Curriculum Vitae
Fedyukovich, Grigory

General Information

University address: Department of Computer Science
LOV262, 1017 Academic Way
Florida State University
Tallahassee 32304-FL
Phone: 2064758585

E-mail address: grigory@cs.fsu.edu
Web: https://www.cs.fsu.edu/~grigory/

Professional Preparation

2016 PhD, University of Lugano. Major: Computer Science. Supervisor: Natasha Sharygina.

Professional Experience

2025–present Associate Professor, Computer Science, Florida State University.

2019–2025 Assistant Professor, Computer Science, Florida State University.

2021–2023 Visiting Academic, Amazon Web Services.

2017–2019 PostDoc, Princeton University.

2016–2017 PostDoc, University of Washington.

Honors, Awards, and Prizes

FSU Departmental Faculty Research Award (2024).

Research and Original Creative Work
Publications

Refereed Proceedings

Kolárik, T., Fedyukovich, G., Labbaf, F., Leopardi, F., Sharygina, N., & Wand, M. (2026). Formally Explaining Neural Network Classification. In *FM* (pp. 471 -- 496). LNCS.

Becchi, A., Fedyukovich, G., Gurfinkel, A., & Nachmanson, L. (2026). Syntactically Convex Model-Based Projection for Linear Real Arithmetic. In *TACAS (1)* (pp. 45 -- 65). LNCS.

Hamza, A., Zavalia, L., Gurfinkel, A., Navas, J., & Fedyukovich, G. (2025). A Flow-Sensitive Refinement Type System for Verifying eBPF Programs. In *OOPSLA* (pp. 3841 -- 3868). ACM.

Britikov, K., Fedyukovich, G., & Sharygina, N. (2025). CHC-Based Reachability Analysis via Cycle Summarization. In *iFM* (pp. 205-225). LNCS.

Riley, D., & Fedyukovich, G. (2025). Exact Loop Bound Analysis. In *PLDI* (pp. 1814--1837). ACM.

Ernst, G., & Fedyukovich, G. (2025). Quick Theory Exploration for Algebraic Data Types via Program Transformations. In *iFM* (pp. 424-450). LNCS.

Labbaf, F., Kolarik, T., Blicha, M., Fedyukovich, G., Wand, M., & Sharygina, N. (2025). Space Explanations of Neural Network Classification. In *CAV* (pp. 287-303). LNCS.

Britikov, K., Blicha, M., Sharygina, N., & Fedyukovich, G. (2024). Reachability Analysis for Multiloop Programs Using Transition Power Abstraction. In *FM* (pp. 558 -- 576). LNCS.

Zlatkin, I., & Fedyukovich, G. (2024). Leveraging Program Structure for Test Case Generation. In *22nd International Symposium on Automated Technology for Verification and Analysis (ATVA)*. Springer International Publishing.

We accelerated our approach to finding test cases for a given program published in TACAS'22 by using incremental SMT solving, compatibility predicates and large blocks of loop encoding. This is joint work with a grad student at FSU, supported by a gift from Ehtereum Foundation.

Sumanth Prabhu, Fedyukovich, G., & Deepak D'Souza. (2024). Maximal Quantified Precondition Synthesis for Linear Array Loops. In *Programming Languages and Systems - 33rd European Symposium on Programming (ESOP)* (pp. 245--274). Springer.

We extended our recent approach for synthesizing program preconditions published in PLDI'21 to support quantified preconditions. We also formalized some conditions when the preconditions are maximal. Collaboration with one grad student and one professor from the Indian Institute of Science. I served as co-advisor of the grad student.

Konstantin Britikov, Ilia Zlatkin, Grigory Fedyukovich, Leonardo Alt, & Natasha Sharygina. (2024). SolTG: A CHC-Based Solidity Test Case Generator. In *Computer Aided Verification - 36th International Conference (CAV)* (pp. 466--479). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-031-65627-9_23

We lifted our approach from TACAS'22 to finding test cases for a given program using its representation as a set of Constrained Horn Clauses (CHC) to Solidity Smart Contracts. This is joint work with my student at

FSU, one grad student and one professor from the University of Lugano, Switzerland, and one industry collaborator from the Ethereum Foundation, Germany (they also sent a gift to the FSU foundation). I served as advisor to the FSU student and as co-advisor to the Lugano student. FSU is the leading contributor to the publication.

Sumanth Prabhu, Deepak D'Souza, Supratik Chakraborty, R. Venkatesh, & Fedyukovich, G. (2024). Weakest Precondition Inference for Non-Deterministic Linear Array Programs. In *Tools and Algorithms for the Construction and Analysis of Systems - 30th International Conference (TACAS), Part II* (pp. 175--195). Springer.

We extended our recent approach for synthesizing program specifications (i.e., preconditions, inductive invariants, or function summaries) published in PLDI'21 by a new technique to prove the maximality of preconditions for programs in a certain class (with nondeterministic branching). Collaboration with two grad students and two professors from the Indian Institute of Science Bengaluru and Indian Institute of Technology Bombay. I served as co-advisor of the grad students.

Kostyukov, Y., Mordvinov, D., & Fedyukovich, G. (2023). Collaborative Inference of Combined Invariants. In *24th International Conference on Logic for Programming, Artificial Intelligence and Reasoning (LPAR)* (pp. 288-305). EPiC Series in Computing.

We presented a novel approach to solving the satisfiability of Constrained Horn Clauses (CHC) with Algebraic Data Types (ADT) over a certain First-Order Theory by conversion to Finite Model Finders (FMF) and an off-the-shelf CHC solver for that theory. Collaboration with two independent researchers (with no official affiliation due to political reasons).

Ameer Hamza, & Grigory Fedyukovich. (2023). Lockstep Composition for Unbalanced Loops. In *Tools and Algorithms for the Construction and Analysis of Systems - 29th International Conference, (TACAS)* (pp. 270--288). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-031-30820-8_18

We presented an automated synthesis technique for equivalence checking for pairs of programs using Counterexample-Guided Abstraction Refinement (CEGAR) for an incremental finding of points of synchronization between programs. This is joint work with a grad student at FSU, supported by my NSF grant.

Zavalia, L., Chernigovskaia, L., & Fedyukovich, G. (2023). Solving Constrained Horn Clauses over Algebraic Data Types. In *Verification, Model Checking, and Abstract Interpretation - 24th International Conference (VMCAI)* (pp. 341-365). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-031-24950-1_16

We presented a new approach to solving the satisfiability of a set of Constrained Horn Clauses (CHC) over Algebraic Data Types (ADT) using a novel concept of Recursive Functional Synthesis. We automatically extract recursive functions from declarative specifications (represented by CHCs) and use the calls to these functions in solutions to CHCs. This is joint work with two grad students at FSU, supported by my NSF grant.

Zlatkin, I., & Fedyukovich, G. (2022). Maximizing Branch Coverage with Constrained Horn Clauses. In *Tools and Algorithms for the Construction and Analysis of Systems - 28th International Conference (TACAS)* (pp. 254-272). Springer International Publishing. Retrieved from http://dx.doi.org/10.1007/978-3-030-99527-0_14

We presented the first approach to finding test cases for a given program using its representation as a set of Constrained Horn Clauses (CHC). The approach explores all program branches exhaustively and

symbolically, and for each branch, it either finds a test case by calling an SMT solver or proves that the branch is unreachable by supplying the necessary invariant. This is joint work with a grad student at FSU, supported by a gift from Amazon.

Riley, D., & Fedyukovich, G. (2022). Multi-phase invariant synthesis. In *30th Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE)*. ACM.

We presented a novel approach to solving the safety verification problem for a given program that learns disjunctive inductive invariants. It leverages the program structure to find phases (i.e., blocks of behaviors), then synthesizes guards and lemmas separately for each phase. This is joint work with a grad student at FSU, supported by my NSF grant.

Blicha, M., Fedyukovich, G., Hyvarinen, A. E. J., & Sharygina, N. (2022). Transition Power Abstractions for Deep Counterexample Detection. In *Tools and Algorithms for the Construction and Analysis of Systems - 28th International Conference (TACAS)* (pp. 524-542). Springer International Publishing. Retrieved from http://dx.doi.org/10.1007/978-3-030-99524-9_29

We presented a novel approach to solving the safety verification problem for a given program that incrementally explores the program states reachable from an initial state and doubles the exploration radius after every step. Collaboration with one grad student, one postdoc, and one professor from the University of Lugano, Switzerland. I served as co-advisor of the grad student.

Kostyukov, Y., Mordvinov, D., & Fedyukovich, G. (2021). Beyond the Elementary Representations of Program Invariants over Algebraic Data Types. In *42nd ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI)* (pp. 451-465). ACM.

We presented a novel approach to solving the satisfiability of Constrained Horn Clauses (CHC) with Algebraic Data Types (ADT) by conversion to Finite Model Finders (FMF). Collaboration with two grad students at Saint Petersburg University, Russia. I served as co-advisor of the grad students.

Fedyukovich, G., & Ernst, G. (2021). Bridging Arrays and ADTs in Recursive Proofs. In *Tools and Algorithms for the Construction and Analysis of Systems - 27th International Conference (TACAS)* (pp. 24-42). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-030-72013-1_2

We presented a novel approach to equivalence checking of different implementations of object-oriented software, specifically for two classes that implement a data structure using arrays or linked lists, respectively. Collaboration with a professor from LMU Munich, Germany. I am the leading contributor to the publication.

Prabhu, S., Fedyukovich, G., Madhukar, K., & D'Souza, D. (2021). Specification Synthesis with Constrained Horn Clauses. In *42nd ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI)*. ACM.

We presented a novel fully automated approach for synthesizing program specifications (i.e., preconditions, inductive invariants, or function summaries) using a combination of enumerative synthesis and incremental strengthening or weakening of the specification candidates. Collaboration with one grad student, one professor from the Indian Institute of Science, and one industry colleague from TCS Pune. I served as co-advisor of the grad student. I am the leading contributor to the publication.

Pick, L., Fedyukovich, G., & Gupta, A. (2021). Unbounded Procedure Summaries from Bounded Environments. In *Verification, Model Checking, and Abstract Interpretation - 22nd International Conference (VMCAI)* (pp. 291-324). Springer International Publishing. Retrieved from http://dx.doi.org/10.1007/978-3-030-67067-2_14

We presented a new approach to verifying the safety of recursive (and possibly mutually recursive) programs based on the automatic computation of function summaries. Collaboration with one grad student and one professor from Princeton. I served as co-advisor of the grad student.

Pick, L., Fedyukovich, G., & Gupta, A. (2020). Automating Modular Verification of Secure Information Flow. In *Formal Methods in Computer Aided Design (FMCAD)* (pp. 158-168). IEEE.

We presented a new approach to verifying software w.r.t. non-interference properties based on Syntax-Guided Synthesis. Collaboration with one grad student and one professor from Princeton. I served as co-advisor of the grad student.

Asadi, S., Blicha, M., Hyvarinen, A. E. J., Fedyukovich, G., & Sharygina, N. (2020). Farkas-Based Tree Interpolation. In *27th International Symposium on Static Analysis (SAS)* (pp. 357-379). Springer International Publishing.

We presented an algorithmic improvement for computing function summaries using Satisfiability Modulo Theories (SMT) to be used in a framework for incremental verification of software, published by us in FMCAD'20. Collaboration with two grad students, one postdoc, and one professor from the University of Lugano, Switzerland. I served as co-advisor of the grad students.

Kobayashi, N., Fedyukovich, G., & Gupta, A. (2020). Fold/Unfold Transformations for Fixpoint Logic. In *Tools and Algorithms for the Construction and Analysis of Systems* (pp. 195-214). Springer International Publishing. Retrieved from http://dx.doi.org/10.1007/978-3-030-45237-7_12

We presented a new approach for relational verification for programs using algebraic data types (ADT) based on Fold/Unfold Transformations. Collaboration with two professors, from Princeton and the University of Tokyo, Japan. I was responsible for the practical side of the project.

Asadi, S., Blicha, M., Hyvarinen, A. E. J., Fedyukovich, G., & Sharygina, N. (2020). Incremental Verification by SMT-based Summary Repair. In *Formal Methods in Computer Aided Design (FMCAD) 2020* (pp. 77-82). IEEE.

We presented a new efficient implementation of an incremental software verification framework that leverages the power of Satisfiability Modulo Theories (SMT) to automatically decide on the precision of software encoding that has to be adequate for successful verification. Collaboration with two grad students, one postdoc, and one professor from the University of Lugano, Switzerland. I served as co-advisor of the grad students.

Katis, A., Fedyukovich, G., Chen, J., Greve, D., Rayadurgam, S., & Whalen, M. W. (2020). Synthesis of Infinite-State Systems with Random Behavior. In *35th IEEE/ACM International Conference on Automated Software Engineering (ASE)* (pp. 250-261). ACM.

We presented a novel application of synthesis in model-based testing to generate fuzzers of competitive performance to general-purpose alternatives, as well as controllers in robot motion planning problems that exhibit randomized behavior. Collaboration with one undergrad student, one grad student, two industry

colleagues from Rockwell Collins and Amazon, and one professor from the University of Minnessota. I served as co-advisor of the grad students.

Zhang, H., Yang, W., Fedyukovich, G., Gupta, A., & Malik, S. (2020). Synthesizing Environment Invariants for Modular Hardware Verification. In *21st International Conference on Verification, Model Checking, and Abstract Interpretation (VMCAI '20)* (pp. 202-225). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-030-39322-9_10

We presented an automated synthesis technique for hardware verification in processors and application-specific accelerators using Counterexample-Guided Abstraction Refinement (CEGAR) and Syntax-Guided Synthesis (SyGuS). Collaboration with two grad students and two professors from Princeton. I served as co-advisor of the grad students.

Govind V. K, Hari, Fedyukovich, G., & Gurfinkel, A. (2020). Word Level Property Directed Reachability. In *IEEE/ACM International Conference On Computer Aided Design (ICCAD)* (pp. 107:1-107:9). ACM.

In this work, we presented a new safety verification approach for software/hardware with bit-precise computations that is based on a new model-based quantifier elimination method for modular (bitvector) arithmetic. Collaboration with one grad student and one professor from the University of Waterloo, Canada. I served as co-advisor of the grad student.

Fedyukovich, G., & Gupta, A. (2019). Functional Synthesis with Examples. In *25th International Conference on Principles and Practice of Constraint Programming (CP '19)* (pp. 547-564). Springer International Publishing. Retrieved from http://dx.doi.org/10.1007/978-3-030-30048-7_32

In this work, we improved the effectiveness of our functional synthesizer (published in the VMCAI'19 paper) via a generalization of concrete examples extracted from the specification. Collaboration with one professor from Princeton. I am the leading contributor to the publication.

Fedyukovich, G., Gurfinkel, A., & Gupta, A. (2019). Lazy but Effective Functional Synthesis. In *Verification, Model Checking, and Abstract Interpretation - 20th International Conference (VMCAI)* (pp. 92-113). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-030-11245-5_5

In this work, we presented a new synthesizer for function implementations based on their declarative specifications that uses modern model-based techniques based on quantifier elimination. Collaboration with two professors from Princeton and the University of Waterloo, Canada. I am the leading contributor to the publication.

Yang, W., Fedyukovich, G., & Gupta, A. (2019). Lemma Synthesis for Automating Induction over Algebraic Data Types. In *25th International Conference on Principles and Practice of Constraint Programming (CP'19)* (pp. 600-617). Springer International Publishing. Retrieved from http://dx.doi.org/10.1007/978-3-030-30048-7_35

In this work, we presented a new automated prover for theorems over algebraic data types, thus often requiring reasoning by induction. To strengthen the inductive proofs, presented a new Syntax-Guided approach to generate auxiliary (helper) lemmas. Collaboration with one grad student and one professor from Princeton. I served as co-advisor of the grad student.

Mordvinov, D., & Fedyukovich, G. (2019). Property Directed Inference of Relational Invariants.

In *International Conference on Formal Methods in Computer-Aided Design (FMCAD)* (pp. 152-160). IEEE. Retrieved from https://ieeexplore.ieee.org/document/8894274

In this work, we presented a new approach to relational verification via an incremental property-driven search of relational invariants. Collaboration with one grad student from Saint Petersburg University, Russia. I served as an advisor to the grad student.

Fedyukovich, G., Prabhu, S., Madhukar, K., & Gupta, A. (2019). Quantified Invariants via Syntax-Guided Synthesis. In *Computer Aided Verification - 31st International Conference (CAV)* (pp. 259-277). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-030-25540-4_14

In this work, we presented an efficient application of Syntax-Guided Synthesis to solve the problem of safety verification for software involving arrays. It is a collaboration with two industry colleagues from TCS Pune, and a professor from Princeton. I am the leading contributor to the publication.

Fedyukovich, G., & Bodik, R. (2018). Accelerating Syntax-Guided Invariant Synthesis. In *Tools and Algorithms for the Construction and Analysis of Systems* (pp. 251-269). Springer International Publishing. Retrieved from http://dx.doi.org/10.1007/978-3-319-89960-2_14

Work published during my postdoctoral appointment.

Pick, L., Fedyukovich, G., & Gupta, A. (2018). Exploiting Synchrony and Symmetry in Relational Verification. In *Computer Aided Verification - 30th International Conference (CAV)* (pp. 164-182). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-319-96145-3_9

Work published during my postdoctoral appointment.

Asadi, S., Blicha, M., Fedyukovich, G., Hyvarinen, A. E. J., Even-Mendoza, K., Sharygina, N., & Chockler, H. (2018). Function Summarization Modulo Theories. In *LPAR-22. 22nd International Conference on Logic for Programming, Artificial Intelligence and Reasoning, Awassa, Ethiopia, 16-21 November 2018* (pp. 56-75). LPAR. Retrieved from http://www.easychair.org/publications/paper/nNLJ

Work published during my postdoctoral appointment.

Fedyukovich, G., Prabhu, S., Madhukar, K., & Gupta, A. (2018). Solving Constrained Horn Clauses Using Syntax and Data. In *2018 Formal Methods in Computer Aided Design, FMCAD 2018, Austin, TX, USA, October 30 - November 2, 2018* (pp. 1-9). IEEE. Retrieved from http://dx.doi.org/10.23919/FMCAD.2018.8603011

Work published during my postdoctoral appointment.

Fedyukovich, G., Zhang, Y., & Gupta, A. (2018). Syntax-Guided Termination Analysis. In *Computer Aided Verification - 30th International Conference (CAV)* (pp. 124-143). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-319-96145-3_7

Work published during my postdoctoral appointment.

Katis, A., Fedyukovich, G., Guo, H., Gacek, A., Backes, J., Gurfinkel, A., & Whalen, M. W. (2018). Validity-Guided Synthesis of Reactive Systems from Assume-Guarantee Contracts. In *Tools and Algorithms for the Construction and Analysis of Systems* (pp. 176-193). Springer International Publishing. Retrieved from http://dx.doi.org/10.1007/978-3-319-89963-3_10

Work published during my postdoctoral appointment.

Fedyukovich, G., Ahmad, M. B. S., & Bodik, R. (2017). Gradual synthesis for static parallelization of single-pass array-processing programs. In *38th ACM SIGPLAN Conference on Programming Language Design and Implementation, PLDI 2017, Barcelona, Spain, June 18-23, 2017* (pp. 572-585). ACM. Retrieved from http://dx.doi.org/10.1145/3062341.3062382

Work published during my postdoctoral appointment.

Alt, L., Asadi, S., Chockler, H., Even-Mendoza, K., Fedyukovich, G., Hyvarinen, A. E. J., & Sharygina, N. (2017). HiFrog: SMT-based Function Summarization for Software Verification. In *Tools and Algorithms for the Construction and Analysis of Systems - 23rd International Conference, TACAS 2017, Held as Part of the European Joint Conferences on Theory and Practice of Software, ETAPS* (pp. 207-213). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-662-54580-5_12

Work published during my postdoctoral appointment.

Fedyukovich, G., Kaufman, S. J., & Bodik, R. (2017). Sampling invariants from frequency distributions. In *2017 Formal Methods in Computer Aided Design, FMCAD 2017, Vienna, Austria, October 2-6, 2017* (pp. 100-107). IEEE. Retrieved from http://dx.doi.org/10.23919/FMCAD.2017.8102247

Work published during my postdoctoral appointment.

Mordvinov, D., & Fedyukovich, G. (2017). Synchronizing Constrained Horn Clauses. In *LPAR-21, 21st International Conference on Logic for Programming, Artificial Intelligence and Reasoning, Maun, Botswana, May 7-12, 2017* (pp. 338-355). LPAR. Retrieved from http://www.easychair.org/publications/paper/340359

Work published during my postdoctoral appointment.

Hyvarinen, A. E. J., Asadi, S., Even-Mendoza, K., Fedyukovich, G., Chockler, H., & Sharygina, N. (2017). Theory Refinement for Program Verification. In *Theory and Applications of Satisfiability Testing - SAT 2017 - 20th International Conference, Melbourne, VIC, Australia, August 28 - September 1, 2017, Proceedings* (pp. 347-363). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-319-66263-3_22

Work published during my postdoctoral appointment.

Fedyukovich, G., & Bodik, R. (2016). Approaching Symbolic Parallelization by Synthesis of Recurrence Decompositions. In *Proceedings Fifth Workshop on Synthesis, SYNT@CAV 2016, Toronto, Canada, July 17-18, 2016* (pp. 55-66). EPTCS. Retrieved from http://

dx.doi.org/10.4204/EPTCS.229.6

Work published during my postdoctoral appointment.

Fedyukovich, G., Gurfinkel, A., & Sharygina, N. (2016). Property Directed Equivalence via Abstract Simulation. In *Computer Aided Verification - 28th International Conference, CAV 2016, Toronto, ON, Canada, July 17-23, 2016, Proceedings, Part II* (pp. 433-453). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-319-41540-6_24

Work published during grad studies.

Jancik, P., Alt, L., Fedyukovich, G., Hyvarinen, A. E. J., Kofron, J., & Sharygina, N. (2016). PVAIR: Partial Variable Assignment InterpolatoR. In *Fundamental Approaches to Software Engineering - 19th International Conference, FASE 2016, Held as Part of the European Joint Conferences on Theory and Practice of Software, ETAPS 2016, Eindhoven, The* (pp. 419-434). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-662-49665-7_25

Work published during grad studies.

Alt, L., Fedyukovich, G., Hyvarinen, A. E. J., & Sharygina, N. (2015). A Proof-Sensitive Approach for Small Propositional Interpolants. In *Verified Software: Theories, Tools, and Experiments - 7th International Conference, VSTTE 2015, San Francisco, CA, USA, July 18-19, 2015. Revised Selected Papers* (pp. 1-18). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-319-29613-5_1

Work published during grad studies.

Fedyukovich, G., Gurfinkel, A., & Sharygina, N. (2015). Automated Discovery of Simulation Between Programs. In *Logic for Programming, Artificial Intelligence, and Reasoning - 20th International Conference, LPAR-20 2015, Suva, Fiji, November 24-28, 2015, Proceedings* (pp. 606-621). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-662-48899-7_42

Work published during grad studies.

Fedyukovich, G., D'Iddio, A. C., Hyvarinen, A. E. J., & Sharygina, N. (2015). Symbolic Detection of Assertion Dependencies for Bounded Model Checking. In *Fundamental Approaches to Software Engineering - 18th International Conference, FASE 2015, Held as Part of the European Joint Conferences on Theory and Practice of Software, ETAPS 2015, London, UK, Ap* (pp. 186-201). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-662-46675-9_13

Work published during grad studies.

Fedyukovich, G., Gurfinkel, A., & Sharygina, N. (2014). Incremental Verification of Compiler Optimizations. In *NASA Formal Methods - 6th International Symposium, NFM 2014, Houston, TX, USA, April 29 - May 1, 2014. Proceedings* (pp. 300-306). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-319-06200-6_25

Work published during grad studies.

Fedyukovich, G., & Sharygina, N. (2014). Towards Completeness in Bounded Model Checking Through Automatic Recursion Depth Detection. In *Formal Methods: Foundations and Applications - 17th Brazilian Symposium, SBMF 2014, Maceió, AL, Brazil, September 29-October 1, 2014. Proceedings* (pp. 96-112). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-319-15075-8_7

Work published during grad studies.

Pastore, F., Mariani, L., Hyvarinen, A. E. J., Fedyukovich, G., Sharygina, N., Sehestedt, S., & Muhammad, A. (2014). Verification-aided regression testing. In *International Symposium on Software Testing and Analysis, ISSTA '14, San Jose, CA, USA - July 21 - 26, 2014* (pp. 37-48). ACM. Retrieved from http://dx.doi.org/10.1145/2610384.2610387

Work published during grad studies.

Fedyukovich, G., Sery, O., & Sharygina, N. (2013). eVolCheck: Incremental Upgrade Checker for C. In *Tools and Algorithms for the Construction and Analysis of Systems - 19th International Conference, TACAS 2013, Held as Part of the European Joint Conferences on Theory and Practice of Software, ETAPS* (pp. 292-307). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-642-36742-7_21

Work published during grad studies.

Rollini, S. F., Alt, L., Fedyukovich, G., Hyvarinen, A. E. J., & Sharygina, N. (2013). PeRIPLO: A Framework for Producing Effective Interpolants in SAT-Based Software Verification. In *Logic for Programming, Artificial Intelligence, and Reasoning - 19th International Conference, LPAR-19, Stellenbosch, South Africa, December 14-19, 2013. Proceedings* (pp. 683-693). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-642-45221-5_45

Work published during grad studies.

Sery, O., Fedyukovich, G., & Sharygina, N. (2012). FunFrog: Bounded Model Checking with Interpolation-Based Function Summarization. In *Automated Technology for Verification and Analysis - 10th International Symposium, ATVA 2012, Thiruvananthapuram, India, October 3-6, 2012. Proceedings* (pp. 203-207). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-642-33386-6_17

Work published during grad studies.

Sery, O., Fedyukovich, G., & Sharygina, N. (2012). Incremental upgrade checking by means of interpolation-based function summaries. In *Formal Methods in Computer-Aided Design, FMCAD 2012, Cambridge, UK, October 22-25, 2012* (pp. 114-121). IEEE. Retrieved from http://ieeexplore.ieee.org/document/6462563/

Work published during grad studies.

Sery, O., Fedyukovich, G., & Sharygina, N. (2011). Interpolation-Based Function Summaries in Bounded Model Checking. In *Hardware and Software: Verification and Testing - 7th International Haifa Verification Conference, HVC 2011, Haifa, Israel, December 6-8,*

2011, Revised Selected Papers (pp. 160-175). Springer. Retrieved from http://dx.doi.org/10.1007/978-3-642-34188-5_15

Work published during grad studies.

Software and Systems Frameworks

Completed (Academic) Projects:

ELBA: Exact Loop Bound Analyzer and Synthesizer (2023–2025).

Description: An automated program analysis framework designed for exact loop bound synthesis and invariant discovery. Leverages advanced constraint solving to compute precise behavioral boundaries for complex programmatic loops.

SolTG: Automated Test Case Generator for Solidity Smart Contracts (2023–2024).

Description: A Constrained Horn Clause (CHC)-based test generation engine tailored for blockchain security. Automatically uncovers vulnerabilities and synthesizes structural test inputs for Ethereum smart contracts. Funded in part by the Ethereum Foundation.

Horntinuum: Automated Test Case Generator (2023–2024).

Description: An automated reasoning tool that maximizes branch coverage using incremental SMT solving and large-block constraint encodings.

FreqHorn: Data-Driven Constrained Horn Clause Solver (2017–2023).

Description: A high-performance CHC verification engine utilizing syntax-guided and data-driven invariant synthesis. Applied directly to industrial-scale verification, including AWS C Common programs through an Amazon Research Award.

AE-VAL: Functional Synthesis Tool (2015–2019).

Description: A foundational automated synthesis framework designed to generate functional implementations directly from declarative first-order logic specifications.

Projects in Progress:

LLM Multi-Agent Orchestration and Verification Framework (2025–2026).

Description: A large-scale, production-mimicking software framework comprising over 150,000 lines of code (150KLOC) to evaluate engineering velocity and safety bounds in autonomous systems. The framework utilizes generative AI multi-agent orchestration setups to automatically generate complex system codebases.

Technical Stack & Methodologies: Integrates deterministic automated reasoning techniques, constraint solvers, and dataflow analysis to guarantee enterprise-level AI safety and behavioral reliability. Tested against massive, real-world data structures (including a deterministic recommendation engine paradigm utilizing MusicBrainz graph infrastructure) to prove scalability and bounded verification properties.

Contracts and Grants

Contracts and Grants Funded

Fedyukovich, G. (2025–2029). *Cross theory rigorous program verification using Constrained Horn clauses*. Funded by SNSF. Total award $220,000.

Gubanov, M., Pyayt, A., & Fedyukovich, G. (2024–2026). *PFI-TT: A Hybrid Scalable Data Management System Providing Deep Access to the Scientific Knowledge in Data Science*. Funded by NSF. Total award $550,000.

The Co-PI from the FSU side with the amount of $70,000.

Fedyukovich, G. (May 2022–Dec 2022). *A test-case generator for Solidity*. Funded by Ethereum Foundation. Total award $21,000.

Supported one student who graduated with a Master's project.

Fedyukovich, G., & Prosper, H. (2022–2023). *Planning grant: An Analysis Description Language for Collider Physics*. Funded by CRC. Total award $25,000.

Supported one PhD student.

Fedyukovich, G., & Gupta, A. (Jul 2021–Jul 2025). *Collaborative Research: SHF: Medium: Automated Word Level Synthesis for Hardware Code Generation and Verified Abstraction*. Funded by NSF. Total award $914,882.

The PI from the FSU side (Lead PI in the collaboration) with the amount of $499,882.

Fedyukovich, G. (Jan 2021–Dec 2021). *Amazon Research Award: Applying FreqHorn to verification of AWS C Common programs*. Funded by Amazon. Total award $60,000.

Supported two students.

Fedyukovich, G. (May 2020–Aug 2020). *FYAP: Re-Modularization for Constrained Horn Clauses*. Funded by FSU. Total award $20,000.

Resource Grant

Fedyukovich, G. (2024, May–2027, May). A grant of 100000. *Verification Mentoring Workshop*

8, 9, and 10. Sponsored by NSF.

Funds to cover student participation in the next three Verification Mentoring Workshops.

Teaching

Courses Taught

Programming Languages (COP4020)
Introduction for Compiler Writing (COP4620)
Software Engineering I (CEN4020)
Compiler Construction (COP5621)
Program Verification (CIS5900)

New Course Development

Selected Topics in Computer Science (CIS5930): Computer Aided Verification (2019)

Service
The Community

Program Committee Member
OOPSLA'26

Program Committee Member
FMCAD'20, FMCAD'21, FMCAD'22, FMCAD'23, FMCAD'24, FMCAD'26

Program Committee Member
ATVA'18, ATVA'25, ATVA'26

Program Committee Member
PLDI'25

Program Committee Member
CAV'19, CAV'22, CAV'24

Sponsorship Chair & Fellowship Co-Chair
CAV'24

Workshop Chair
CAV'22 and CAV'25

Co-Chair
Verification Mentoring Workshop (at CAV'24 and CAV'25)

Program Committee Member
TACAS'23

Artifact Evaluation Co-Chair
TACAS'23

Program Committee Member
VMCAI'22, VMCAI'24

Program Committee Member
VSTTE'20, VSTTE'23

NSF Panelist
Grant Applications 2020 and 2024

Program Committee Member
ASE-Tools'21

Chair, Student Forum
FMCAD'19

Local Organization Chair & PC Member
RV'17 2017

Chair
Workshop on Verification and Synthesis for Software Evolution 2016, 2018