

# Aleksandr Drozd

*curriculum vitae*

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## Brief Profile

My research interests lie at the intersections of **artificial intelligence**, especially areas like natural language processing and artificial life, and **high performance computing**. In addition to academic background I have strong software development skills and experience.

## Education

- 2010-2014 Ph.D., Tokyo Institute of Technology, Graduate School of Information Science and Technology, Tokyo.
- 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.
- Thesis title: "Semantic Pseudo-Code: Approach to Meaning-Base Search."

## Employment History

- 2019.01-onwards **Invited Researcher** at *RIKEN Center for Computational Science (R-CCS)*
- 2018.06-onwards **Invited Researcher** at *AIST-Tokyo Tech Real World Big-Data Computation Open Innovation Laboratory (RWBC-OIL)*
- 2018.04-onwards **Researcher** at *Tokyo Institute of Technology, School of Computing, Department of Mathematical and Computing Science*
- 2018.01-onwards **AI consultant**, self-employed
- 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://www.msusevastopol.net/>), Programming Department.
- 2006.09-2009.06 **Software Architect and Developer** at *Outsourcing Ukraine* (<http://www.outsourcing-ukraine.com/>), Sevastopol

## Fellowships and Grants

- 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.

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## Software Development and Other Relevant Skills

I stay passionate about software development after moving to academia, continuing to code myself and supervising engineering efforts in related research projects. My toolbox includes:

- **Software Design and Development:** team management, development processes, continuous integration and delivery, object oriented design and patterns.
- **C, C++**, along with such libraries and tools for parallel programming as **CUDA, OpenMP, MPI, OpenCL, TBB**, etc for performance-critical parts.
- **Python** for everything else: high level scripting, quick prototyping and such. Being open-source enthusiast I'm trying to contribute back to the Python ecosystem.
- Application of machine learning techniques - from basic statistical analysis methods to cutting edge deep learning models.
- Databases (SQL and noSQL), web technologies, version control systems, computer algebra and publishing systems etc.

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## Community Service

Organized workshops and tutorials:

- "Deep Learning from HPC Perspectives: Opportunities and Challenges" Mini-Symposium at SIAM PP 2018 conference. [http://meetings.siam.org/session/dsp\\_programs/session.cfm?SESSIONCODE=63584](http://meetings.siam.org/session/dsp_programs/session.cfm?SESSIONCODE=63584)
- "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](http://text-machine.cs.uml.edu/lrec2018_t4)
- "The Third Workshop on Evaluating Vector Space Representations for NLP". Accepted to be 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 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.

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## Languages

Russian	native
English	fluent
Japanese	conversational
Ukrainian	conversational

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## Interests

Music	I play cello, guitar, and sing
Photography	Taking pictures of people and events 📷 <a href="http://nightwind.in">http://nightwind.in</a>
Sport	Hiking, mountaineering, martial arts

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## Notable Projects / Research Achievements

- One of my main focus areas is natural language processing / computational linguistics. I was working on old-fashioned semantic parsing in the past, and currently transitioned into the area of neural representation learning. Alongside with working on my ideas in this area, I've established an international team of collaborators working on related topics and led the development of *vecto* framework: an open-source implementation of our research ideas, with additional focus on reproducibility. Our results include novel and performant methods for constructing embeddings, intrinsic and extrinsic methods for their evaluation, new multi-lingual datasets etc. Please check <http://vecto.space> for more details.
- Another point of strong focus for me is on running deep learning workloads on supercomputers: orchestration/scheduling, scaling, optimization of hyper-parameters etc. As a member of AIST RWBC OIL I was involved in the design of specifications and evaluation criteria for ABCI - a 4000 GPU supercomputer purpose-built by AIST for AI workloads. Now ABCI is deployed and I moved to improving support for orchestrating deep learning workloads on this system.  
  
As a member of RIKEN CCS I am working with RIKEN scientists and industry partners (ARM, Linaro, Fujitsu, Preferred Networks) on creating a deep learning ecosystem for post-K, Japanese ARM-based flagship supercomputer to be deployed around 2020.
- Since 2018 I have been working as a private consultant for AI development, working with corporate clients on topics ranging from robotics control to anomaly detection in production lines.
- I am supervising a number of individual research projects by Tokyo Tech students, on topics ranging from using machine learning to predict performance of hardware platforms and applications to optimizing Python for scientific computation.
- Before that I have been working on artificial life, particularly using evolutionary approaches to discover emergence of communication and swarming behavior. My interest is both on the problem domain side (discovering new dynamics in populations) and performance side: using hierarchical space decomposition and parallel programming to accelerate multi-agent simulations.
- My PhD work was about making multi-GPU implementations of algorithmic kernels for processing of big genomic data and sorting.
- Prior to moving to Japan I had 5 years experience of teaching computer science in Moscow State University. I was responsible for creating materials and teaching courses on operating systems, parallel data processing and computer graphics.
- At the same time I was working as industrial software architect and developer as a part of local team with international clients. The projects I have been involved in range from online trading platform for precious stones and jewelry to embedded software for controlling industrial machinery.

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## Selected Publications

- Shweta Salaria, Aleksandr Drozd, Artur Podobas, and Satoshi Matsuoka. Predicting performance using collaborative filtering. In 2018 IEEE International Conference on Cluster Computing (CLUSTER), pp 504–514. Sep. 2018.
- 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.
- Bofang Li, Tao Liu, Zhe Zhao, Buzhou Tang, Aleksandr Drozd, Anna Rogers and Xiaoyong Du. Investigating Different Syntactic Context Types and Context Representations for Learning Word Embeddings. *Proceedings of the 2017 Conference on Empirical Methods in Natural Language Processing (EMNLP)*. pp 2421–2431.
- 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.
- 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, 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.
- Hideyuki Shamoto, Koichi Shirahata, Aleksandr Drozd, Hitoshi Sato, Satoshi Matsuoka. Large-scale Distributed Sorting for GPU-based Heterogeneous Supercomputers. *Proceedings of 2014 IEEE Conference of Big Data*, October 2014, pp 510 - 518.
- Aleksandr Drozd, Miquel Pericàs, Satoshi Matsuoka. Efficient String Sorting on Multi- and Many-Core Architectures in *Proceedings of IEEE 3rd International Congress on Big Data (2014)*, Anchorage, AK, pp 637 - 644.

- Aleksandr Drozd, Naoya Maruyama, Satoshi Matsuoka. Sequence Alignment on Massively Parallel Heterogeneous Systems in *Proceedings of IEEE 26th International Parallel and Distributed Processing Symposium Workshops & PhD Forum (2012)*, pp. 2498 - 2501, ISBN 978-1-4673-0974-5
- Aleksandr Drozd, Naoya Maruyama, Satoshi Matsuoka. A Multi GPU Read Alignment Algorithm with Model-Based Performance Optimization, *Springer's Lecture Notes in Computer Science N7851 (2012)*, pages 270-277.
- Aleksandr Drozd, Naoya Maruyama, Satoshi Matsuoka. Fast GPU Read Alignment with Burrows Wheeler Transform Based Index, *In Companion Proceeding of SC'11 Conference on High Performance Computing Networking, Storage and Analysis, 2011, Pages 21-22* .
- 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.
- Anna Gladkova and Aleksandr Drozd. Towards Easier Querying of XML-based Linguistic Corpora, *Taurida Bulletin of Mathematics and Informatics*. #2, 2009, pages 71-77