of funding