Aleksandr Drozd

curriculum vitae

Tokyo
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Employment History

2019.07-onwards	**Research Scientist** at RIKEN Center for Computational Science (R-CCS), High Performance Artificial Intelligence Systems Research Team.
2019.07-onwards	**Visiting Researcher** at Tokyo Institute of Technology, School of Computing
2019.02-2019.06	**Visiting Scientist** at RIKEN Center for Computational Science (R-CCS), High Performance Big Data Research Team.
2018.06-2019.06	**Invited Researcher** at AIST-Tokyo Tech Real World Big-Data Computation Open Innovation Laboratory (RWBC-OIL).
2018.04-2019.06	**Researcher** at Tokyo Institute of Technology, School of Computing, Department of Mathematical and Computing Science.
2014.04-2018.03	**Researcher** at Tokyo Institute of Technology, Global Scientific Information and Computing Center.
2005.06-2010.05	**Lecturer / Senior Lecturer** (from 2008) at Moscow State University (Sevastopol Branch, http://sev.msu.ru/), Department of Computational Mathematics and Cybernetics.
2006.09-2009.06	**Software Architect and Developer** at Outsourcing Ukraine (http://www.outsourcing-ukraine.com/).
2005.05-2006.09	**Software Developer** at Soft-Pilot 2000.

Education

2010-2014	Ph.D., Tokyo Institute of Technology, Graduate School of Information Science and Technology.
Thesis title:	"Memory-Conscious Optimizations for Sorting and Sequence Alignment for Massively Parallel Heterogeneous Architectures."
2000-2005	Specialist degree (M.Sc. equivalent), Moscow State University. Department of Computational Mathematics and Cybernetics.
Thesis title:	"Semantic Pseudo-Code: Approach to Meaning-Base Search."
1989-2010	Feodosia Specialised School with Advanced Study of English No. 2.

Fellowships and Grants

- JSPS KAKENHI Grant number JP22H03600 adopted FY 2022: "Automated, Scalable, and Machine Learning-Driven Approach for Generating and Optimizing Scientific Application Codes".
- HPCI Project hp210265 “Training Novel Types of Large-Scale Language Models: Tuning”. 1000000 node-hours on supercomputer Fugaku.
- 2021 ABCI Grand Challenge 3: 1000 A-100 GPU/days for scalable weakly supervised video representation learning study.
- HPCI Project hp200281 “Training Novel Types of Large-Scale Language Models: Preparation”. 100000 node-hours on supercomputer Fugaku.
- JSPS KAKENHI Grant number JP17K12739 adopted FY 2017: "Corpora on Demand: Scalable Methods of Obtaining Linguistic Data".
- Japanese Government (Monbukagakusho) scholarship for conducting PhD research 2010-2014.
- 2018 TSUBAME 3.0 Grand Challenge: 2000 GPU/days for scalable deep learning study.
- 2018 ABCI Grand Challenge: 4000 GPU/days for scalable deep learning study.

Community Service

Organized workshops and tutorials:

- **The Third Workshop on Insights from Negative Results in NLP** In conjunction with ACL 2022 - 60th Annual Meeting of the Association for Computational Linguistics. `https://insights-workshop.github.io`
- **Benchmarking in the Data Center: Expanding to the Cloud** in conjunction with PPoPP 2022: Principles and Practice of Parallel Programming 2022. `https://parallel.computer`
- **International Workshop COmputing using EmeRging EXotic AI-Inspired Systems (CORtEX'22)**. Co-hosted with IPDPS 2022 conference. `https://cortex.ws`
- **"Deep Learning from HPC Perspectives: Opportunities and Challenges"** Mini-Symposium at SIAM PP 2018 conference. `http://meetings.siam.org/sess/dsp_programsess.cfm?SESSIONCODE=63584`
- **"Text Representation Learning and Compositional Semantics"**. Tutorial 5 at the 11th Asian Conference on Machine Learning (ACML 2019) `http://www.acml-conf.org/2019/tutorials/drozd-rogers/`
- **"Distributional Compositional Semantics in the Age of Word Embeddings: Tasks, Resources and Methodology"**. Tutorial 4 at LREC 2018 conference. `http://text-machine.cs.uml.edu/lrec2018_t4`
- **"The Third Workshop on Evaluating Vector Space Representations for NLP"**. Co-located with NAACL 2019 conference on June 6 or 7, 2019. `https://repeval2019.github.io`

Other activities:

- I have served as a program committee member and reviewer of a number of conferences and workshops, including NAACL, *SEM, SC, ISC, PARCO among others.
- From 2017 I serve as one of the organizers of "Tokyo Machine Learning Gym" meetup.

Teaching Experience

Courses taught as a lecturer / senior lecturer at the Moscow State University, Faculty of Computational Mathematics and Cybernetics through years 2005-2010:

- **Operating Systems**: Architecture of Unix-like operating systems, inter-process communication mechanisms, C programming language.
- **Object-Oriented Software Design**: C++ programming language, object-oriented approach to software development.
- **Computer Graphics**: basic 2D drawing, 3D projections and transformations, shading, ray tracing.
- **Parallel Data Processing**: Theoretical foundations of parallel computing, OpenMP and MPI libraries/run-times, GPU computing.

I was responsible for developing curricula and teaching materials for these courses, as well as conducting the final examinations.
I have also taught fundamentals of computer science at the Faculty of Philology of the Moscow State University.

As a post-doctoral appointee at the Tokyo Institute of Technology I have helped advising PhD work of several students (the main supervisor was prof. Satoshi Matsuoka), the most recent is Shweta Salaria, thesis title **"Cross Architecture Performance Prediction"**, October 2019.

Technical Skills

I stay passionate about software development after moving to academia, continuing to code myself and supervising engineering efforts in related research projects. Technologies in which I'm particularly invested in include:

- **Software Design and Development**: team management, development processes, continuous integration and delivery, object oriented design .
- **Python** is my main programming language for web-applications, high level scripting and prototyping. Being open-source enthusiast I'm trying to contribute back to the Python ecosystem.
- **C, C++** for performance-oriented codes, along with such libraries and tools for parallel programming as CUDA, OpenMP, MPI, OpenCL, TBB, etc.
- **Machine Learning technologies** - from edge inference to thousands of nodes- scale distributed training. I mainly use PyTorch Deep Learning framework.
- **Web Development**: JavaScript, HTML, CSS, Static Site Generators, self-hosting, content delivery etc.
- Misc: Databases (SQL and noSQL), version control systems, computer algebra and publishing systems etc.

Language Proficiency

Japanese: fluent | English: fluent | Russian: fluent | Ukrainian: fluent

Publications

Conferences and workshops (refereed):

- Satoshi Matsuoka, Jens Domke, Mohamed Wahib, Aleksandr Drozd, Andrew A Chien, Raymond Bair, Jeffrey S Vetter, John Shalf. **Preparing for the Future—Rethinking Proxy Applications** Computing in Science Engineering N24 (2), 2022, pp 85-90
- Truong Thao Nguyen, François Trahay, Jens Domke, Aleksandr Drozd, Emil Vatai, Jianwei Liao, Mohamed Wahib, Balazs Gerofi **Why globally re-shuffle? Revisiting data shuffling in large scale deep learning.** 2022 IEEE International Parallel and Distributed Processing Symposium (IPDPS) pp 1085-1096.
- Giovanni Puccetti, Anna Rogers, Aleksandr Drozd and Felice Dell'Orletta. **Outlier Dimensions that Disrupt Transformers are Driven by Frequency** Findings of the Association for Computational Linguistics: EMNLP 2022, pp 1286–1304.
- Prajjwal Bhargava, Aleksandr Drozd, Anna Rogers. **Generalization in NLI: Ways (Not) To Go Beyond Simple Heuristics**. Proceedings of the Second Workshop on Insights from Negative Results in NLP (Insights 2021), pp 125–135.
- Steven Farrell, Murali Emani, Jacob Balma, Lukas Drescher, Aleksandr Drozd et al. **MLPerf™ HPC: A Holistic Benchmark Suite for Scientific Machine Learning on HPC Systems.** 2021 IEEE/ACM Workshop on Machine Learning in High Performance Computing Environments (MLHPC)
- Jens Domke, Emil Vatai, Aleksandr Drozd, et al. **Matrix Engines for High Performance Computing: A Paragon of Performance or Grasping at Straws?** IPDPS 2021: International Parallel and Distributed Processing Symposium. pp 1056-1065.
- Mohamed Wahib, Haoyu Zhang, Truong Thao Nguyen, Aleksandr Drozd, Jens Domke, Lingqi Zhang, Ryousei Takano, Satoshi Matsuoka. **Scaling distributed deep learning workloads beyond the memory capacity with KARMA**. Proceedings of SC 20: the International Conference for High Performance Computing, Networking, Storage and Analysis. Article No.: 19. pp 1–15.
- Shweta Salaria, Aleksandr Drozd, Artur Podobas, Satoshi Matsuoka. **Learning Neural Representations for Predicting GPU Performance**. International Conference on High Performance Computing 2019, pp 40–58.
- Marzena Karpinska, Bofang Li, Anna Rogers and Aleksandr Drozd. **Subcharacter Information in Japanese Embeddings: When Is It Worth It?** In Proceedings of the Workshop on Relevance of Linguistic Structure in Neural Architectures for NLP (RELNLP) 2018 at ACL 2018. Melbourne, Australia. pp 28–37.
- Bofang Li and Aleksandr Drozd. **Subword-Level Composition Functions for Learning Word Embeddings**. *Proceedings of The 2nd Workshop on Subword and Character level models in NLP (SCLeM)* at NAACL 2018. pp 38–48.
- Shweta Salaria, Aleksandr Drozd, Artur Podobas, Satoshi Matsuoka. **Predicting performance using collaborative filtering** 2018 IEEE International Conference on Cluster Computing (CLUSTER), pp 504–514
- Anna Rogers, Aleksandr Drozd and Bofang Li. **The (too Many) Problems of Analogical Reasoning with Word Vectors**. In Proceedings of the 6th Joint Conference on Lexical and Computational Semantics (*SEM 2017), Association for Computational Linguistics, pp 135–148, Vancouver, Canada.

- Aleksandr Drozd, Anna Gladkova, Satoshi Matsuoka. **Word Embeddings, Analogies, and Machine Learning: Beyond King - Man + Woman = Queen.** Proceedings of COLING 2016, the 26th International Conference on Computational Linguistics: Technical Papers, pp 3519–3530, Osaka, Japan, December 11-17 2016
- Mateusz Bysiek, Aleksandr Drozd and Satoshi Matsuoka. **Migrating Legacy Fortran to Python While Retaining Fortran-Level Performance through Transpilation and Type Hints.** Proceedings of PyHPC 16: the 6th Workshop on Python for High-Performance and Scientific Computing. pp 9-18.
- Anna Gladkova and Aleksandr Drozd. **Intrinsic Evaluations of Word Embeddngs: What Can We Do Better?** in Proceedings of The 1st Workshop on Evaluating Vector Space Representations for NLP, Berlin, Germany, 2016, pp. 36–42.
- Annd Gladkova, Aleksandr Drozd and Satoshi Matsuoka. **Analogy-based Detection of Morphological and Semantic Relations With Word Embeddings: What Works and What Doesn't.** Proceedings of NAACL-HLT-SRW 2016, pp 8–15.
- Aleksandr Drozd, Anna Gladkova, Satoshi Matsuoka. **Discovering Aspectual Classes of Russian Verbs in Untagged Large Corpora.**The 2015 IEEE International Conference on Data Science and Data Intensive Systems (DSDIS 2015), At Sydney, Australia, Dec 2015, pp 61 - 68.
- Aleksandr Drozd, Anna Gladkova, Satoshi Matsuoka. **Python, Performance and Natural Language Processing**. 5th Workshop on Python for High-Performance and Scientific Computing, at Austin, Texas, USA, Nov 2015 in conjunction with SC15, pp 1-10.
- Aleksandr Drozd, Olaf Witkowski, Satoshi Matsuoka, Takashi Ikegami.**Signal-Driven Swarming: A Parallel Implementation of Evolved Autonomous Agents to Perform A Foraging Task.** Proceedings of SWARM 2015 - The First International Symposium on Swarm Behavior and Bio-Inspired Robotics, Kyoto, Oct 2015.
- Aleksandr Drozd, Naoya Maruyama and Satoshi Matsuoka. **Sequence Alignment on Massively Parallel Heterogeneous Systems**, IEEE 26th International Parallel and Distributed Processing Symposium Workshops & PhD Forum. 2012, Shanghai, China. Proceedings of IPDPS 12 workshops, pages 2498 - 2501
- Aleksandr Drozd and Satoshi Matsuoka. **A Multi GPU Read Alignment Algorithm with Model-based Performance Optimization**, 10th International Conference, on High Performance Computing for Computational Science - VECPAR 2012, Kobe, Japan, July 17-20, printed as Springer's Lecture Notes in Computer Science N7851, pages 270-277.

Journals (refereed):

- Satoshi Matsuoka, Jens Domke, Mohamed Wahib, Aleksandr Drozd, Torsten Hoefler. **Myths and Legends in High-Performance Computing**. Accepted for the publication in Journal of High Performance Computing Applications. 2023.
- Bofang Li, Aleksandr Drozd, Yuhe Guo, Tao Liu, Satoshi Matsuoka, Xiaoyong Du. **Scaling Word2Vec on Big Corpus** Data Science and Engineering, June 2019, Volume 4, Issue 2, pp 157–175.
- Hideyuki Shamoto, Koichi Shirahata, Aleksandr Drozd, Hitoshi Sato and Satoshi Matsuoka. **GPU-Accelerated Large-Scale Distributed Sorting Coping with Device Memory Capacity**. IEEE Trans. Big Data 2(1): 57-69 (2016)
- Aleksandr Drozd, Olaf Witkowski, Satoshi Matsuoka and Takashi Ikegami. **Critical Mass in**

the Emergence of Collective Intelligence: a Parallelized Simulation of Swarms in Noisy Environments. Artificial Life and Robotics 2016, volume 21, number 3, pp 317-323

- Anna Gladkova and Aleksandr Drozd, **Towards Easier Querying of XML-based Linguistic Corpora,** Taurida Bulletin of Mathematics and Informatics. #2, 2009, pages 71-77 http://tvim.info/node/146

Posters (refereed):

- Aleksandr Drozd, Naoya Maruyama and Satoshi Matsuoka. **Fast GPU Read Alignment with Burrows Wheeler Transform Based Index**, SC'11 Conference on High Performance Computing Networking, Storage and Analysis, 2011, Seattle, USA,In Companion Proceeding of SC11, pages 21-22.

Workshops (un-refereed):

- Aleksandr Drozd, Satoshi Matsuoka. **HPC and Interactive Big Data Analytics: Case Study of Distributional Semantics**. Proceedings of IPSJ SIG Technical Reports 2014-HPC-146, Naha, Oct 2014.
- Aleksandr Drozd, Satoshi Matsuoka. **MSD Radix String Sort on GPU: Longer Keys, Shorter Alphabets**, In proceedings of IPSJ SIG Technical Reports 2013-ARC-199 2013-HPC-142 (HOKKE-21), Hokkaido, Nov, 2013.
- Aleksandr Drozd, Naoya Maruyama, Satoshi Matsuoka. **Fast Read Alignment with Burrows Wheeler Transform: the GPU Perspective**, In Proceedings of the 24th Summer United Workshops on Parallel, Distributed, and Cooperative Processing (SWoPP 2011) , August 2011.