

Mihail Popov

Tenured Research Scientist

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I am interested in high performance computing and machine learning.

Experience

- 2021 - current **Research Scientist ISFP**, *Inria STORM/TADaaM*, Bordeaux, France.
- Using AI/LLM methods for verification (**IPDPS24**).
 - Exploring ML methods for performance/energy optimization (**IPDPS22**, **MPLR**, **JPDC**).
 - Studying and classifying I/O behaviors.
- 2020 **Senior Software Researcher**, *Huawei 2012 Research Labs*, Edinburgh, UK.
- Developed compiler transformations for AI.
- 2018 - 2019 **Postdoc Researcher**, *UART Architecture Group Uppsala University*, Uppsala, Sweden.
- Designed ML models to optimize/explore hardware parameters and NUMA effects (**ICS20**).
 - Optimized performance on NUMA systems by exploring a larger search space of thread and page mappings. The additional exploration cost is amortized with sampled execution (**ICS19**).
- 2017 **Postdoc Researcher**, *University of Versailles Saint-Quentin (UVSQ)*, Versailles, France.
- Characterized HPC applications performance over the last decade (**Proceedings of the IEEE**).
 - Improved autotuning of compiler optimization with clustering (**CCPE**).
- 2013 - 2016 **Ph.D. Student**, *UVSQ/Paris-Saclay*, Versailles, France.
- Title*: Automatic Decomposition of Parallel Programs for Optimization and Performance Prediction
Ph.D. advisors: Assistant Prof. Pablo de Oliveira Castro and Full Prof. William Jalby
- Decomposed applications into codelets with **CERE**. Codelets map loops or OpenMP regions and are replayed as standalone programs. (**IPDPS15**, **TACO**).
 - Proposed a piecewise holistic approach to tune compiler optimizations and thread configurations through codelets. Codelet autotuning achieves better speedups at lower tuning cost (**Euro-Par**).
- 2016 **Intern**, *UVSQ/Intel Software Tools*, Champaign, USA.
- Worked on profiling methods and simulation with codelets.
- 2013 **Intern**, *Exascale Computing Research (ECR)*, Versailles, France.
- Participated in the elaboration of a method to reduce the benchmarking cost. I clustered codes with similar computation patterns and which are sensitive to the same architectural changes (**CGO**).
- 2012 **Intern**, *ECR*, Versailles, France.
- Developed a method to quantify a distance between applications using compression tools.

Ph.D. Students

- 2022 - ongoing **Lana Scravaglieri**, Vectorization with numerical accuracy control for multi-precision simulation codes, <https://theses.fr/s351408>.
- 2024 - ongoing **Asia Auville**, Co-advised with Emmanuelle Saillard, Large Language Models for Detection and Correction of Errors in HPC Applications, <https://theses.fr/s401487>.

Awards and Grants

- 2024 - 2027 **Inria exploratory action**, 129k€, Large Language Models for Detection and Correction of Errors, <https://www.inria.fr/en/llm4dice>.
- 2022 - 2024 **Atos/Eviden Plan de relance**, 47k€, Statistical methods for system error detection.
- 2016 **Euro-Par publication in the best paper issue**, 3% acceptance rate, 5 out of 176.

Academic Supervision

- 2024 **Asia Auville**, *Enserb master student*, worked on models to detect MPI errors.
- 2024 **Arvid Lorén**, *Uppsala University bachelor thesis*, worked methods to optimize Intel hybrid E/P cores. Bachelor thesis accessible at <https://www.diva-portal.org/smash/get/diva2:1888603/FULLTEXT01.pdf>.
- 2024 **Patrick Gutsche**, *ENS Lyon student*, modeled code embedding capabilities for performance and energy tuning.
- 2023 **Jad El Karchi**, *Enserb master student*, worked on models to detect MPI errors. Work published at **IPDPS24**.
- 2023 **Angel Hippolyte**, *Bordeaux University master student*, worked on on tuning different compiler optimizations. <https://inria.hal.science/hal-04090612>.
- 2023 **Frederic Becerril**, *ENS Lyon student*, explored and modeled different MPI parameters resulting in performance and energy gains.
- 2021 **Lana Scravaglieri**, *Enserb master student*, Worked on NUMA/prefetch optimizations across datasets. Work published at **JPDC**.
- 2019 **Anastasia Stupnikova**, *Uppsala University master thesis*, explored machine learning methods applied to optimize NUMA effects. Work published at **ICS20**.
- 2019 **Isaac Sánchez Barrera**, *Ph.D. student at Barcelona Supercomputing*, explored machine learning methods applied to optimize NUMA/prefetch effects. Work published at **ICS20**.
- 2015 **Florent Conti**, *University of Versailles bachelor student*, worked on lock OpenMP methods in checkpoint restart strategies. Work published at **IPDPS15**.

Teaching

- 2025 **Head teacher, 16 hours**, Enseirb master course, Parallel programming. Introduction to parallel programming with OpenMP and CUDA.
- 2022 - 2025 **Head teacher, 12 hours**, Enseirb master course, Introduction to cryptography. Presented the basics of symmetric and asymmetric cryptography.
- 2022 - 2023 **Teaching Assistant, 20 hours**, Enseirb, Introduction to cryptography. Supervised exercises on the basics of symmetric and asymmetric cryptography.
- 2021 - 2024 **Teaching Assistant, 20 hours**, Enseirb, C project. Supervised students to implement games using C.
- 2019 **Head teacher, 16 hours**, Uppsala master course, [Low Level Parallel Programming](#). Presented different parallelization strategies including OpenMP (threads and tasks), SIMD vectorization, C++ threads, and CUDA.
- 2015 **Head teacher, 20 hours**, ISTY master course, Operating Systems Project. Designed a project to model the Linux file system. Focused on low level structures (inodes, blocks).
- 2014 - 2015 **Teaching Assistant, 73 hours**, ISTY/UVSQ, Operating Systems/Computer architecture.
- Introduction to Linux: processes and internal structures.
 - Introduction to computer architecture with an emphasize on floating point arithmetics.

Volunteer Experience

My recent contributions.

- **Co-Organizer**: HPC Bugs Fest during SC 2023 & SC 2024
- **Webchair and publicity chair**: [ICPP 2021](#).
- **PC**: COMPAS 2022, PDP 2022/2023/2024, Correctness 2023, IPDPSW 2024, ICPP 2024
- **Reviewer**: IPDPS 2022, PeerJ Computer Science 2023, SC 2023, Cluster 2023, SC 2024

Education

- 2010 - 2013 **Master Degree in Engineering and Computer Science**, *ISTY*, France.
European master degree of computer science.
- 2012 - 2013 **Master Degree in High Performance Computing**, *UVSQ/Ecole Centrale Paris*.
Master degree obtained in parallel of the last year of the master degree in engineering.

Research Interests

- General Linux, Performance Characterization, Computer Architecture
- Parallelism OpenMP (threads and tasks), MPI (Processes), Cuda, Vectorization
- AI Clustering, DNNs, Data Analysis, Automatic Differentiation, Backpropagation Optimization
- Compilation LLVM

Publications

- J. Karchi, H. Chen, A. TehraniJamsaz, A. Jannesari, **M. Popov**, and E. Saillard., “Mpi errors detection using gnn embedding and vector embedding over llvm ir,” in *IEEE International Parallel and Distributed Processing Symposium*, **IPDPS**, **2024**.
- L. Scravaglieri, **M. Popov**, L. Lima Pilla, A. Guermouche, A. Olivier, and E. Saillard, “Optimizing performance and energy across problem sizes through a search space exploration and machine learning,” *Journal of Parallel and Distributed Computing*, **JPDC**, **2023**.
- A. TehraniJamsaz, **M. Popov**, A. Dutta, E. Saillard, A. Jannesari, “Learning intermediate representations using graph neural networks for numa and prefetchers optimization,” in *IEEE International Parallel and Distributed Processing Symposium*, **IPDPS**, **2022**.
- M. Shimchenko, **M. Popov**, and T. Wrigstad, “Analyzing and predicting energy consumption of garbage collectors in openjdk,” in *Managed Programming Languages and Runtimes*, **MPLR**, **2022**.
- I Sánchez, D Black-Schaffer, M Moretó, M Casas, A. Stupnikova, and **M. Popov**, “Modeling and optimizing numa effects and prefetching with machine learning,” in *Proceedings of the ACM International Conference on Supercomputing*, **ICS**, **2020**. [20-minute Video](#).
- M. Popov**, A. Jimborean, and D. Black-Schaffer, “Efficient thread/page/parallelism autotuning for numa systems,” in *Proceedings of the ACM International Conference on Supercomputing*, **ICS**., **2019**. [5-minute Video](#).
- W. Jalby, D. Kuck, A. D. Malony, M. Masella, A. Mazouz, and **M. Popov**, “The long and winding road toward efficient high-performance computing,” in *Proceedings of the IEEE*, **2018**.
- M. Popov**, C. Akel, Y. Chatelain, W. Jalby, and P. de Oliveira Castro, “Piecewise holistic autotuning of parallel programs with cere,” in *Wiley Online Library Concurrency and Computation: Practice and Experience*, **CCPE**, **2017**.
- M. Popov**, C. Akel, W. Jalby, and P. de Oliveira Castro, “Piecewise holistic autotuning of compiler and runtime parameters,” in *European Conference on Parallel Processing*, **Euro-Par**, **2016 (included in the Best Paper Issue)**.
- M. Popov**, C. Akel, F. Conti, W. Jalby, and P. de Oliveira Castro, “Pcerc: Fine-grained parallel benchmark decomposition for scalability prediction,” in *IEEE International Parallel and Distributed Processing Symposium*, **IPDPS**, **2015**.
- P. D. O. Castro, C. Akel, E. Petit, **M. Popov**, and W. Jalby, “Cere: Llvm-based codelet extractor and replayer for piecewise benchmarking and optimization,” in *ACM Transactions on Architecture and Code Optimization*, **TACO**, **2015**.

P. de Oliveira Castro, Y. Kashnikov, C. Akel, **M. Popov**, and W. Jalby, “Fine-grained benchmark subsetting for system selection,” in *Proceedings of Annual IEEE/ACM International Symposium on Code Generation and Optimization*, **CGO**, **2014**.