



## 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

**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.

**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.
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## 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

- [Oakes2022] **Oakes, B. J.**, Famelis, M., and Sahraoui, H. (2022). 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

- [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*, page 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
- [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. Master's 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

## PROFESSIONAL ACTIVITIES

### Organising Committee Member:

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

### Session Chair:

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

### Program Committee Member:

- *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)

### Reviewer:

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