Dr. Suren A. Chilingaryan

Data Processing and Performance Expert | Lead of Cloud Computing

@ csa@suren.me
skype:csa8000
http://suren.me
Scholar
linkedin

I do research in high-performance and heterogeneous computing and apply it to architect online systems for scientific instrumentation. With improvements in detector technology, I believe new approaches are required to keep pace with the increasing data rates. Codesign of hardware, software, and analysis algorithms is often a key to successful projects. Currently, I lead an effort to adopt cloud technologies for data acquisition and control systems.

Areas of expertise

High performance computing
Distributed data acquisition and control systems
Performance analysis and software optimization techniques
Parallel algorithms and parallel hardware architectures
Low-latency communication in heterogeneous systems
Cloud-based data management and visualization

Technical skills

Programming	C/C++, IPC, TCP/IP, CUDA/OpenCL, SSE/AltiVec, OpenMP/NPTL
System Programming	POSIX, Linux Internals, PCI Drivers, DMA, GPUDirect/DirectGMA
Networking	Ethernet/Infiniband, Sockets/MPI/0MQ, RDMA (ROCe), LibVMA
Software Analysis	gdb, perf/operf, nvvp/nvprof, vtune, valgrind, systap, tcpdump
Scientific Computing	MATLAB, Python/SciPy, ROOT, BLAS/LAPACK
Data Management	Brokers, Databases (SQL/NOSQL), XML & Co, Web Development
Orchestration	Ansible, OpenShift, Docker, LibVirt/KVM, Infiniband, GlusterFS

Employment

Since 2020	**Leader of CloudDAQ project** at Karlsruhe Institute of Technology: Research on cloud technologies for control and data acquisition applications
2013 – 2020	**Data processing and performance expert** at KIT: high-performance instrumentation for large-scale scientific experiments
2007 – 2012	**Postdoctoral researcher** at KIT: data management & software optimization
2005 – 2007	**Software engineer** at Yerevan Physics Institute: data acquisition systems
2002 – 2005	**Associate researcher** at Forschungszentrum Karlsruhe
2001 – 2002	**Software engineer** at Yerevan Physics Institute

Education

July 2006	PhD in Computer Engineering “Data Exchange Solution for Distributed Data Acquisition Systems and its application for Cosmic Ray Monitor Networks”, National Academy of Science, Armenia
1996 – 2001	MSc in Mathematics “Data Processing using Neural Networks”, Moscow State University, Russia

Personal data

Nationality	Armenian, Russian Federation, residence permit in Germany
Languages	English, Armenian, Russian

Projects

Ongoing — **Cloud technologies for heterogeneous control systems**
- Responisble for operation of the Kaas platform
- Prepare the KATRIN infrastructure for new high-speed detectors

2018 – 2020 — **Katrin-as-a-Service Cloud Platform**
- Proposed, built, and maintain the KaaS cloud platform for the KATRIN experiment
- Coordinated migration of the KATRIN services to the KaaS platform
- Made a distributed and scalable version of the ADEI data management system
- Supervised development of online monitoring framework for the ADEI ecosystem

2017 – 2020 — **Research of undocumented aspects in GPU architectures**
- Investigated performance imbalances and hidden parallelism in GPU architectures
- Developed method to exploit intra-SM parallelism (up to 30% speed-up)
- Evaluated methods of approximate computing for tomography (quality vs. speed-up)
- Applied these techniques to speed-up tomographic reconstruction by extra 4-6 times via performance modeling and rebalancing of hardware usage [s11554-019-00883-w]

2010 – 2018 — **Coordinated student exchange program with Tomsk Polytechnic University**

2012 – 2017 — **Data Acquisition Platform for UFO ecosystem**
- Developed a driver platform for fast prototyping of PCIe-based electronics with a modular (user-space) DMA engine (up to 12 GB/s) and scirpting/debugging support
- Implemented drivers for in-house electronics, e.g. camera (*in use at KIT and Desy*)
- Used RDMA and GPUDirect/DirectGMA to intercommunicate detectors with GPUs
- Participated in a case study on applications of GPUs for CMS track trigger, decision on acceptance of a track candidate was made within 6 μs (data transfer + analysis)
- GPUs allowed to utilize a more precise algorithm than was possible with classic designs

2015 – 2016 — **Cloud platform for collaborative analysis of tomographic data**
- Led development of web-visualization for large and time-resolved volumes

2011 – 2015 — **UFO: Ultrafast tomography with online monitoring and image-based control**
- Proposed a scalable architecture for pipelined processing of image streams
- Coordinated software development with a team in KIT and 3 Russian universities
- Supervised development of fast reconstruction algorithms (up to 6 GB/s per node)
- Supervised development of regularized reconstruction methods to compensate low SNR and/or undersampling in case of high-speed tomography
- Since 2016, the developed system is installed at the KIT synchrotron and enables both high-speed (5 volumes/second) and high-throughput (1000 samples/week) operation

2011 – 2014 — **ADEI: Advanced Data Extraction Infrastructure**
- Helped to secure funding and initiated collaboration between KIT and YerPhI
- Supervised a cross-university team of researchers and engineers
- Developed a platform for exploration and analysis of time-series in terascale archives
- System is in operation in YerPhI, the SEVAN network, and 7 major facilities at KIT

2009 – 2013 — **Parallel algorithms and software optimization**
- Developed parallel algorithms for μPIV (micro-particle velocimetry)
- Leveraged the PoweXCell architecture for a MRSES feature selection algorithm
- Optimized performance of PyHST (ESRF tomographic framework)
- Implemented a digital image correlation and tracking algorithm for GPUs

2002 – 2008 — **Distributed systems for data acquistion and slow control**
- Stabilized a slow control system of the KATRIN experiment for production use *(in use)*
- Built a distributed data acquisition system for ASEC particle detector networks *(in use)*
- Developed drivers for PCI neuro-accelerator and evaluated it for control applications

Experiments and collaborations

Current

Since 2020	PANDA: antiProton ANnihilation in Darmstadt, Germany *(Member)*
Since 2013	BESS: Battery Technology Center at *KIT*, Germany
Since 2008	KARA: Karlsruhe Research Accelerator, *KIT*, Germany
Since 2007	KATRIN: Karlsruhe Tritium Neutrino Experiment, Germany *(Member)*
Since 2006	SEVAN: Space Environment Viewing and Analysis Network; coordinated by *YerPhI*
Since 2001	ASEC: Aragats Space Environmental Center, Armenia *(Member)*

Past

2020 – 2021	CCPi: Collaborative Computational Project for Imaging; led by UoM and STFC
2014 – 2018	HZG: Helmholtz-Zentrum Geesthacht, Germany
2010 – 2018	TPU: Tomsk Polytechnic University, Russia
2016 – 2017	CMS: Compact Muon Solenoid, *CERN*
2016 – 2017	UFO: German-Russian Collaboration on Ultrafast Tomography
2010 – 2017	SCI: Shubnikov Crystallography Institute, Russia
2009 – 2015	KIT Cube: Integrated atmospheric observation system (operated by *KIT*)
2009 – 2015	KIT Tower: Meteorological tower at *KIT* North Campus, Germany
2008 – 2014	TOSKA: Test facility for fusion magnets at *KIT*, Germany
2008 – 2014	ESRF: European Synchrotron Radiation Facility, France

Funding

2021	(Author) investments for upgrade of *KaaS* cluster *KATRIN* (250 k€) KaaS (2021)
2019	(Technical contribution) to *MT-DTS ST2* subtopic in *Matter and Technologie* program Helmholtz MT-DTS (2021 – 2027)
2013, 2016	(Technical contribution) projects on collaborative analysis of tomographic datasets BMBF (750 k€) ASTOR (2013 – 2016) NOVA (2016 – 2020)
2012	(Contributing author) networking grant for cooperation with *ASEC* BMBF (15 k€) ADEI (2013 – 2015)
2011	(Contributing author) *Vaporciyan Multivariate Analysis and Visualization* (non-governmental grant by Armenian diaspora) Diaspora (100 k$) VMAV (2012 – 2014)
2010, 2011	(Contributing author) *Ultra Fast X-ray Imaging of Scientific Processes with On-line Assessment and Data-driven Process Control* BMBF (2.5 m€) UFO-1 (2010 – 2013) UFO-2 (2012 – 2015)
2009	(Technical contribution) to *HDRI (High Data Rate Processing and Analysis)* initiative in *Helmholtz PNI (Photons, Neutrons, Ions)* research program Helmholtz HDRI (2010 – 2014)

Leadership

Since 2020	Leading efforts to prepare the *KATRIN* data infrastructure for the *Tristan* detector Group: 2 engineers PhD 2 students
2018 – 2020	Led development of the *KATRIN* cloud platform and migration of services Group: 2 Postdocs PhD 2 students
2013 – 2018	Led volume visualization task force in the *ASTOR* and *NOVA* projects Group: PhD 5 students
2010 – 2018	Coordinated a program on stewardship of theses for *TPU* students Participation: 3 PhD 12 students

2010 – 2016	Led a collaboration with *ASEC* on online data analysis platform Group: Postdoc and PhD in *KIT* · Postdoc and 2 engineers at *ASEC* · 10 students
2010 – 2017	Coordinated a work-package on tomographic software in the *UFO* project Group: 3 PhD in *KIT* · 3 PhD in partner universities · 5 students

Responsibilities

Current

Since 2018	Data management cloud at *KATRIN*
Since 2013	Data management system for *KIT Battery Technology Center*
Since 2011	Software stack of *UFO* data acquisition platform
Since 2007	Slow control system at *KATRIN*

Past

2017 – 2018	Transfer of *UFO* Camera technology to *HZG*
2010 – 2017	Parallel computing cluster for *UFO* project
2013 – 2016	Technology transfer to *ASEC* and *SEVAN* experiments
2009 – 2015	Data portal for *KIT Cube* experiment and *KIT Weather Tower*
2008 – 2014	Maintenance and optimization of *KARA* branch of *PyHST*
2008 – 2014	Data management system at *TOSKA* and *CULTKA* facilities
2007 – 2009	Integration of *KATRIN* components in centralized control system
2005 – 2007	Data acquisition and data management at *ASEC* and *SEVAN*
2003 – 2005	Intercommunication between *KATRIN* DAQ and NI fieldpoint devices
2001 – 2002	IT infrastructure of *ASEC*

Scientific and open-source software

Maintain

Since 2018	KaaS: Katrin-as-a-Service data management platform for KATRIN ands.suren.me · KATRIN
Since 2015	Bora: monitoring framework for ADEI ecosystem bora.suren.me · KATRIN
Since 2011	Alps: Linux driver platform for fast prototyping of PCIe-based electronics alps.suren.me · Camera at HZG · Camera at SCI · Kapture/Kalypso at KARA
Since 2008	ADEI: cloud platform for visualization and analysis of time-series adei.info · KATRIN · KARA · ASEC · BESS · KIT Tower · KIT Cube · TOSKA
Since 2005	ADAS: data acquisition system for ASEC detectors adas.suren.me · ASEC
Since 2003	RusXMMS: operations with multilingual strings in non-unicode encodings rusxmms.sf.net · RedHat · OpenSuSE · Debian · Ubuntu · Arch · FreeBSD

Supervised and coordinated

2015 – 2018	WAVe: JavaScript volume rendering library based on WebGL wave.suren.me
2012 – 2017	UFO: image-processing framework and a collection of GPU-accelerated algorithms ufo-kit.github.io · KARA

Contributions

2020 – 2021	CCPi: Tomographic Imaging Project (*performance optimizations*) www.ccpi.ac.uk
2008 – 2014	PyHST: *ESRF* tomography software (*DFI algorithm and performance improvements*) pyhst2.suren.me KARA ESRF

Obsolete

2010 – 2011	MRSES: feature selection algorithm for Intel and PowerXCell architectures
2009 – 2010	DictHW: CUDA implementation of digital image tracking algorithm
2003 – 2009	XMLBench: XML Benchmarking suite

Research and development

While the focus of my research is computing technologies, the developed instrumentation enabled major scientific break-throughs achieved by the KATRIN [5] and ASEC [20] collaborations. Below are referenced selected peer-reviewed publications which are either authored by me and my students or where we made a significant contribution.

Since 2011	**High-bandwidth data acquisition and data-driven control**
2018 – 2019	Fine-tuning of tomographic reconstruction algorithms through micro-benchmarking and performance modeling [3] UFO PyHST
2016 – 2017	Participated in a case study on applications of GPUs in the Level-1 track trigger for the next upgrade of the *CMS* experiment [9] CMS
2016 – 2017	Designed a platform for synchrotron imaging beamlines with a possibility of online reconstruction and an image-based feedback loop [8], [16] UFO
2015 – 2016	Researched low-latency communication mechanisms for data-driven control applications [11] Alps
2014 – 2015	Implemented fast DMA drivers with GPUDirect / DirectGMA support [13] Alps
2013 – 2014	Reviewed asymptotically fast methods of tomographic reconstruction well-fitted for GPU architectures [15] UFO PyHST
2011 – 2013	Researched software architectures for online processing of image streams [18] UFO
2011 – 2013	Developed a streaming data acquisition platform for scientific cameras [17] Alps

Since 2007	**Parallel architectures, performance analysis, and software optimization**
2020 – 2021	Applied methods of approximate computing to enable reconstruction of large datasets using memory-intensive regularization methods [2] CCPi
2017 – 2018	Researched performance imbalances and a hidden parallelism in GPU architectures and how they can be exploited to speed-up tomographic reconstruction [7] PyHST
2014 – 2017	Investigated viable compromises between reconstruction quality and parallelization capabilities of tomographic algorithms [14] UFO
2013 – 2014	Developed parallel algorithms for μPIV (micro-particle velocimetry) [6] UFO
2010	Leveraged the PoweXCell architecture for an MRSES feature selection algorithm (5000x speed-up compared to a MATLAB prototype) MRSES
2009 – 2010	Optimized the PyHST tomographic reconstruction framework [19] PyHST
2009 – 2010	Implemented a digital image correlation and tracking algorithm for GPUs DictHW
2007 – 2008	Carried out a performance study of open-source XML frameworks [22] XMLBench

Since 1999	**Digitization, data organization, and distributed control systems**
Since 2019	Researching cloud technologies for highly heterogeneous control systems in large-scale scientific experiments [1] KaaS
2015 – 2017	Researched remote visualization techniques for large and time-resolved tomographic volumes [4], [10] WAVe
2013 – 2015	Researched emerging web technologies for management and visualization of terabyte-scale archives with time-series ADEI
2011 – 2014	Converted the KATRIN data management system into a full flagged platform for time-series exploration and analysis ADEI
2008 – 2010	Developed data management modules of the KATRIN control system [21] ADEI
2007 – 2008	Stabilized the KATRIN slow control system for production use [12] KATRIN
2005 – 2006	Developed a data acquisition system for particle detector networks [23] ADAS
2002 – 2004	Researched network protocols for heterogeneous slow control systems [24] ADAS
1999 – 2001	Evaluated hardware-accelerated neural networks for trigger applications [25]

Supervision and teaching

	Supervised PhD students
Since 2020	PhD student on adoption of cloud technologies for data acquisition and control systems

	Co-supervised PhD students
2014 – 2018	thesis “Big Data Management and Visualisation”
2013 – 2017	work on collaborative tools for analysis of microtomography data
2013 – 2017	work on low-latency communication protocols for distributed data acquisition systems
2011 – 2016	thesis “An Extensible Parallel Computing Framework for Ultra-Fast X-Ray Imaging”

	Supervised MSc and BSc students
2021 – 2021	MSc theses “Fast tomographic reconstruction using parallel and approximate computing”
2021 – 2021	3 MSc theses on database and cloud technologies for slow-control systems of large-scale experiments
2014 – 2018	5 MSc theses on remote visualization of archives with tomographic data
2013 – 2017	4 students working on fast DMA interconnects between FPGA and GPUs
2011 – 2016	4 MSc and 2 BSc theses on advanced algorithms in tomographic reconstruction
2010 – 2015	10 internships on web technologies for visualization of time series
2014	2 MSc theses on GPU-accelerated algorithms for nano-particle tracking

	Courses and seminars
2019	GPU computing tutorial at ARBRA summer school in Nor-Amberd, Armenia
2014 – 2017	4 student projects at seminar “Advanced topics in Parallel Programming”
2013	GPU computing tutorial at KSETA graduate school at KIT

Selected publications

[1] M. Aker *et al.*, "The design, construction, and commissioning of the katrin experiment," *Journal of Instrumentation*, vol. 16, T08015, 2021. DOI: 10.1088/1748-0221/16/08/T08015.

[2] E. Ametova *et al.*, *Crystalline phase discriminating neutron tomography using advanced reconstruction methods (preprint)*, 2021. arXiv: 2102.06706.

[3] S. Chilingaryan *et al.*, "Reviewing GPU architectures to build efficient back projection for parallel geometries," *Journal of Real-Time Image Processing*, vol. 17, pp. 1331–1373, 5 Oct. 2020. DOI: 10.1007/s11554-019-00883-w.

[4] P. D. Lösel *et al.*, "Introducing Biomedisa as an open-source online platform for biomedical image segmentation," *Nature Communications*, vol. 11, no. 1, p. 5577, Nov. 2020. DOI: 10.1038/s41467-020-19303-w.

[5] M. Aker *et al.*, "Improved upper limit on the neutrino mass from a direct kinematic method by KATRIN," *Phys. Rev. Lett.*, vol. 123, p. 221 802, 22 Nov. 2019. DOI: 10.1103/PhysRevLett.123.221802.

[6] P. Cavadini *et al.*, "Investigation of the flow structure in thin polymer films using 3D µPTV enhanced by GPU," *Experiments in Fluids*, vol. 59, no. 4, pp. 1–13, Mar. 2018. DOI: 10.1007/s00348-017-2482-z.

[7] S. Chilingaryan *et al.*, "Balancing load of GPU subsystems to accelerate image reconstruction in parallel beam tomography," in *Proceedings of the 30th International Symposium on Computer Architecture and High Performance Computing (SBAC-PAD)*, 2018. DOI: 10.1109/CAHPC.2018.8645862.

[8] A. Kopmann *et al.*, "UFO - a scalable platform for high-speed synchrotron X-ray imaging," in *Proceedings of the 2016 IEEE NSS/MIC*, 2017. DOI: 10.1109/NSSMIC.2016.8069895.

[9] H. Mohr *et al.*, "Evaluation of GPUs as a level-1 track trigger for the High-Luminosity LHC," *Journal of Instrumentation*, vol. 12, no. 04, p. C04019, 2017. DOI: 10.1088/1748-0221/12/04/c04019.

[10] N. Tan Jerome *et al.*, "WAVE: A 3D online previewing framework for big data archives," in *Proceedings of the Intl.. Conf. on Computer Vision, Imaging, and Computer Graphics Theory and Applications (IVAPP)*, vol. 3, 2017, pp. 152–163.

[11] M. Vogelgesang *et al.*, "High-throughput data acquisition and processing for real-time x-ray imaging," in *Proc. SPIE*, vol. 9967, 2016, pp. 996 715–996715-9. DOI: 10.1117/12.2237611.

[12] J. Amsbaugh *et al.*, "Focal-plane detector system for the katrin experiment," *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, vol. 778, pp. 40–60, 2015. DOI: 10.1016/j.nima.2014.12.116.

[13] L. Rota *et al.*, "A PCIe DMA architecture for multi-gigabyte per second data transmission," *IEEE Transactions on Nuclear Science*, vol. 62, no. 3, pp. 972–976, 2015. DOI: 10.1109/TNS.2015.2426877.

[14] A. Shkarin *et al.*, "An open source GPU accelerated framework for flexible algebraic reconstruction at synchrotron light sources," *Fundam. Inform.*, vol. 141, no. 2-3, pp. 259–274, 2015. DOI: 10.3233/FI-2015-1275.

[15] R. Shkarin *et al.*, "GPU-optimized Direct Fourier method for on-line tomography," *Fundam. Inform.*, vol. 141, no. 2-3, pp. 245–258, 2015. DOI: 10.3233/FI-2015-1274.

[16] U. Stevanovic *et al.*, "A control system and streaming DAQ platform with image-based trigger for X-ray imaging," *IEEE Transactions on Nuclear Science*, vol. 62, no. 3, pp. 911–918, 2015. DOI: 10.1109/TNS.2015.2425911.

[17] M. Caselle *et al.*, "Ultrafast streaming camera platform for scientific applications," *IEEE Transactions on Nuclear Science*, vol. 60, no. 5, pp. 3669–3677, 2013. DOI: 10.1109/TNS.2013.2252528.

[18] M. Vogelgesang *et al.*, "UFO: A scalable GPU-based image processing framework for on-line monitoring," in *Proceedings of The 14th IEEE Conference on High Performance Computing and Communication & The 9th IEEE International Conference on Embedded Software and Systems (HPCC-ICESS)*, ser. HPCC '12, Liverpool, UK, Jun. 2012, pp. 824–829. DOI: 10.1109/HPCC.2012.116.

[19] S. Chilingaryan *et al.*, "A GPU-based architecture for real-time data assessment at synchrotron experiments," *IEEE Transactions on Nuclear Science*, vol. 58, no. 4, pp. 1447–1455, 2011. DOI: 10.1109/TNS.2011.2141686.

[20] A. Chilingarian *et al.*, "Ground-based observations of thunderstorm-correlated fluxes of high-energy electrons, gamma rays, and neutrons," *Phys. Rev. D*, vol. 82, p. 043 009, 4 Aug. 2010. DOI: 10.1103/PhysRevD.82.043009.

[21] S. Chilingaryan *et al.*, "Advanced data extraction infrastructure: Web based system for management of time series data," *Journal of Physics: Conference Series*, vol. 219, no. 4, p. 042 034, Apr. 2010. DOI: 10.1088/1742-6596/219/4/042034.

[22] S. Chilingaryan, "The XMLBench project: Comparison of fast, multi-platform XML libraries," no. 5667, pp. 21–34, 2009. DOI: 10.1007/978-3-642-04205-8_4.

[23] S. Chilingaryan *et al.*, "Advanced data acquisition system for SEVAN," *Advances in Space Research*, vol. 43, no. 4, pp. 717–720, 2009. DOI: 10.1016/j.asr.2008.10.008.

[24] W. Eppler *et al.*, "New control system aspects for physical experiments," *IEEE Transactions on Nuclear Science*, vol. 51, no. 3, pp. 482–488, 2004. DOI: 10.1109/TNS.2004.828633.

[25] A. Vardanyan *et al.*, "Fast pattern recognition trigger for atmospheric cherenkov telescopes," in *Proceedings of 27th International Cosmic Ray Conference, Katlenburg-Lindau, Germany*, 2001, pp. 2935–2938.

Selected presentations

Conferences

Oct 2019	(invited) "*Accelerating Remote Visualization of Large Tomographic Data Volumes*" at Global Innovation Forum, Armenia
Oct 2018	(talk) "*Balancing load of GPU subsystems to accelerate image reconstruction in parallel beam tomography*" at SBAC-PAD 2018 conference, Lyon, France
Okt 2014	(talk) "*Computing Infrastructure for Online Monitoring and Control of High-throughput DAQ Electronics*" at 10th PCAPAC conference, Karlsruhe, Germany
Sep 2014	(invited) "*UFO – Status and Perspectives of Ultrafast X-Ray Imaging at ANKA" and "Fast Reconstruction Algorithms for Computed Tomography*" at SNI 2014, Germany
Jun 2012	(talk) "*A High Throughput Platform for Real-Time X-ray Imaging" and "Advanced Linux PCI Services*" at 18th IEEE Real-Time Conference, Berkeley, CA, USA
May 2012	(talk) "*A High Performance Platform for Real-Time X-ray Imaging*" at GPU Technology Conference, San Jose, CA, USA
May 2010	(talk) "*A GPU-based Architecture for Real-Time Data Assessment at Synchrotron Experiments*" at 17th IEEE Real-Time Conference, Lisbon, Portugal
Apr 2009	(talk) "*Comparison of fast multi-platform XML Libraries: Results for January 2009*" at BenchmarX'09 workshop at DASFAA 2009, Brisbane, Australia
Sep 2007	(talk) "*Advanced Data Acquisition System for SEVAN*" at SEE 2007 Symposium, Athens, Greece

Workshops

Mar 2019	(talk) "*UFO Cloud: Data-Acquisition-as-a-Service*" at *Matter and Technologie* program meeting, Germany
Nov 2018	(talk) "*High-Speed Tomography: Fine-tuning back projection for GPU architectures*" at CAMERA workshop, Berkeley, CA, USA
Nov 2017	(invited) "*UFO - A platform for high data rate instrumentation with GPUs*" at EUCALL GPU/FPGA Workshop at *XFEL*, Hamburg, Germany
May 2017	(invited) "*SHAPe: Scalable and Highly Available Platform for Scientific Data Portals*" at ARBRA Workshop, Nor-Amberd, Armenia
Apr 2017	(invited) "*Tuning tomographic reconstruction for different parallel architectures*" at workshop on Real-Time 3D Tomography, *CWI*, Amsterdam, Netherlands
Jan 2016	(invited) "*Performance-oriented instrumentation for high-speed synchrotron imaging*" at workshop on Large Scale Tomography, Szeged, Hungary
Apr 2012	(invited) "*ADEI for Tango*" at Tango workshop, *MAX-IV*, Lund, Sweden
Mar 2012	(talk) "*Practical Experience with GPUs for high throughput computing*" at *HDRI*/*PanData* workshop
Mar 2011	(invited) "*High Speed Tomography at KIT*" at meeting on Tomographic reconstruction software, *ESRF*
Sep 2008	(talk) "*Advanced Data Extraction Infrastructure*" at FORGES 2008 workshop, Nor-Amberd, Armenia

Seminars

May 2020	(talk) "*Real-time reconstruction for synchrotron tomography*" at lunch-and-learn session at *University of Manchester*, UK
Oct 2018	(talk) "*Balancing load of GPU subsystems to accelerate back projection for synchrotron tomography*" at *ESRF*, Grenoble, France
Apr 2016	(talk) "*ADEI: Intelligent visualization and management of time-series data in scientific experiments*" at *Instituto de Física, UNAM*, Mexico
May 2015	(talk) "*Advanced Algorithms for Tomography*" at *YerPhI* seminar, Yerevan, Armenia
Sep 2013	(talk) "*Ultrafast X-Ray Imaging of Scientific Processes*" at *SCI* and *TPU*, Russia