

# Bence Graics



## Education

- 2019 – 2024 **Budapest University of Technology and Economics**  
Doctoral School of Informatics  
**Software Engineering, PhD, With Honors**  
Field of research: model-driven software engineering, usability of formal methods  
Dissertation: Formal Modeling, Verification and Test Generation for Component-Based Reactive Systems
- 2017 – 2019 **Budapest University of Technology and Economics**  
Faculty of Electrical Engineering and Informatics  
**Software Engineering, MSc, With Honors**  
Specialization: Critical Systems  
Thesis: Mixed-Semantics Composition of Statecharts for the Model-Driven Design of Reactive Systems
- 2013 – 2017 **Budapest University of Technology and Economics**  
Faculty of Electrical Engineering and Informatics  
**Software Engineering, BSc, With Honors**  
Specialization: Systems Design  
Thesis: Model-Driven Design and Verification of Component-Based Reactive Systems
- 2009 – 2013 Pécs, PTE Babits Mihály Secondary School  
Mathematics-informatics section

## Internships and Research Visits

- 2024 fall **Imandra, Austin, Texas, USA – Research visit, 2 weeks**  
Main tasks: Integration of the Imandra automated reasoning framework into the Gamma Statechart Composition Framework
- 2024 summer **INPE, São José dos Campos and Natal, Brazil – Research visit, 6 weeks**  
Main tasks: Lecturing, preparing laboratory practices, consulting, developing tools
- 2023 summer **FBK, Trento, Italy – Research visit, 8 weeks**  
Main tasks: Integration of the nuXmv and xSAP verification and analysis tools into the Gamma Statechart Composition Framework
- 2022 summer **INPE, São José dos Campos, Brazil – Research visit, 4 weeks**  
Main tasks: Lecturing, consulting, developing design and verification tools
- 2019 fall **INPE, São José dos Campos and Natal, Brazil – Research visit, 4 weeks**  
Main tasks: Lecturing, preparing laboratory practices, consulting, developing design and verification tools
- 2017 summer **IncQuery Labs Ltd., Budapest, Hungary – Internship, 6 weeks**  
Main tasks: Development of MagicDraw Development Kit (model transformations), benchmarking VIATRA with MONDO-SAM
- 2016 summer **IncQuery Labs Ltd., Budapest, Hungary – Internship, 6 weeks**  
Main tasks: Development of the Gamma Statechart Composition Framework: language design (metamodel, grammar, model validation), model transformations, code generation

## Participation in Research Projects

- 2019 – 2024 **ADVANCE**  
Addressing Verification and Validation Challenges in Future Cyber-Physical Systems
- 2019 – 2022 **2018-1.3.1-VKE-2018-00040**

2019 – 2020      Development of a distributed electronic railway interlocking system (RIS)  
**MTA-BME Lendület – Cyber-Physical Systems Research Group**  
Research in the area of heterogeneous component modeling for reactive CPS

## Honors, Awards & Scholarships

2019      **Academic Students Conference (National)**  
*Dissertation:* Model-Driven Development of Reactive Systems with Mixed Synchronous and Asynchronous Hierarchical Composition (*2nd prize*)

2017      **Academic Students Conference (University)**  
*Dissertation:* Model-Driven Development of Reactive Systems with Mixed Synchronous and Asynchronous Hierarchical Composition (*1<sup>st</sup> prize*)

2016      **Academic Students Conference (University)**  
*Dissertation:* Model-Driven Design and Verification of Component-Based Reactive Systems (*3<sup>rd</sup> prize*)

2017, 2019, 2020, 2022, 2023      **New National Excellence Program Scholarship**

2017, 2018      **National Higher Education Scholarship**

2019      **Nokia Bell Labs Junior Scholar Award**

2016, 2017, 2018      **Technical Scholarship of the Faculty**

2018      **EFOP 3.6.2-16 Scholarship**  
*Topic:* Guaranteeing dependability in CPS systems

2020      **Publication Award of Schnell Foundation**  
*Publication:* Mixed-semantics composition of statecharts for the component-based design of reactive systems

2021      **Best Presentation Award of Schnell Foundation** at the *28th Minisymposium of the Department of Measurement and Information Systems*  
*Presentation:* Mixed-semantics composition of statecharts for the component-based design of reactive systems

2022      **Josef Heim Award of Schnell Foundation**  
*Innovation work:* Facilitating the formal verification of hierarchical state-based SysML v2 models

2023      **László Schnell Award of Schnell Foundation**  
*Innovation work:* Facilitating the integration testing and description of adaptive behavior of collaborating statechart models

## University Activities

Teaching assistant      **System Modeling, Formal Methods:** lecturing, preparing exam exercises, grading exams, preparing home assignments, grading home assignments  
**Software and Systems Verifications:** lecturing, preparing and leading laboratory practices, preparing exam exercises, grading exams, grading home assignments  
**IT System Design:** lecturing, preparing home assignments  
**System Design Laboratory 1:** leading lab practices, grading lab reports

Main instructor      **Basics of Java Programming:** preparing course material, lecturing, grading assignments

Supervisor      **BSc theses:**

- *Model-Driven Development of Heterogeneous Cyber-Physical Systems (2020)*
- *Scenario-Based Modeling and Analysis of Reactive Systems (2020)*
- *Testing of Model Transformations in the Gamma Framework (2021)*
- *Exploiting the Byproducts of Model Checking for More Efficient Debugging in Model-Driven Development (2022)*

- *Integration of SCXML State Machines to the Gamma Framework (2022)*
- *Formal Verification of Asynchronously Cooperating State-Based Models in the Gamma Framework (2022)*
- *Development of a C Code Generator in the Gamma Framework (2023)*
- *Verification of Logic-Based Contract Refinement in the Gamma Framework (2024)*

#### **MSc thesis:**

- *Efficient Scenario-Based Verification of Reactive Systems in the Gamma Framework (2022)*

#### **Academic Students Conference (University):**

- *Model-Driven Development of Heterogeneous Cyber-Physical Systems (2020) (2<sup>nd</sup> prize)*
- *Formal Modeling and Verification of Process Models in Component-based Reactive Systems (2021) (2<sup>nd</sup> prize)*
- *Formal Methods for Better Standards: Validating the UML PSSM Standard About State Machine Semantics (2022) (2<sup>nd</sup> prize)*
- *Verification of Engineering Models Using a Modular Modeling Language with Configurable Semantics (2023) (1<sup>st</sup> prize)*

## University Projects and Tools

2016 – 2018	<b>MoDeS<sup>3</sup></b> project: design and verification of the distributed safety logic
2016 – present	Main developer of the <b>Gamma Statechart Composition Framework</b> : a framework for the design, verification and implementation of component-based reactive systems

## Academical Activities and Services

Conference organizer	Local chair at the <b>28th Minisymposium of the Department of Measurement and Information Systems</b> : editing the website, organizing the program, editing the proceedings
Thesis reviewer	<i>Supporting and Improving the Extensibility of the “Odin” system (NTNU)</i>
Paper subreviewer	DepCoS’19, DepCoS’20, MODELS’20, MODELS’21, SAC DADS’21, FMICS’21, SAC DADS’22, Minisymposium’22, FMICS’22, SRDS’23, SBMF’23, Minisymposium’24, ICSSOFT’24

## Skills

Language skills:	Hungarian – native <b>English</b> – fluent (Language Certificate: combined advanced – Level C1, 2012) Russian – passive (Language Certificate: combined intermediate – Level B1, 2019)
Programming skills:	C, C++, C#, Python, Java/Xtend programming languages, Git Eclipse technologies: EMF, Xtext, VIATRA <b>Main skills: Eclipse technologies, Java</b>

## Personal Skills

My greatest strength lies in my endurance and persistence. I am a hard worker, dedicated to my goals and strive to achieve them at all costs. I am accurate and always aim to carry out my tasks precisely. I love working with motivated people and consider myself as a great team worker. I find lifelong learning crucial in our modern society and I am always interested in getting to know new and interesting topics.

Budapest, 26 February 2025.

Bence Graics

## Publications

- [1] **Bence Graics**, Vince Molnár. Formal Compositional Semantics for Yakindu Statecharts. In *Proceedings of the 24th PhD Mini-Symposium*, Pages 22–25. Budapest University of Technology and Economics, Department of Measurement and Information Systems, 2017. ISBN: 978-963-313-243-2.
- [2] **Bence Graics**, Vince Molnár. Mix-and-Match Composition in the Gamma Framework. In *Proceedings of the 25th PhD Mini-Symposium*, Pages 24–27. Budapest University of Technology and Economics, Department of Measurement and Information Systems, 2018. ISBN: 978-963-313-285-2.

- [3] Vince Molnár, [Bence Graics](#), András Vörös, István Majzik, and Dániel Varró. The Gamma Statechart Composition Framework. In *Proceedings of the 40th International Conference on Software Engineering: Companion Proceedings, ICSE 2018, Gothenburg, Sweden, May 27 - June 03, 2018, Pages 113-116*. ACM. DOI: 10.1145/3183440.3183489
- [4] [Bence Graics](#), István Majzik. Modeling and Analysis of an Industrial Communication Protocol in the Gamma Framework. In *Proceedings of the 27th PhD Mini-Symposium*, Pages 25–28. Budapest University of Technology and Economics, Department of Measurement and Information Systems, 2020
- [5] Simon József Nagy, [Bence Graics](#), Kristóf Marussy, András Vörös. Simulation-based Safety Assessment of High-level Reliability Models. In *Proceedings MARS 2020*, arXiv:2004.12403; EPTCS 316, 2020, pp. 240-260; DOI:10.4204/EPTCS.316.9
- [6] [Bence Graics](#), Vince Molnár, András Vörös, István Majzik, and Dániel Varró. Mixed-semantics composition of statecharts for the component-based design of reactive systems. *Software and Systems Modeling*, Volume 19, Number 6, Pages 1483–1517, 2020, DOI: 10.1007/s10270-020-00806-5
- [7] Benedek Horváth, [Bence Graics](#), Vince Molnár, Ákos Hajdu, Zoltán Micskei, Vince Molnár, István Ráth, Luigi Andolfato, Ivan Gomes, and Robert Karban. Model Checking as a Service: Towards Pragmatic Hidden Formal Methods. *MODELS '20: In Proceedings of the 23rd ACM/IEEE International Conference on Model Driven Engineering Languages and Systems: Companion Proceedings*, October 2020, Article No.: 37, Pages 1–5, DOI:10.1145/3417990.3421407
- [8] János Csanád Csuvárszki, [Bence Graics](#), András Vörös. Model-Driven Development of Heterogeneous Cyber-Physical Systems. In *Proceedings of the 28th PhD Mini-Symposium*, Pages 24–27. Budapest University of Technology and Economics, Department of Measurement and Information Systems, 2021. ISBN: 978-963-421-845-6
- [9] [Bence Graics](#), Vince Molnár, and István Majzik. Contract-Based Specification and Test Generation for Adaptive Systems. In *Proceedings of the 16th International Conference on Dependability of Computer Systems DepCoS-RELCOMEX*, June 28 – July 2, 2021, Wrocław, Poland, in *Advances in Intelligent Systems and Computing*, Volume 1389, Pages 136–145, Springer Nature, DOI:10.1007/978-3-030-76773-0
- [10] Danilo Almeida, [Bence Graics](#), Ronan Chagas, Fabiano Luis de Sousa and Fatima Mattiello-Francisco, Towards Simulation of CubeSat Operational Scenarios under a Cyber-Physical Systems View, In *Proceedings of the 10th Latin-American Symposium on Dependable Computing (LADC)*, 2021, pp. 1-4, DOI: 10.1109/LADC53747.2021.9672594.
- [11] [Bence Graics](#), István Majzik. Integration Test Generation and Formal Verification for Distributed Controllers. In *Proceedings of the 30th PhD Mini-Symposium*, Pages 1–4. Budapest University of Technology and Economics, Department of Measurement and Information Systems, 2023
- [12] [Bence Graics](#), Vince Molnár, and István Majzik. Component-based specification, design and verification of adaptive systems. *Systems Engineering*. 26(5), 2023, pp. 567–589. DOI: 10.1002/sys.21675
- [13] Benedek Horváth, Vince Molnár, [Bence Graics](#), et al. Pragmatic verification and validation of industrial executable SysML models. *Systems Engineering*. 26, 2023; pp. 693–714. DOI: 10.1002/sys.21679
- [14] [Bence Graics](#), Vince Molnár, and István Majzik. Configurable Model-Based Test Generation for Distributed Controllers Using Declarative Model Queries and Model Checkers, In *proceedings of the 28th International Conference on Formal Methods for Industrial Critical Systems (FMICS)*, September 20-22, 2023, Antwerp, Belgium.
- [15] [Bence Graics](#), Milán Mondok, Vince Molnár, and István Majzik. (2024). Model-Based Testing of Asynchronously Communicating Distributed Controllers. In: Cámara, J., Jongmans, SS. (eds) *Formal Aspects of Component Software. FACS 2023*. Lecture Notes in Computer Science, vol 14485. Springer, Cham. DOI: 10.1007/978-3-031-52183-6\_2.
- [16] Vince Molnár, [Bence Graics](#), András Vörös, et al. 2024. Towards the Formal Verification of SysML v2 Models. In *Proceedings of the ACM/IEEE 27th International Conference on Model Driven Engineering Languages and Systems (MODELS Companion '24)*. Association for Computing Machinery, New York, NY, USA, 1086–1095. DOI: 10.1145/3652620.3687820
- [17] [Bence Graics](#), Milán Mondok, Vince Molnár, and István Majzik. Model-based testing of asynchronously communicating distributed controllers using validated mappings to formal representations. *Science of Computer Programming*. 242, 2025. DOI: 10.1016/j.scico.2025.103265