Sept 29, 2023

Dear INNS Nominations Committee,

I am honoured to nominate **Prof. Alexander Gorban** as the INNS Board Candidate. Prof. Gorban is one of the pioneers of artificial neural networks who has been promoting rigor and excellence in the field of neural networks since its first Renaissance in late 1980s. I read his Russian book on training neural networks published in 1990 when I myself was a student of the art and science of neural networks.

Prof. Gorban has been very active in Russian Neural Network Society (RNNS) with its annual conferences "Neuroinformatics", as well as giving many lectures on various topics in mathematics, physics and of course neural networks. His work on stochastic separation theorems published in *Neural Networks* in 2017 proposes a rigorous, an elegant and a very effective approach to the problem of non-iterative, one-shot and non-destructive correction of unavoidable mistakes, which was implemented already in a number of applications in AI based classifiers and computer vision systems. His team is now very active and advancing the field of self-correcting and trustworthy AI in a very unique way.

Prof. Gorban is both outstanding scientist and educator in a number of fields including NN for over 30 years. While in the past he was educating lots of students and junior academics in Russia, he has been doing the same in UK as the chair of Applied Mathematics at University of Leicester for almost 20 years.

Please don't hesitate to ask if you have any questions about Prof. Gorban.

Sincerely,

Dr. Danil Prokhorov

Toyota Research, Ann Arbor, MI

INNS member since 1994 (Member ID: 936)

Alexander N. Gorban is currently a Professor, Chair in Applied Mathematics and Director of the Centre for Artificial Intelligence, Data Analytics and Modelling at the College of Science and Engineering, University of Leicester (since 2004), PhD in differential equations and mathematical physics (1980) and ScDr in biophysics (1990). He worked for the Russian Academy of Sciences, Siberian Branch, and ETH Zürich, was a visiting professor and research scholar at Clay Mathematics Institute (Cambridge, MA), Institut des Hautes Etudes Scientifiques (Bures-sur-Yvette, France), Courant Institute of Mathematical Sciences (New York, NY), and Isaac Newton Institute for Mathematical Sciences (Cambridge, UK).

His research has been continuously supported by grants of various foundations and industrial contracts. Recently, he has been the Lead Academic of two InnovateUK Knowledge Transfer Partnership grants (of total ca. £300 K), a Co-I of £1M AHRC grant on using AI and Machine Learning in Archaeology (UK), a Co-I of the Health Foundation grant "Predictive Modelling of Patient Reported Outcome Measures" (ca. £350 K).

He has more than 30 years of research in neural networks and machine learning, published more than 200 research papers and 18 books. For his research achievement he was awarded by Prigogine medal (2003), Lifetime Achievement Award "in recognition of outstanding contributions to the research field of (bio)chemical kinetics," MaCKIE-2015, Ghent, Belgium, 2015, and the honorary title "Pioneer of Russian Neuroinformatics" (#1) for "extraordinary contribution into theory and applications of artificial neural networks" (Neuroinformatics-2017, Moscow, Russia). His first book about learning of neural networks was published in 1990 (USSR-USA JV ParaGraph), and the latest book in applications of AI in forensic psychology was published in 2019 (Springer). Citation information (August 2023):

- Web of Science citation index 4,050, h-index 36;
- Scopus citation score: citations 5,031, h-index 39;
- Google Scholar citation index 16,260, h-index 61.

Alexander supervised 36 successful PhD theses, 5 ScDr, and 2 Habilitation Dr. He organised many research workshops, seminars and schools. In particular, together with D. Wunsch he organised U.S.-NIS Workshop on Neurocomputing Opportunities associated with IJCNN'99 and supported by NSF U.S. In 2018, 2019 and 2020 he organised special sessions at IJCNN. In 2020 he was a keynote speaker of IJCNN. He is a member of INNS, SIAM, LMS, fellow of the Higher Education Academy (UK), a member of the Board of Governors of RNNS (Russian Neural Network Society), and a member of the Scientific Council of Russian Society of Artificial Intelligence.

Selected latest publications in five years (2019-2023). See for more publications the GOOGLE Scholar page https://scholar.google.com/citations?user=D8XkcCIAAAAJ&hl=en

1. A.N. Gorban, B. Grechuk, I. Tyukin, Stochastic Separation Theorems: How Geometry May Help to Correct AI Errors. December 20, 2022, *Not Am Math Soc.* 70(1):25-33.
2. Y. Tsybina, I. Kastalskiy, M. Krivonosov, A. Zaikin, V. Kazantsev, A. Gorban, S. Gordleeva, Astrocytes mediate analogous memory in a multi-layer neuron-astrocytic network, *Neural Comput & Applic* (2022).
3. Rybnikova, N., Portnov, B. A., Mirkes, E. M., Zinovyev, A., Brook, A., & Gorban, A. N. (2021). Coloring panchromatic nighttime satellite images: Comparing the performance of several machine learning methods. *IEEE Trans Geosci Remote Sens*, 60, 1-15.

4. Kastalskiy, I.A., Pankratova, E.V., Mirkes, E.M., Kazantsev V.B., Gorban, A.N. Social stress drives the multi-wave dynamics of COVID-19 outbreaks. *Sci Rep* 11, 22497 (2021).
5. Gorban, A. N., Tyukina, T. A., Pokidysheva, L. I., & Smirnova, E. V. (2021). Dynamic and thermodynamic models of adaptation. *Physics of Life Reviews*, Volume 37, Pages 17-64,
6. Gordleeva, S. Y., Tsybina, Y. A., Krivonosov, M. I., Ivanchenko, M. V., Zaikin, A. A., Kazantsev, V. B., & Gorban, A. N. (2021). Modelling working memory in spiking neuron network accompanied by astrocytes. *Frontiers in Cellular Neuroscience*, 15, 86
7. B. Grechuk, A.N. Gorban, & I.Y.Tyukin (2021). General stochastic separation theorems with optimal bounds. *Neural Networks*, 38 (2021), 33-56.
8. Y. Tyukin, A. N. Gorban, A. A. McEwan, S. Meshkinfamfard & L. Tang, (2021). Blessing of dimensionality at the edge and geometry of few-shot learning. *Information Sciences*. Volume 564, Pages 124-143.
9. S.E. Golovenkin, J. Bac, A. Chervov, E.M. Mirkes, Y.V. Orlova, E. Barillot, A.N. Gorban, A. Zinovyev, Trajectories, bifurcations, and pseudo-time in large clinical datasets: applications to myocardial infarction and diabetes data, *GigaScience*, Volume 9, Issue 11, November 2020, giaa128.
10. A.N. Gorban, E.M. Mirkes, I.Y. Tyukin, How Deep Should be the Depth of Convolutional Neural Networks: a Backyard Dog Case Study. *Cogn Comput* 12 (2020), 388–397.
11. Z. Chen, B. Wang, A.N. Gorban, A.N. Multivariate Gaussian and Student-t process regression for multi-output prediction. *Neural Comput & Applic* 32 (2020), 3005–3028.
12. D Roland, N Suzen, TJ Coats, J Levesley, AN Gorban, EM Mirkes, What can the randomness of missing values tell you about clinical practice in large data sets of children's vital signs? *Pediatr Res* (2020).
13. A.N. Gorban, R. Burton, I. Romanenko, I.Y. Tyukin, One-trial correction of legacy AI systems and stochastic separation theorems, *Information Sciences* 484 (2019) 237–254
14. H Chen, L Albergante, JY Hsu, CA Lareau, GL Bosco, J Guan, S Zhou, AN Gorban, DE Bauer, MJ Aryee, DM Langenau, A Zinovyev, JD Buenrostro, G-C Yuan, L Pinello, Single-cell trajectories reconstruction, exploration and mapping of omics data with STREAM. *Nature Comm.* 2019 Apr 23;10(1):1903.
15. E. Fehrman, V. Egan, AN Gorban, J Levesley, EM Mirkes, AK Muhammad (2019). *Personality Traits and Drug Consumption. A story told by data.* Springer International Publishing. Research Monogaph.
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