# Tigran Kalaydzhyan

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## PROFESSIONAL EXPERIENCE

**Quantitative Analyst at ART Advisors, LLC.** **2019 – now**

Created new mid- and low-frequency statistical arbitrage strategies (including idea generation, research, data acquisition, backtesting, and writing production code for live trading). Responsible for maintaining and improving 30% of fund's preexisting forecasts in production. Developed various parts of trading and simulation infrastructure. Experience with traditional datasets (e.g., Reuters Fundamentals, Factset) and alternative data.

**Research Associate at NASA-JPL, California Institute of Technology.** **2016 – 2018**

Developed simulation software for NASA fundamental physics programs on board the International Space Station. Played a role of consultant and lead theorist for various space missions. Sole contributions include:

- Theory of relativistic clock desynchronization for systems of communicating clocks subject to gravitational forces, data analysis for the ACES atomic clock mission, tests of gravity and dark matter searches.
- Simulation of atomic clouds and Bose-Einstein Condensates in a magnetic trap created in the NASA Cold Atom Laboratory (currently in space).

**Research Associate in Theoretical Nuclear Physics, University of Illinois at Chicago** **2015 – 2016**

**Research Associate in Theoretical Nuclear Physics, Stony Brook University.** **2013 – 2015**

Developed a set of theoretical hydrodynamic methods predicting properties of quark-gluon plasma in heavy-ion collisions, cosmic rays and the early universe. Status of U.S. Permanent Resident granted on the basis of extraordinary ability in the field. Selected contributions include:

- Discovery of hydrodynamic properties of high-multiplicity collision states of two protons at LHC. Monte-Carlo protein-folding codes, and molecular dynamics codes for solving many-body problems.
- Exact solutions of hydrodynamic equations in presence of electromagnetic fields, rotation and quantum anomalies (in- and out-of-equilibrium).

**Scientific fellow of the String Theory Group. DESY-Hamburg, Germany.** **2010 – 2013**

Developed a set of theoretical methods, connecting dynamics of classical fields and strings in high-dimensional curved spaces with real-life properties of quark matter in accelerator experiments. Wrote numerical solvers for time-dependent nonlinear ODEs and PDEs (general relativity, supergravity and string theory). Developed scripts for automatic distribution of parallel calculations at the International Lattice Data Grid infrastructure.

**Research fellow of the ITEP Lattice Group, Moscow, Russia.** **2009 – 2012**

Wrote a high-performance Monte-Carlo package for lattice quantum chromodynamics. The program predicts electromagnetic and topological properties of quark matter at high temperatures and strong magnetic fields.

- Applied stochastic methods (Heat bath, Metropolis, Cabibbo-Marinari, overrelaxation) to the simulation of gluonic fields and extracting physical observables from the simulated data.
- Developed algorithms determining Dirac operator spectra with the use of Krylov subspace methods (Arnoldi, Lanczos, GMRES, BiCGSTAB, etc) and code optimization.

## EDUCATION

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| 2017 | Coursera.org certificate in Deep Learning, License# HAW4JL726QV9 |
| 2010 – 2013 | Ph.D. studies at the University of Hamburg, Germany. Degree of Doctor of Natural Sciences, with honors. Thesis: “Quark-gluon plasma in strong magnetic fields". |
| 2004 – 2010 | Lomonosov Moscow State University. Diploma in **Theoretical Physics**, with honors. (GPA: 4.0/4.0, Summa cum laude) Department of Physics. Chair of Quantum Statistics and Field Theory. Thesis: “Black hole creation in three-dimensional anti-de Sitter space". |

## TECHNICAL SKILLS

Analysis of experimental and simulated data. Statistical and spectral methods. Knowledge of C, C++ (98, 11, 14), Python, Perl, Matlab, Mathematica, Maple, Fortran, x86/ARM assembly. Object-oriented software design, low latency programming, version control (git), system programming, databases (SQL), static and dynamic testing. Leading researcher with 34 papers in top journals, 700+ citations, 100+ talks.

## LANGUAGES

English (fluent), Russian (native), German (fluent), French (intermediate), Armenian (basic).

## PUBLICATIONS

- **T. Kalaydzhyan**, N. Yu, *“Searching for stochastic background of ultra-light fields with atomic sensors”*, Universe 2018, 4(10), 99.
- **T. Kalaydzhyan**, N. Yu, *“Extracting dark matter signatures from atomic clock stability measurements”*, Phys. Rev. D 96 (2017) 075007.
- **T. Kalaydzhyan**, E. Murchikova, *“Thermal chiral vortical and magnetic waves: new excitation modes in chiral fluids”*, Nucl. Phys. B 919 (2017) 173.
- **T. Kalaydzhyan**, *“Comment on Testing Planck-scale gravity with accelerators*”, Phys. Rev. Lett. 116, 209001 (2016).
- **T. Kalaydzhyan***, “Gravitational mass of positron from LEP synchrotron losses”*, Sci. Rep. 6, 30461 (2016) [Nature Publishing Group].
- **T. Kalaydzhyan**, *“Gravitational mass of relativistic matter and antimatter”*, Phys. Lett. B 751 (2015) 29.
- **T. Kalaydzhyan**, *“Testing general relativity on accelerators”,* Phys. Lett. B 750 (2015) 112.
- **T. Kalaydzhyan**, E. Shuryak, *“Collective ow in high-multiplicity proton-proton collisions”,* Phys. Rev. C 91 (2015) 054913.
- **T. Kalaydzhyan**, E. Shuryak, *“Gravity waves generated by sounds from Big Bang phase transitions”,* Phys. Rev. D 91 (2015) 083502.
- **T. Kalaydzhyan**, E. Shuryak, *“Explosive regime should dominate collisions of ultra-high energy cosmic rays”*, arXiv:1407.3270 [hep-ph].
- **T. Kalaydzhyan**, E. Shuryak, *“Collective interaction of QCD strings and early stages of high multiplicity pA collisions”*, Phys. Rev. C 90 (2014) 014901.
- **T. Kalaydzhyan***, “On the temperature dependence of the chiral vortical effects”*, Phys. Rev. D 89 (2014) 105012
- **T. Kalaydzhyan**, E. Shuryak, *“Self-interacting QCD strings and string balls”*, Phys. Rev. D 90 (2014) 025031.
- M. N. Chernodub, **T. Kalaydzhyan**, J. Van Doorsselaere, H. Verschelde, *“Fermion zero modes in a chromomagnetic vortex lattice”*, Phys. Rev. D 89 (2014) 065021

- Id. Ben-Dayan, **T. Kalaydzhyan**, *"Constraining the primordial power spectrum from SNIa lensing dispersion"*, Phys. Rev. D 90 (2014) 083509.
- M.N. Chernodub, **T. Kalaydzhyan**, J. Van Doorsselaere, H. Verschelde, *"On chromoelectric (super)conductivity of the Yang-Mills vacuum"*, Phys. Lett. B 730 (2014) 63
- **T. Kalaydzhyan***, "Chiral superfluidity of the quark-gluon plasma"*, Nucl. Phys. A 913 (2013) 243.
- Il. Gahramanov, **T. Kalaydzhyan**, I. Kirsch, *"Anisotropic hydrodynamics, holography and the chiral magnetic effect"*, Phys. Rev. D 85, 126013 (2012).
- P. V. Buividovich, **T. Kalaydzhyan**, M. I. Polikarpov, *"Fractal dimension of the topological charge density distribution in SU(2) lattice gluodynamics",* Phys. Rev. D 86, 074511 (2012).
- **T. Kalaydzhyan**, I. Kirsch*, "Fluid-gravity model for the chiral magnetic effect"*, Phys. Rev. Lett. 106, 211601 (2011).
- V. Braguta, P. Buividovich, **T. Kalaydzhyan**, S. Kuznetsov, M. Polikarpov, *"The Chiral Magnetic Effect and chiral symmetry breaking in SU(3) quenched lattice gauge theory"*, Phys. Atom. Nucl. 75, 488.
- N. Evans, **T. Kalaydzhyan**, K. -y. Kim, I. Kirsch, *"Non-equilibrium physics at a holographic chiral phase transition"*, JHEP 1101, 050 (2011).
- **T. Kalaydzhyan**, I. Kirsch, *"Holographic dual of a boost-invariant plasma with chemical potential"*, JHEP 1102, 053 (2011).
- P. V. Buividovich, M. N. Chernodub, D. E. Kharzeev, **T. Kalaydzhyan**, E. V. Luschevskaya, M. I. Polikarpov, *"Magnetic-Field-Induced insulator-conductor transition in SU(2) quenched lattice gauge theory"*, Phys. Rev. Lett. 105, 132001 (2010).
- **T. Kalaydzhyan**, *"Testing gravity on accelerators"*, Proceedings of CPT'16, Bloomington, Indiana, USA.
- **T. Kalaydzhyan**, *"Testing general relativity on accelerators"*, Proceedings of KSM2015 conference, Frankfurt, Germany.
- **T. Kalaydzhyan**, *"Chiral Superfluidity for QCD"*, Proceedings of QUARKS-2014 conference, Suzdal, Russia.
- **T. Kalaydzhyan**, E. Shuryak, *"Why is the radial flow in central pA collisions stronger than in AA?"*, Nucl. Phys. A 931 (2014) 899.
- **T. Kalaydzhyan**, *"Chiral Superfluidity for the Heavy Ion Collisions"*, PoS CONFINEMENT X, 302 (2013).
- **T. Kalaydzhyan**, I. Kirsch, *"Chiral magnetic effect and holography"*, PoS CONFINEMENT X, 262 (2013).
- V. Braguta, P. Buividovich, **T. Kalaydzhyan**, M.I. Polikarpov, *"Topological and magnetic properties of the QCD vacuum probed by overlap fermions"*, PoS CONFINEMENT X, 085 (2013).
- P. V. Buividovich, M. N. Chernodub, **T. Kalaydzhyan**, D. E. Kharzeev, E. V. Luschevskaya, M. I. Polikarpov, *"Magnetic-field-induced insulator-conductor transition in quenched lattice gauge theory"*, PoS LATTICE2010, 076 (2010).
- V. V. Braguta, P. V. Buividovich, **T. Kalaydzhyan**, S. V. Kuznetsov, M. I. Polikarpov, *"The Chiral Magnetic Effect and chiral symmetry breaking in SU(3) quenched lattice gauge theory"*, PoS LATTICE2010, 190 (2010).
- M. I. Polikarpov et al*., "Conductivity of SU(2) gluodynamics vacuum induced by magnetic field"*, AIP Conf. Proc. 1343, 630-631 (2011).