

---

## 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-value results provide a crucial advantage for 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. 28, 2022***Polytechnique Montréal - Montréal, Canada**LOG6953DE - Model-Driven Software Engineering**Lecture topics:* Model-driven engineering, usage and verification of model transformations**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.

**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, 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, 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, 2016**
- *Harold H. Helm Fellowship, McGill University* **2013, 2014**
- *Grad Excellence Award in Computer Science, McGill University* **2012, 2014**

## PUBLICATIONS

### Works-in-Progress

- [Oakes2022] **Oakes, B.**, 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*. To be published in Springer book of best papers from MODELSWARD 2021/2022
- [Oakes2022a] **Oakes, B.**, 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*. Under preparation following a major revision decision
- [Oakes2022b] **Oakes, B.**, Troya, J., Galasso, J., and Wimmer, M. (2022c). Fault localization in model transformations by combining symbolic execution and spectrum-based analysis. Under review

### Journal Publications and Book Chapters

- [Karaduman2022] Karaduman, B., **Oakes, B.**, 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.**, 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.**, 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.**, and Famelis, M. (2022). End-to-end rationale reconstruction. In *Proceedings of the International Conference on Automated Software Engineering (NIER track)*
- [Oakes2021b] **Oakes, B.**, 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.**, 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.**, 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.**, 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.**, 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.**, 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.**, 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.**, 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.**, 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.**, 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.**, 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.**, 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.**, 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.**, 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.** (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.** (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.** (2018). *A Symbolic Execution-Based Approach to Model Transformation Verification Using Structural Contracts*. PhD thesis, McGill University
- [Lucio2014] Lúcio, L., **Oakes, B.**, 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.** (2014). Optimizing Simulink models. Technical Report CS-TR-2014.5, McGill University
- [Oakes2013] **Oakes, B.** (2013). Practical and theoretical issues of evolving behaviour trees for a turn-based game. Master's thesis, McGill University
- [Oakes2012a] **Oakes, B.** (2012). Embedding causal block diagrams within behaviour trees. Technical Report COMP 522 - Modelling and Simulation Course Project, McGill University

## SERVICE

### Lead Organizer:

*Software Engineering at Montreal (SEMTL):*

**Aug. 2022 - Present**

<https://semtl.ca>

A regular scientific and social meeting of software engineering researchers in Montreal.

Role: Coordinating with meeting hosts on content, venue, date, and maintaining website

### Journal Reviewer:

*Journal of Computer Languages (JCL)* **2022**

*Empirical Software Engineering (EMSE)* **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:**

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

**Vice President of Finance****2012 - 2015***Computer Science Graduate Society (CSGS)*

McGill University - Montréal, Canada

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