Mher Safaryan | Curriculum Vitae

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Education

Ph.D. in Mathematics — **Yerevan State University**
Department of Mathematics, Chair of Theory of Functions — *2015–2018*
Thesis: On estimates for maximal operators associated with tangential regions

M.Sc. in Mathematics — **Yerevan State University**
Department of Mathematics, Chair of Theory of Functions — *2013–2015*
Thesis: Some generalizations of theorems of Fatou and Littlewood

B.Sc. in Mathematics — **Yerevan State University**
Department of Mathematics and Mechanics — *2009–2013*
Thesis: Some properties of convergent and divergent convolution type operators

High school student — **Quantum, Yerevan**
Mathematics-Physics flow — *2007–2009*

Experience

Postdoctoral fellow — **KAUST, Saudi Arabia**
King Abdullah University of Science & Technology (KAUST) — *Oct 2019–present*
Visual Computing Center (VCC)
Optimization for Machine Learning, advisor: Prof. Peter Richtárik

Research Technician — **KAUST, Saudi Arabia**
King Abdullah University of Science & Technology (KAUST)
Computer, Electrical and Mathematical Sciences & Engineering (CEMSE) Division
KAUST SRI, Center for Uncertainty Quantification in Computational Science and Engineering
Computer Algebra for Differential Equations — *Nov 2016–Oct 2019*
Automation of symbolic PDE analysis with Wolfram Mathematica, advisor: Prof. Diogo Gomes
- *Finding conservation and dissipation laws for a system of time-dependent evolution equations,*
- *Symbolic methods for overdetermined systems of linear PDEs with free parameters.*

[collaboration] Big Data Optimization in Machine Learning — *Jan 2019–Oct 2019*
Stochastic optimization methods, advisor: Prof. Peter Richtárik

Junior Researcher — **Yerevan, Armenia**
Institute of Mathematics of National Academy of Sciences — *Aug 2014–Dec 2017*, July 2018–June 2019
Real Analysis Department, advisor: Prof. Grigori Karagulyan
Harmonic Analysis: Real-variable Methods, Orthogonality, and Oscillatory Integrals
- *Convergence regions of integral operators of convolution type*
- *Differentiation of integrals in* $\mathbb{R}^n$

Search Engine Developer — **Yerevan, Armenia**
Teamable Software — *Apr 2014–Nov 2016*

Working extensively on data quality and all aspects of search engine in the product. Building intelligent, advanced and scalable search engine with Apache Solr.

- Processing, cleaning and regularizing data
- Extending company's data with third party sources of information
- Enhancing data collection procedures to include information relevant to search improvements
- Programming with python using its libraries for data analysis such as Scikit-learn, Natural Language Toolkit (NLTK), SciPy (IPython, NumPy, SymPy, Pandas, Matplotlib), etc
- Optimizing the indexing process and querying engine
- Creating customized search types, including synonym search and boolean search
- Incessantly improving search quality and performance based on the data analysis

Assistant Teacher of Olympiad Mathematics — **Yerevan, Armenia**
Quantum, Yerevan — *2011–2012*

Internships

Internship Student — **Thuwal, Saudi Arabia**
King Abdullah University of Science & Technology (KAUST) — *2016, April–June*
Computer, Electrical and Mathematical Science and Engineering (CEMSE) Division

Automation of basic operations in analysis of PDEs using Wolfram Mathematica: variational derivative of a functional, integration by parts, generating polynomials with respect to certain symmetry groups and simplifying integral identities.

Visiting Student — **Bonn, Germany**
Hausdorff Research Institute for Mathematics (HIM) — *2016, Jan 11–15*
Winter School on *Advances in Mathematics of Signal Processing*

Web Programming Intern — **Yerevan, Armenia**
Instigate Training Center, Instigate Mobile CJSC — *Oct 2012–Jul 2013*

Publications

Preprints

Optimal Gradient Compression for Distributed and Federated Learning, arXiv:2010.03246, 2020
Alyazeed Albasyoni, Mher Safaryan, Laurent Condat, Peter Richtárik

On Biased Compression for Distributed Learning, arXiv:2002.12410, 2020
Aleksandr Beznosikov, Samuel Horváth, Peter Richtárik, Mher Safaryan

Uncertainty Principle for Communication Compression in Distributed and Federated Learning and the Search for an Optimal Compressor, arXiv:2002.08958, 2020
Mher Safaryan, Egor Shulgin, Peter Richtárik

A surprisingly effective algorithm for the simplification of integrals and sums arising in the partial differential equations and numerical methods, preprint, 2020
Diogo A. Gomes, Mher Safaryan, Ricardo de Lima Ribeiro, Mohammed Sayyari

On Stochastic Sign Descent Methods, arXiv:1905.12938, 2019
Mher Safaryan, Peter Richtárik

Journal papers

- *On Generalizations of Fatou's Theorem in L^p for Convolution Integrals with General Kernels*, J. Geom. Anal., 2020
  Mher Safaryan
- *On an equivalency of rare differentiation bases of rectangles*, Journal of Contemporary Math. Anal., Vol. 53, No. 1, pp. 57-61, 2018.
  Mher Safaryan
- *On a theorem of Littlewood*, Hokkaido Math J., Volume 46, Number 1, 87-106, 2017
  Grigori Karagulyan, Mher Safaryan
- *On an equivalency of differentiation basis of dyadic rectangles*, Colloquium Mathematicum 146, 295-307, 2017
  Grigori Karagulyan, Davit Karagulyan, Mher Safaryan
- *On generalizations of Fatou's theorem for the integrals with general kernels*, J. Geom. Anal., Volume 25, Issue 3, pp 1459-1475, 2014
  Grigori Karagulyan, Mher Safaryan
- *Construction of free g-dimonoids*, Algebra Discrete Math., Volume 18, Issue 1, 138–148, 2014
  Yuri Movsisyan, Sergey Davidov, Mher Safaryan

Conferences

- *A package for symbolic PDE analysis*
  Mean Field Games and Applications, November 26-27, 2018, KAUST, Saudi Arabia.
  D. A. Gomes, M. H. Safaryan
  - *A package for symbolic PDE analysis*
    European Wolfram Technology Conference, July 19-20, 2017, Amsterdam, The Netherlands.
    D. A. Gomes, M. H. Safaryan
- *On theorems of Fatou and Littlewood*
  International Conference, Harmonic Analysis and Approximations VI, September 12-18, 2015, Tsaghkadzor, Armenia.
  G. A. Karagulyan, M. H. Safaryan
  - *On an equivalency of differentiation basis of dyadic rectangles*
    Armenian Mathematical Union Annual Session dedicated to the 100th anniversary of Professor Haik Badalyan, June 23-25, 2015, Yerevan, Armenia.
    G. A. Karagulyan, M. H. Safaryan
  - *On theorems of Fatou and Littlewood*
    Armenian-Georgian Conference, September, 2014, Tsaxkadzor, Armenia.
    G. A. Karagulyan, M. H. Safaryan
- *On free A-bisemigroups*
  Computer Science and Information Technologies (CSIT), Proceedings of the Conference, September 23-27, Yerevan, 2013, Armenia, pp. 42-44.
  Y. M. Movsisyan, S. S. Davidov, M. H. Safaryan
  - *Free A-bisemigroups*
    Mathematical Problems of Computer Science, XXXVIII, 2012, Yerevan, Armenia, pp. 23-25.
    Y. M. Movsisyan, S. S. Davidov, M. H. Safaryan

Workshops

- *On Stochastic Sign Descent Methods*,
  NeurIPS OPTML Workshop, 2020
  Mher Safaryan, Peter Richtárik
- *Optimal Gradient Compression for Distributed and Federated Learning*,
  Neurips SpicyFL Workshop, 2020
  Alyazeed Albasyoni, Mher Safaryan, Laurent Condat, Peter Richtárik
- *On Biased Compression for Distributed Learning*,
  Neurips SpicyFL Workshop, 2020
  Aleksandr Beznosikov, Samuel Horváth, Peter Richtárik, Mher Safaryan

Awards

- **Third Prize (2011, 2013), Honorable mention (2012)** — **AUBG, Blagoevgrad**
  International Mathematics Competition (IMC) for University Students — *2011-2013*
- **YSU bronze medal** — **Yerevan State University**
  YSU best student competition, Department of Mathematics — *2013*