

## CURRICULUM VITAE

Ivan Tyukin, PhD, DrSc,

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### QUALIFICATIONS

#### *Academic*

- DrSc (Habilitation) in *System Analysis, Control and Information Processing* (15 May 2006, Saint-Petersburg State University of Electrical Engineering)
- PhD in *System Analysis, Control and Information Processing* (25 June 2001, Saint-Petersburg State University of Electrical Engineering);
- MSc in *System Engineering*, Diploma with Distinction (Department of Automation and Control Processes Saint-Petersburg State Electrical Engineering University, 1992 to 1998)

#### *Educational*

- Fellow of Higher Education Academy (from 2013)

### EMPLOYMENT HISTORY

- *November 2019 – present*. Adjunct Professor [Professor 2] (within Applied Computational Intelligence), Norwegian University of Science and Technology (NTNU), Trondheim, Norway
- *August 2018 – present*. Professor of Applied Mathematics, University of Leicester, Department of Mathematics, Leicester, United Kingdom
- *April 2014 – August 2018*. Reader (Associate Professor) in Applied Mathematics, University of Leicester, Department of Mathematics, Leicester, United Kingdom
- *April 2012 – March 2014*. Lecturer, University of Leicester, Department of Mathematics, Leicester, United Kingdom
- *March 2007 – March 2012*. RCUK Academic Fellow, University of Leicester, Department of Mathematics, Leicester, United Kingdom
- *October 2001 – March 2007*. Research Scientist, RIKEN Brain Science Institute, Laboratory for Perceptual Dynamics, Wako-shi, Japan
- *April 2007 – March 2011*. Visiting Researcher, RIKEN Brain Science Institute, Laboratory for Perceptual Dynamics, Wako-shi, Japan
- *February 2000 – August 2000*. Visiting Researcher, Ford Research Laboratories, Powertrain Control Systems Department, Dearborn, USA

### OTHER PERSONAL INFORMATION

- Fellow of Higher Education Academy (from 2013)
- Member of the London Mathematical Society
- Member of IEEE (Institute for Electrical and Electronics Engineering), CSS (Control Systems Society), from 1999
- Member of International Academy of Navigation and Control, from 2008

- PhD Dissertation has been nominated by High Dissertation Committee of Russian Federation for the Award of President of Russian Federation ("Poisk" No. 52, 2002)

## **SUMMARY OF CURRENT DUTIES**

### *Teaching duties*

- Convener of MA2021 (MA2022), Differential Equations and Dynamics, 20 credits (MA2022 is a 10 credit version of the module for some students on joint degrees)
- Convener of MA3077 (MA7077), Operations Research, 20 credits (MA7077 is an MSc-level module)
- Supervision of BSc and MSc /MMath students

### *Administrative roles (current)*

- Director of Research
- Research Excellence Framework Deputy Lead
- Deputy Director of the Artificial Intelligence, Data Analytics, and Modelling Centre
- Head of Visual Intelligence Laboratory
- Member of the School Management Group

## **ADMINISTRATIVE ROLES IN THE PAST**

- House Tutor, Euler (until 2014)
- Equality and Diversity Officer (2015 – 2017)
- Career and Employability Tutor (until 2015); the department was in Top 3 mathematics departments for Employability in the UK (Guardian University Guide, 2015)
- Member of the Teaching and Learning Committee
- Member of the Athena Swan Group

## **TEACHING EXPERIENCE, ACTIVITIES, AND ACHIEVEMENTS**

### *Taught modules*

- 2009-2010, developing and delivering of Introduction to Mathematical Neuroscience<sup>1</sup> module (designed for MSc Mathematical Biology programme)
- 2009-2010, re-designed Differential Equations and Dynamics<sup>2</sup> module (MA2021 – 20 credit, MA2022 – 10 credit)
- 2009-present, module convener of MA2021, MA2022
- 2012-present, module convener of MA3077, MA7077
- 2011-2012, re-designed Operations Research<sup>2</sup> module (MA3077 – 20 credit, MA7077 – 15 credit)

<sup>1</sup> – Development of entirely new module

<sup>2</sup> – Deep re-design of existing modules, including substantial changes in syllabus, assessment, aligning the module with Numerical Stream in the curriculum, creating interactive online formative assessments (Maple TA), and creation of complete package of

module resources on Blackboard (lecture notes, slides, solved problems, mock exam papers with solutions, assignments and computer practical, discussions)

### *Supervision*

- BSc projects, MMaths projects, MSc projects

### *Achievements*

- Fellow of Higher Education Academy (from 2013)
- Superstar Award (Leicester Student Union, 2015)

## **RESEARCH EXPERIENCE, ACTIVITIES, AND ACHIEVEMENTS**

**Publications:** 60 publications, 1 monograph, and 1 book chapter

Google Scholar: >1930 citations, h-index: 20; Web of Science: >470 citations, h-index: 12; Scopus: >660 citations, h-index 14. Researcher ID: M-8466-2013; ORCID: 0000-0002-7359-7966

### **Patents**

1. I. Romanenko, I. Tyukin, A.N. Gorban, K. Sofeikov. US Patent number US 10062013B2. Method of Image Processing.
2. US Patent Application No. 15/716,6220 filed on 26 Sept 2017
3. Chinese Patent Application No. 201710884016.7 filed on 26 Sept 2017

### **In the NEWS (recent)**

- [A new approach to the correction of artificial intelligence errors](#), August 2019.
- [Six degrees of separation: why it is a small world after all](#), October 2017.  
[https://www.eurekalert.org/pub\\_releases/2017-10/uol-sdo101917.php](https://www.eurekalert.org/pub_releases/2017-10/uol-sdo101917.php)
- [New theorems help Robots to correct errors on-the-fly and learn from each other](#), in [Science Daily](#), August 2017.

### **Funding track record**

#### *UKRI (Research Councils)*

- £1,014,769 FEC [£811,815 from the RC] AH/T001003/1 Arch-I-Scan: Automated recording and machine learning for collating Roman ceramic tablewares and investigating eating and drinking practices, 2019-2022. *Co-Investigator*. [Principal Investigator - Prof Penelope Allison (University of Leicester)].
- £402,980 FEC [£322,384 from the RC] MR/T017988/1 Long-Term anatomical fluid dynamics for new Univentricular heartS palliation (LOTUS), 2019-2021. *Co-Investigator*. [Principal Investigator - Dr Andrea Cangiani (University of Nottingham)].

#### *British Health Foundation*

- £351,400 Insight Research Programme, Prediction of PROMS outcomes after major trauma, 2020-2022. *Co-Investigator*. [Principal Investigator - Prof Tim Coats (University of Leicester)].

## *UK Technology Strategy Board*

- £245,824 (2017-2020). *Data Analytics and Mathematical Modelling in High Energy Physics. Academic Leader and Co-Investigator*. Innovate UK Knowledge Transfer Partnership KTP010819 with Photek Ltd. [The highest-scored project in the funding round]
- £ 206,176.05 (2016-2019). *Low-cost, power-efficient security systems capable of real-time facial recognition. Principal Investigator*. Innovate UK Knowledge Transfer Partnership KTP010522 with VMS Ltd.
- £ 179,135 (2015-2017). *Visual Intelligence Technology. Principal Investigator*. Innovate UK Knowledge Transfer Partnership KTP009890 with Apical Ltd.
- £ 182,576 (2016-2019). *Secure, scalable, cyber-physical system for managing intelligent factories in the food processing industry. Support Academic, Co-Investigator*. Innovate UK Knowledge Transfer Partnership (KTP) with Millitec Ltd.

## *Industry*

- £ 93, 000 (2013 – 2017) *Image processing methods based on analysis of visual scenes. Principal Investigator*. Industrial Project with Apical Ltd.
- £ 43,458 (2013 – 2014) *Objects identification and tracking in video streams. Principal Investigator*. European Regional Development Fund: Partnership in Knowledge Transfer (ERDF PiKT) project with Apical Ltd.

## *External, Other*

- £ 214,000 [P18M] (2019 – 2022) Russian Science Foundation, *Principal Investigator*
- £ 49,000 (2019) SPRINT, *Principal Investigator*.
- £ 35,000 (2013 – 2017) Joint KU Leuven – University of Leicester PhD project. *Principal Investigator*. Total budget of the project is £ 55,000
- £ 12,000 (2008 – 2010) Royal Society, *Co-Investigator*.
- £ 10,000 (2007 – 2009) Royal Society, *Principal Investigator*.

## *Internal*

- £ 33,000 (2013) Visual Intelligence Laboratory, RIF. *Principal Investigator*

## **Supervision of Research Students (as 1<sup>st</sup> Supervisor)**

- David Fairhurst (*successfully passed viva exam on the 4<sup>th</sup> of June, 2014*)
- Nicolas Jarman (*successfully passed viva exam on 30<sup>th</sup> of June, 2017*)
- Konstantin Sofeikov (*successfully passed viva exam on 2<sup>nd</sup> of February, 2018*)
- Jehan Mohamed Al-Ameri (*successfully passed viva exam on the 29<sup>th</sup> of August, 2018*)
- Stephen Green (*successfully passed viva exam on the 6<sup>th</sup> of December, 2019*)
- Rosie Fenwick (current, started in January 2018)
- Eliyas Woldegeorgis (current, started in January 2019)
- Roqaiyah Ateeq (current, started in January 2019)
- Mohammad Alkhudaydi (current, started in April 2019)

Additionally, currently co-supervising 3 PhD students as the 2<sup>nd</sup> Supervisor.

## Supervision of Research Associates

- Peng Sun (January 2014 – March 2015), PiKT Research Associate
- Richard Burton (July 2015 – January 2018), KTP Research Associate
- Sepehr Meshkinfamfard (January 2017 – May 2019), KTP Research Associate
- Sharon Wang (May 2019 – present), Postdoctoral Research Associate
- Santos Núñez Jareño (November 2019 – present), Postdoctoral Research Associate

## Other academic distinctions and roles

- *Associate Editor*, Communications in Nonlinear Science and Numerical Simulation (Elsevier), 2015 – present
- *Guest Editor*, Applied Soft Computing (Elsevier), 2017
- *Guest Editor*, Special Issue of Mathematical Modelling of Natural Phenomena, 2015, 2017
- *Associate Editor and International Program Committee member*: IFAC CHAOS Conference on Analysis and Control of Chaotic Systems, 2015; IFAC CHAOS, 2018.
- *Associate Editor and International Program Committee member*, IFAC PSYCO Workshop on Periodic Control Systems, 2016.
- *Institutional Advisory Boards*, Skoltech (Skolkovo Institute of Science and Technology) Data Science and Artificial Intelligence Advisory Board, 2018 – present
- *Nominated* for Leicester Best (potential) Economic Impact Award 2017 (as a part of the Data Analytics Team with Prof. A. Gorban, J. Levesley, Dr. E. Mirkes, A. Mudrov)
- *Member of editorial board* for the Open Automation and Control Systems Journal
- *Reviewed* grant applications for BBSRC, Research Foundation Flanders FWO (Belgium), journal articles for Automatica, Communications in Nonlinear Science and Numerical Simulations, IEEE Transactions on Automatic Control, IEEE Transactions on Circuits and Systems, International Journal of Control, International Journal of Robust and Nonlinear Control, IEEE Transactions on Neural Networks, IEEE Transactions on Neural Networks and Learning Systems, Neural Networks, International Journal on Adaptive Control and Signal Processing.
- *Best session paper and presentation award* (co-authored with Danil Prokhorov and Cees van Leeuwen). The American Control Conference, Portland, Oregon (Automotive Applications), June 2005. *Best session paper award*. Young Scientists Conference: "Navigation and Control of Motion", section "Theory and Control Systems", March 2000
- *Member of the Academy of Navigation and Motion Control*
- *Member of the Program and Technical Committees*: International Conferences on Informatics in Control, Automation and Robotics (2005-2007); International Conference on Advanced Engineering Computing and Applications in Sciences (ADVCOMP' 07); International Conference on Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP 2007); Symposium on Sensor Fusion, Intelligent Sensors and Applications; International Joint Conference on Neural Networks (IJCNN 2008); IFAC Conference on Analysis and Control of Chaotic Systems (CHAOS'09); Model Reduction Across Disciplines, 2014, Leicester, UK; IFAC Conference on Analysis and Control of Chaotic Systems (CHAOS'15); IFAC Workshop on Periodic Control Systems (PSYCO'16)

- *Symposia and Conference Organizer*. Synchronization, Control and Mathematical Modelling of Neural Systems (as a part of 2007 Conference on Physics and Control, PHYSCON'07); International Workshop on Mathematics of the Brain, 1-2 September 2009, University of Cumbria, Ambleside, UK (as a part of 2009 Algorithms for Approximation VI Conference); Workshop on Mathematical Models of Brain, 23-d November, 2009, University of Leicester, UK; International Conference on Model Reduction Across Scales, 19-23d of August , 2014; Invited session at IFAC Conference on Analysis and Control of Chaotic Systems (CHAOS'15), August 2015. IFAC Workshop on Periodic Control Systems (PSYCO'16), June 29-July 1 2016; Mini-symposium at the 27<sup>th</sup> and 28<sup>th</sup> Biennial Numerical Analysis Conferences, University of Strathclyde, Glasgow, June 2017, June 2019; Artificial Intelligence After Tomorrow, Special Session at the IEEE 2018 World Congress on Computational Intelligence. IEEE 2019 International Joint Conference on Neural Networks. Session: Metrology of AI: blessing of dimensionality, tolerance and fits, July 2019.

### **Industrial collaboration**

- Apical Ltd. Joint ERDF-funded project on tracking shapes in video streams,
- Apical Ltd (ARM), image processing based on the analysis of scenes (industrial PhD)
- Apical Ltd (ARM). Leading joint Innovate UK funded Knowledge Transfer Partnership
- VMS Ltd. Leading joint Innovate UK funded Knowledge Transfer Partnership
- Millitec Ltd. Supporting joint Innovate UK funded Knowledge Transfer Partnership
- Photek Ltd. Academic Leader for Innovate UK Knowledge Transfer Partnership

### **Invited and plenary talks at major international meeting**

- International Conference on Robotics and Machine Vision, **keynote lecture**, September 2017, Kitakyushu, Japan
- KU Leuven – UNN bilateral workshop, **keynote lecture**, 10<sup>th</sup> of October, 2016
- Volga Neuroscience Meeting 2016, July 24 – 30, 2016, St-Petersburg – Nizhny Novgorod, Russia
- 6<sup>th</sup> IFAC International Workshop on Periodic Control Systems, June 29 – July 1, 2016, Eindhoven, The Netherlands
- 4<sup>th</sup> IFAC Conference on Analysis and Control of Chaotic Systems, August 26 – August 28, 2015, Tokyo, Japan.
- 53d IEEE Control and Decision Conference, 15<sup>th</sup> of December, 2014, Los Angeles, USA (**invited SIAM presentation**)
- Institute for Complex Molecular Systems, 3d of December, 2014, Eindhoven University of Technology, The Netherlands
- Workshop on Computational Biology, Computational Neuroscience, and Modern Control Theory: on the Path to Symbiosis, 29 June – 1 July 2014. Laboratoire Des Signaux et Systemes
- IV-th International Symposium on Topical Problems of Biophotonics – 2013 , 21-27 July 2013, Institute of Applied Physics of Russian Academy of Science, Nizhny Novgorod, Russia
- International Symposium on Resonance and Synchronization, 20-24 August 2012, The Netherlands

- XV International Conference on NeuroCybernetics – 2009 (**plenary talk**), Rostov-on-Don, Southern Federal University, Russia.
- International Conference on Topical Problems of Biophotonics – 2009, 19-24 July 2009, Institute of Applied Physics of Russian Academy of Science, Nizhny Novgorod, Russia.
- Navigation and Control (School-Seminar), September 2008. “Electropribor”, Russia
- European Dynamics Days, August 2008. The University of Delft, The Netherlands
- International Conference on Topical Problems of Biophotonics – 2007, 4-11 August 2007, Institute of Applied Physics of Russian Academy of Science, Nizhny Novgorod, Russia.

## ACADEMIC MANAGEMENT (SUMMARY)

- Member of the Teaching and Learning Committee (2012 – present)
- Member of the School Management Group (2012 – present)
- Head of the Laboratory for Visual Intelligence (2013 – present)
- Director of Research (2018 – present)
- Careers and Employability Tutor (2012 – 2014, 2017 – present)
- Employability Officer (2014-2015)
- Equality and Diversity Officer (2015 – 2017)
- External Examiner, University of Loughborough, Department of Physics (2015 – 2019)
- External Examiner, University of Coventry, Department of Mathematics (2018 – present)
- External Examiner for PhD viva / Evaluation panel (St-Petersburg, Eindhoven)
- Internal Examiner for PhD viva (Matthew Adamson, Ayo Akinduko, Etienne Pillin)

## LIST OF PUBLICATIONS

### Journals

- [39] A.N. Gorban, V.A. Makarov, I.Y. Tyukin. Symphony of high-dimensional brain. Reply to comments on "the unreasonable effectiveness of small neural ensembles in high-dimensional brain". [Physics of Life Reviews](#), **29**, 115-119, 2019.
- [38] A.N. Gorban, E. Mirkes, I. Tyukin. How deep should be the depth of convolutional neural networks: a backyard dog case study. *Cognitive Computation*, 2019.
- [37] I. Tyukin, D. Iudin, F. Iudin, T. Tyukina, V. Kazantsev, I. Mukhina, A. Gorban. Simple model of complex dynamics of activity patterns in developing networks of neuronal cultures. *PLOS ONE*, 2019. <https://doi.org/10.1371/journal.pone.0218304> .
- [36] A.N. Gorban, R. Burton, I. Romanenko, I. Tyukin. One-Trial Correction of Legacy AI Systems and Stochastic Separation Theorems. *Information Sciences*. 2019. <https://doi.org/10.1016/j.ins.2019.02.001>. <https://arxiv.org/abs/1610.00494>
- [35] I. Tyukin, A.N. Gorban, S. Green, D. Prokhorov. Fast Construction of Correcting Ensembles for Legacy Artificial Intelligence Systems: Algorithms and a Case Study, *Information Sciences*. 230-247, 2019. <https://doi.org/10.1016/j.ins.2018.11.057>. <https://arxiv.org/abs/1810.05593>.

- [34] A.N. Gorban, V.A. Makarov, I.Y. Tyukin. The unreasonable effectiveness of small neural ensembles in high-dimensional brain. *Physics of Life Reviews*, 2018. <https://doi.org/10.1016/j.plrev.2018.09.005>.
- [33] A.N. Gorban, A. Golubkov, B. Grechuk, E.M. Mirkes, I.Y. Tyukin. Correction of AI systems by linear discriminants: Probabilistic foundations. *Information Sciences*, 466, 303-322, 2018. <https://doi.org/10.1016/j.ins.2018.07.040>
- [32] D. Adebayo, J. Al-Ameri, I. Tyukin, A Rona. Linear stability analysis of the flow between rotating cylinders of wide gap. *European Journal of Mechanics - B/Fluids*, 2018. doi: 10.1016/j.euromechflu.2018.07.002
- [31] I.Tyukin, A.N. Gorban, K. Sofeikov, I. Romanenko. Knowledge Transfer Between Artificial Intelligence Systems. *Frontiers in Neurorobotics*, 2018. doi:10.3389/fnbot.2018.00049. <https://arxiv.org/abs/1709.01547>
- [30] Carlos Calvo Tapia, Ivan Y. Tyukin, Valeri A. Makarov. Fast Social-like Learning of Complex Behaviours Based on Motor Motifs. *Phys. Rev. E* 97, 052308, 2018. doi:10.1103/PhysRevE.97.052308.
- [29] I. Tyukin, A.N. Gorban, C. Calvo, J. Makarova, V.A. Makarov. High-dimensional Brain. A Tool for Encoding and Rapid Learning of Memories by Single Neurons. *Bulletin of Mathematical Biology*, 2018. (accepted). <https://arxiv.org/abs/1710.11227>
- [28] A.N. Gorban, I. Tyukin. Blessing of dimensionality: mathematical foundations of the statistical physics of data. *Philosophical Transactions of the Royal Society A*, 2018. doi:10.1098/rsta.2017.0237. Preprint available at <http://arxiv.org/abs/1801.03421>
- [27] N. Jarman, C. Trengove, E. Steur, I. Tyukin, Cees van Leeuwen. Self-organisation of small-world networks by adaptive rewiring in response to graph diffusion. *Scientific Reports*, 7: 13158, 2017. [www.nature.com/articles/s41598-017-12589-9](http://www.nature.com/articles/s41598-017-12589-9). doi:10.1038/s41598-017-12589-9.
- [26] A.N. Gorban, I.Y. Tyukin. Stochastic Separation Theorems. *Neural Networks*, 94, 255-259, 2017. doi:10.1016/j.neunet.2017.07.014 . Preprint available at <https://arxiv.org/abs/1703.01203>
- [25] I.Y. Tyukin, A.N. Gorban, T.A. Tyukina, J.M. Al-Ameri, Y.A. Korablev. Fast Sampling of Evolving Systems with Periodic Trajectories, *Mathematical Modelling of Natural Phenomena*, 11 (4), 74-89, 2016. Preprint available at <http://arxiv.org/abs/1511.03054>
- [24] A.N. Gorban, I. Tyukin, D. Prokhorov, K. Sofeikov. Approximation with random bases: Pro et contra. *Information Sciences*, 324-325, 129-145, 2016. Preprint available at <http://arxiv.org/abs/1506.04631>
- [23] I. Prokin, I. Tyukin, V. Kazantsev. Phase selective oscillations in two noise driven synaptically coupled spiking neurons. *International Journal of Bifurcation and Chaos*, 25 (7), 2015, 1540005.
- [22] A.N. Gorban, N. Jarman, E. Steur, C. van Leeuwen, I. Tyukin. Leaders do not look back, or do they? *Mathematical Modelling of Natural Phenomena*, 10 (3), 212-231, 2015. doi: [10.1051/mmnp/201510316](https://doi.org/10.1051/mmnp/201510316). preprint available at <http://arxiv.org/abs/1505.01440>

- [21] N. Jarman, C. Trengove, E. Steur, I. Tyukin, and Cees van Leeuwen. Spatially Constrained Adaptive Rewiring in Cortical Networks Creates Spatially Modular Small World Architectures. *Cognitive Neurodynamics*, 2014. doi: [10.1007/s11571-014-9288-y](https://doi.org/10.1007/s11571-014-9288-y)
- [20] P. Jurica, S. Gepshtein, I. Tyukin, and Cees van Leeuwen. Sensory Optimization by Stochastic Tuning. *Psych Review*, 120(4), 798-816, 2013. doi: [10.1037/a0034192](https://doi.org/10.1037/a0034192)
- [19] I.Yu. Tyukin, E. Steur, H. Nijmeijer, and Cees van Leeuwen. Adaptive Observers and Parameter Estimation for a Class of Systems Nonlinear in Parameters. *Automatica*, 49(8), 2409-2423, 2013, preprint available at <http://arxiv.org/abs/0903.2361>
- [18] A. Gorban, I. Tyukin, E. Steur, and H. Nijmeijer. Lyapunov-like Conditions of Forward Invariance and Boundedness for a Class of Unstable Systems. *SIAM Journal on Control and Optimization*, 51(3), 2306–2334, 2013. ([full text pdf](#), preprint available at <http://arxiv.org/abs/0901.3577>)
- [17] I.Yu. Tyukin, V.B. Kazantsev. Precise Self-tuning of Spiking Patterns in Coupled Neuronal Oscillators. *Mathematical Modelling of Natural Phenomena*. 7(6): 67-94, 2012. doi: <http://dx.doi.org/10.1051/mmnp/20127604> ([full text pdf](#))
- [16] V.B. Kazantsev, I.Yu. Tyukin. Adaptive and Phase Selective Spike Timing Dependent Plasticity in Synaptically Coupled Neuronal Oscillators. *PLOS One*, 7(3): e30411. doi: [10.1371/journal.pone.0030411](https://doi.org/10.1371/journal.pone.0030411), 2012 ([full text pdf](#), [supplement](#))
- [15] I.Yu. Tyukin, E. Steur, H. Nijmeijer, D. Fairhurst, I. Song, A. Semyanov, and C. van Leeuwen. State and Parameter estimation for Canonic Models of Neural Oscillators. *International Journal of Neural Systems*, 20(3): 193-207, 2010 ([full text pdf](#))
- [14] D. Fairhurst, I.Yu. Tyukin, H. Nijmeijer, and C. van Leeuwen. Observers for canonic models of neural oscillators. *Mathematical Modelling of Natural Phenomena*, 5(2): 146-184, 2010 (preprint available at <http://arxiv.org/abs/0905.0149>)
- [13] E. Steur, I. Tyukin, and H. Nijmeijer. Semipassivity and synchronization of diffusively coupled neural oscillators. *Physica D: Nonlinear Phenomena*, 2009. doi:10.1016/j.physd.2009.08.007. (preprint available at <http://arxiv.org/abs/0903.3535>)
- [12] I.Yu. Tyukin, T. Tyukina, and C. van Leeuwen. Invariant template matching in systems with spatiotemporal coding: a matter for instability. *Neural Networks*, 22(4): 425-449, 2009 ([full text pdf](#), preprint available at <http://arxiv.org/abs/cs.CV/0702082>).
- [11] I.Yu. Tyukin, D. V. Prokhorov, and C. van Leeuwen. Adaptive classification of temporal signals in fixed-weights recurrent neural networks: an existence proof. *Neural Computation*, 20(10):2564-2596, 2008 ([full text pdf](#), preprint available at <http://arxiv.org/abs/0705.3370v1>).
- [10] I.Yu. Tyukin, E. Steur, H. Nijmeijer, and C. van Leeuwen. Non-uniform small-gain theorems for systems with unstable invariant sets. *SIAM Journal on Control and Optimization*, 47(2): 849-882, 2008 ([full text pdf](#), [preprint](#)).
- [9] I.Yu. Tyukin, D. V. Prokhorov, and C. van Leeuwen. Adaptation and parameter estimation in systems with unstable target dynamics and nonlinear parametrization. *IEEE Transactions on*

*Automatic Control*, 52(9):1543-1559, 2007 ([full text pdf](#), preprint available at <http://arxiv.org/abs/math.OC/0506419>).

[8] S. Gepshtein, I. Tyukin, and M. Kubovy. The economics of motion perception and invariants of visual sensitivity. *Journal of Vision*, 7(8):8, 1-18, 2007. doi:10.1167/7.8.8.

[7] I. Yu. Tyukin and C. van Leeuwen. Decentralized adaptation in interconnected uncertain systems with nonlinear parametrization. *Lecture Notes in Control and Information Sciences*, 336:251-270, 2006 (preprint available at <http://arxiv.org/abs/math/0606206>).

[6] I.Yu. Tyukin, C. van Leeuwen, and D.V. Prokhorov. Parameter estimation of sigmoid superpositions: Dynamical system approach. *Neural Computation*, 15(10):2419-2455, 2003 ([full text pdf](#), preprint available at <http://arxiv.org/abs/math/0207075>).

[5] I.Yu. Tyukin. Adaptation algorithms in Finite form for nonlinear dynamic objects. *Automation and Remote Control*, 64(6):951-974, 2003 ([full text pdf](#)).

[4] I.Yu. Tyukin, D.V. Prokhorov, and V.A. Terekhov. Adaptive control with nonconvex parameterization. *IEEE Transactions on Automatic Control*, 48(4):554-567, 2003 ([full text pdf](#)).

[3] D.V. Prokhorov, V.A. Terekhov, and Tyukin I.Yu. On the applicability conditions of the adaptive algorithms for the nonconvex problems. *Automation and Remote Control*, 63(2):262-279, 2002 ([full text pdf](#)).

[2] V.A. Terekhov and I.Yu. Tyukin. Investigation of the neural networks training processes stability. Part I. *Automation and Remote Control*, (10), 1999.

[1] V.A. Terekhov and I.Yu. Tyukin. Investigation of the neural networks training processes stability. Part II. *Automation and Remote Control*, (11), 1999.

## Monographs

[1] S. Gepshtein, I. Tyukin. Optimal measurement of visual motion across spatial and temporal scales. In Favorskaya MN and Jain LC (Eds), Computer vision in control systems - 1. Mathematical theory, Springer-Verlag, Berlin, 2015, pages 211-238. ISBN 978-3-319-10653-3

[2] I. Tyukin. Adaptation in Dynamical Systems, Cambridge University Press, 2011. (ISBN-10: 0521198194 | ISBN-13: 9780521198196) Published February 2011