## Yuriy Mishchenko

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## *Professional*

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| 2015-current | **Toros University, Mersin, Turkey**<br>Associate Professor, Department of Computer-Software Engineering. |
| 2011-2015 | **Toros University, Mersin, Turkey**<br>Assistant Professor, Department of Computer-Software Engineering. |
| 2008-2010 | **Columbia University, New York, NY, USA**<br>Postdoctoral Fellow, Center for Theoretical Neuroscience and Department of Statistics (advisor Prof. Dr. L. Paninski). |
| 2006-2008 | **Howard Hughes Medical Institute, Janelia Farm Research Campus, Ashburn, VA, USA**<br>Research Associate, Bioinformatics and Computational Neuroscience Group of Dr. D. Chklovskii. |
| 2005-2006 | **Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, USA**<br>Research Associate, Bioinformatics and Computational Neuroscience Group of Dr. D. Chklovskii. |
| 2003-2004 | **North Carolina State University, Raleigh, NC, USA**<br>Research Assistant, Department of Physics (advisor Prof. Dr. C.-R. Ji). |
| 2003 | **Jefferson Laboratory, Newport News, VA, USA**<br>Research Assistant (advisor Prof. Dr. A. Radyushkin and Prof. Dr. C.-R. Ji). |
| 2000-2003 | **North Carolina State University, Raleigh, NC, USA**<br>Teaching Assistant, Department of Physics. |

## *Education*

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| 2004 | **North Carolina State University, Raleigh, NC, USA (Summa Cum Laude)**<br>Ph.D. Theoretical Physics, Advisor Prof. Dr. C.-R. Ji<br>Dissertation title: "Applications of Canonical Transformations and Nontrivial Vacuum Solutions to Flavor Mixing and Critical Phenomena in Quantum Field Theory." |
| 2000 | **National Kiev University of Taras Shevchenko, Kiev, Ukraine (Summa Cum Laude)**<br>M.S. Theoretical Physics, Advisor Prof. Dr. I. Simenog<br>Thesis title: "Nonperturbative Mass Renormalization in 2+1 Scalar Yukawa Model." |
| 1999 | **National Kiev University of Taras Shevchenko, Kiev, Ukraine (Summa Cum Laude)**<br>B.S. Theoretical Physics, Advisor Prof. Dr. I. Simenog<br>Thesis title: "Precision Quantum Mechanical Variational Calculations of Three-Body Coulomb System ($dt\mu$)." |

## *Honors and Awards*

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| 2015 | 2nd Place Award at the 1st Signal Processing and Applications Competition at 23rd IEEE Signal Processing and Communications Applications (SIU2015) (Turkey). |
| 2014 | Best R&D Project 5th Place Award at the 4th Regional Project Fair of East Mediterranean Universities (Turkey). |
| 2013 | Young Scientist Award under BAGEP program of The Science Academy (Turkey). |
| 2010 | Madison Who's Who Registry of Executives and Professionals (USA). |
| 2002 | SURA/JLab Graduate Fellowship Award of the South-Eastern Universities Research Association and Jefferson Lab (SURA/JLAB) (USA). |

1994 3rd Place Award at the National Physics Olympiad (Ukraine).

## *Grants and Projects*

"Development of more efficient noninvazive brain-machine interfaces", *Principal Investigator*, TUBITAK ARDEB 1001 Grant Number 113E611 (Turkey), 2014-2017.

"Founding of the Noninvazive Brain-Machine Interfaces Research Laboratory at the Faculty of Engineering of Toros University", *Principal Investigator*, Toros University BAP Grant Number TUBAP135001 (Turkey), 2013-2014.

"Constraining parameters of Dark Matter particles from observations of Dark Matter in high-speed collision galaxy clusters", *Co-Investigator*, APS ITGAP (USA), 2014.

"Measurements of the efficiency of solar panels (PV) and electronic devices (diod, transistor, LED)", *Researcher*, Toros University BAP Grant Number TUBAP135002 (Turkey), 2013-2014.

## *Supervised M.S. Theses*

Erhan ONEL, "Information management systems and emotional intelligence in information technology", M.S. Thesis, Toros University (2014).

## *Administrative Duties*

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| 2012-current | Department head, Department of Computer Engineering, Faculty of Engineering, Toros University. |
| 2012-current | Member of the Faculty Steering Committee, Faculty of Engineering, Toros University. |
| 2012-2013 | Department head, Department of Computer-Software Engineering, Faculty of Engineering, Toros University. |

## *Professional Society Memberships*

2005 Society for Neuroscience
2003 American Physical Society
2002 Phi Kappa Phi Honor Society

## *Undergraduate and Graduate Courses Taught*

**Undergraduate level**
Information Systems Security
C/C++ Programming Language
Java Programming Language
MATLAB for Engineers
Optimization theory
Physics I and II

**Graduate level**
Artificial Intelligence and Machine Learning
Methods in Convex Optimization
Algorithms and Data Structures
Internet Programming

## *Patents*

"Systems and Methods for Exchanging Information in a Large Group", US8335827 B2 (US 12/480,325), granted Dec 18, 2012.

## Yuriy Mishchenko

### *Languages*

Ukrainian (native), Russian (native), English (fluent), Turkish (advanced), German (basic).

### *Publications*

#### Journal Publications

1. Mishchenko Y. (2015) The impact of neuronal inter-connectivity on stimulus estimation in population-based brain-computer interfaces. (In preparation.)
2. Kaya M., Mishchenko Y. (2015) Detecting the attention state of an operator in continuous attention task using EEG-based brain-computer interface. (In preparation.)
3. Mishchenko Y., Ji C.-R. (2015) Dark matter phenomenology of high speed galaxy cluster collisions. (In preparation.)
4. Mishchenko Y. (2015) Consistent estimation of complete neuronal connectivity in large neuronal populations using sparse "shotgun" neuronal activity sampling. (Submitted Journal of Computational Neuroscience.)
5. Mishchenko Y. (2015) Variability in cellular gene expression profiles and homeostatic regulation. (Submitted BioRxiv.)
6. Mishchenko Y. (2015) A function for fast computation of large discrete Euclidean distance transforms in three or more dimensions in Matlab. Signal, Image and Video Processing, 9, 19.
7. Mishchenko Y. (2014) Application of the radial distribution function for quantitative analysis of neuropil microstructure in stratum radiatum of CA1 region in hippocampus. BioRxiv, doi: 10.1101/003863.
8. Mishchenko Y. (2014) Oscillations in rational economies. Plos ONE, 9(2), e87820.
9. Marblestone A., Daugharthy E., Kalhor R., Peikon I., Kebschull J., Shipman S., Mishchenko Y., Lee J. H., Kording K., Boyden E., Zador A., Church G. (2014) Rosetta Brains: A Strategy for Molecularly-Annotated Connectomics. arXiv:1404.5103.
10. Marblestone A., Daugharthy E., Kalhor R., Peikon I., Kebschull J., Shipman S., Mishchenko Y., Dalrymple D., Zamft B., Kording K., Boyden E., Zador A., Church G. (2013) Conneconomics: The Economics of Large-Scale Neural Connectomics. BioRxiv, doi: 10.1101/001214.
11. Rah J.-C., Bas E., Colonell J., Mishchenko Y., Karsh B., Fetter R., Myers E., Chklovskii D., Svoboda K., Harris T., Isaac J. (2013) Thalamocortical input onto layer 5 pyramidal neurons measured using quantitative large-scale array tomography. Frontiers in Neural Circuits, 7, 177.
12. Mishchenko Y., Paninski L. (2012) A Bayesian compressed-sensing approach for reconstructing neural connectivity from subsampled anatomical data. Journal of Computational Neuroscience, 33(2), 371.
13. Rivera-Alba M., Vitaladevuni S., Mishchenko Y., Lu Z., Takemura S., Scheffer L., Meinertzhagen I., Chklovskii D., de Polavieja G. (2011) Wiring economy and volume exclusion determine neuronal placement in the Drosophila brain. Current Biology, 21, 2000.
14. Mishchenko Y. and Paninski L. (2011) Efficient methods for sampling spike trains in networks of coupled neurons. Annals of Applied Statistics, 5, 1893.
15. Mishchenko Y., Vogelstein J., Paninski L. (2011) A Bayesian approach for inferring neuronal connectivity from calcium fluorescent imaging data. Annals of Applied Statistics, 5, 1229.
16. Mishchenko Y. (2011) Reconstruction of complete connectivity matrix for connectomics by sampling neural connectivity with fluorescent synaptic markers. Journal of Neuroscience Methods, 196, 289.

17. Mishchenko Y. (2010) On optical detection of densely labeled synapses in neuropil and mapping connectivity with combinatorially multiplexed fluorescent synaptic markers. PLoS ONE 5(1): e8853.
18. Mishchenko Y., Hu T., Spacek J., Mendenhall J., Harris K., Chklovskii D. (2010) Ultrastructural analysis of hippocampal neuropil from the connectomics perspective. Neuron, 67, 1009.
19. Mishchenko Y. (2009) Automation of 3D reconstruction of neural tissue from large volume of conventional serial section transmission electron micrographs. Journal of Neuroscience Methods, 176, 276.
20. Mishchenko Y. (2008) Strategies for identifying exact structure of neural circuits with broad light microscopy connectivity probes. Nature Precedings; retrieved http://hdl.handle.net/10101/npre.2009.2669.2.
21. Ji C.-R., Mishchenko Y., Radyushkin A. (2006) Higher Fock state contributions to the generalized parton distribution of pion. Physical Review D, 73, 114013.
22. Mishchenko Y. (2006) Remedy for the fermion sign problem in the diffusion Monte Carlo method for few fermions with antisymmetric diffusion process. Physical Review E, 73, 026706.
23. Bakker B., DeWitt M., Ji C.-R., Mishchenko Y. (2005) Restoring the equivalence between the light-front and manifestly covariant formalisms. Physical Review D, 72, 076005.
24. Mishchenko Y., Ji C.-R. (2005) A novel variational approach for quantum field theory: example of study of the ground state and phase transition in nonlinear sigma model. International Journal of Modern Physics A, 20, 3488.
25. Mishchenko Y., Ji C.-R. (2005) Exploring properties of dark and visible mass distribution on different scales in the Universe. International Journal of Modern Physics A, 20, 3124.
26. Ji C.-R., Mishchenko Y. (2005) Time to space conversion in quantum field theory of flavor mixing. Annals of Physics, 315, 488.
27. Capolupo A., Ji C.-R., Mishchenko Y., Vitiello C.-R. (2004) Phenomenology of flavor oscillations with nonperturbative effects from quantum field theory. Physics Letters B, 594, 135.
28. Mishchenko Y., Ji C.-R. (2003) Molar mass estimate of dark matter from the dark mass distribution measurements. Physical Review D, 68, 063503.
29. Ji C.-R., Mishchenko Y. (2002) The general theory of quantum field mixing. Physical Review D, 65, 096015.
30. Ji C.-R., Mishchenko Y. (2001) Nonperturbative vacuum effect in the quantum field theory of meson mixing. Physical Review D, 64, 076004.

**Book Chapters**

31. Mishchenko Y., Ji C.-R. (2005) General formulation of flavor mixing in Quantum Field Theory, in O. Kovras (ed.): Focus on Quantum Field Theory, Nova Science Publisher, pp115-149.
32. Mishchenko Y., Ji C.-R. (2004) Distribution of mass in galaxy cluster CL0024 and the particle mass of dark matter, in J. Val Blain (ed.): Progress in Dark Matter Research, Nova Science Publisher, pp217-239; astro-ph/0406563.
33. Ji C.-R., Mishchenko Y., Shalaby A. (2004) Duality and canonical transformations in the scalar field theory, in S. G. Pandalai: Recent Developments in Physics, vol. 5, Transworld Research Network, pp1487-1510.

## Yuriy Mishchenko

### Books and Theses

34. Mishchenko Y. (2009) Nontrivial vacuum solutions in flavor mixing and critical phenomena. VDM Verlag: Saarbrucken, 228p.
35. Mishchenko Y. (2004) Applications of Canonical Transformations and Nontrivial Vacuum Solutions to Flavor Mixing and Critical Phenomena in Quantum Field Theory, Ph.D. Dissertation (Supervisor: C.-R. Ji), UMI-31-54334, 226pp.
36. Mishchenko Y. (2000) Nonperturbative Mass Renormalization in 2+1 Scalar Yukawa Model, M.Sc. Thesis (Supervisor: I. Simenog), *unpublished master thesis.*
37. Mishchenko Y. (1999) Precision Quantum Mechanical Variational Calculations of Three-Body Coulomb System ($dt\mu$), B.Sc. thesis (Supervisor: I. Simenog), *unpublished bachelor thesis.*

## *Talks and Presentations*

### Talks and Presentations at National and International Meetings

1. Y. Mishchenko, M. Kaya "Detecting The Attention State Of An Operator In Continuous Attention Task Using EEG-Based Brain-Computer Interface", 23rd IEEE SIU2015 Signal Processing and Communications Applications Congress, Malatya, Turkey, May 16-19, 2015.
2. M. Kaya, Y. Mishchenko "The system for estimating operator's attention state", in R&D Project Fair 2015 of Mersin Technology Transfer Office, Mersin, Turkey, May 7-8, 2015.
3. E. Onel, Y. Mishchenko, M. Miman "The relationships between use features of Information Management Systems", in Proceedings of Congress on Information Management Systems YBS2014, Istanbul, Turkey, Oct 16-17, 2014.
4. M. Kaya, Y. Mishchenko, H. Seckin "Methods for direct brain-computer communications using a Brain-Computer Interface", in Proceedings of 4th Regional Project Fair of East Mediterranean Universities, Iskenderum, Turkey, April 30, 2014.
5. O. O. Akirmak, M. Miman, Y. Mishchenko "A system for lane-tracking suitable for day and night conditions", in Proceedings of 4th Regional Project Fair of East Mediterranean Universities, Iskenderum, Turkey, April 30, 2014.
6. Y. Mishchenko "Reconstructing functional connectivity in complete neural populations by randomized sparse sampling", in Proceedings of COSYNE 2014 Conference, Salt Lake City, UT, USA, Feb 27 - Mart 02, 2014.
7. Y. Mishchenko "Fluorescent co-localization synaptic markers for connectome reconstructions", in Proceedings of 8th FENS Forum of Neuroscience, Barcelona, Spain, June 14-18, 2012.
8. Y. Mishchenko and L. Paninski "Efficient methods for sampling spike trains in networks of coupled neurons", in Proceedings of COSYNE Conference, Salt Lake City, UT, USA, Feb 28 - Mart 01, 2011.
9. J. Vogelstein, T. Machado, Y. Mishchenko, A. Packer, R. Yuste and L. Paninski "Methods for in vitro neural circuit inference from population calcium imaging data", in Proceedings of COSYNE Conference, Salt Lake City, UT, USA, Feb 28 - Mar 01, 2010.
10. Y. Mishchenko, J. Vogelstein, L. Paninski "Statistical reconstruction of neural connectivity from the data produced using stochastically Cre/Lox guided fluorescent synaptic marker GRASP", in Proceedings of SfN Meeting, Chicago, USA, Sep 17-21, 2009.
11. J. Vogelstein, Y. Mishchenko, A. Packer, T. Machado, R. Yuste, L. Paniski, "Towards confirming neural circuit inference from population calcium imaging", in Proceedings of SfN Meeting, Chicago, USA, Sep 17-21, 2009.

12. Y. Mishchenko, "Using Brainbow and GRASP for detailed reconstruction of complete circuits with light microscopy", in Proceedings of COSYNE Conference, Salt Lake City, UT, USA, Feb 26 - Mart 03, 2009.
13. S. Vitaladevuni, Y. Mishchenko, A. Genkin, D. Chklovskii, K. Harris, "Mitochondria detection in electron microscopy images", in Proceedings of MIAAB 2008, New York, NY, USA, Sep 06, 2008.
14. Y. Mishchenko, J. Spacek, J. Mendenhall, K. Harris and D. Chklovskii, "Full electron microscopy reconstructions reveal organization of hippocampus neuropil at nanometer resolution", in Proceedings of SfN Meeting, Washington, DC, USA, November 15-19, 2008.
15. S. Vitaladevuni, Y. Mishchenko, A. Genkin and D. Chklovskii, "Brain circuit reconstruction from electron micrographs", JFRC HHMI Meeting on "What can computer vision do for neuroscience and vice versa?", JFRC HHMI, Ashburn, VA, USA, September 14-17, 2008.
16. M. Rivera-Alba, Y. Mishchenko, S. Vitaladevuni, R. Fetter, Z. Lu, G. de Polavieja, I. Meinertzhagen, D. Chklovskii, "Reconstructing the first stage of visual processing", JFRC HHMI Meeting on "What can computer vision do for neuroscience and vice versa?", JFRC HHMI, Ashburn, VA, USA, September 14-17, 2008.
17. Y. Mishchenko, A. Genkin, D. Chklovskii, "Automation of reconstruction of neuropil from serial electron micrographs: current results and future prospects", JFRC HHMI Meeting on "Neural Circuit Reconstruction", JFRC HHMI, Ashburn, VA, USA, September 23-26 2007.
18. D. Chklovskii, Y. Mishchenko, J. Spacek, K. Harris, "Analysis of the neuropil micro-architecture using semi-automated 3D reconstructions from electron microscope", JFRC HHMI Meeting on "Neural Circuit Reconstruction", JFRC HHMI, Ashburn, VA, USA, September 23-26 2007.
19. K. Harris, J. Spacek, Y. Mishchenko, D. Chklovskii, "What we can learn about circuitry from high resolution, full volume reconstruction of brain neuropil", JFRC HHMI Meeting on "Neural Circuit Reconstruction", JFRC HHMI, Ashburn, VA, USA, September 23-26 2007.
20. Y. Mishchenko, D. Chklovskii, "Large scale electron microscope reconstructions of brain structure", UKC 2007 Conference, Washington, DC, USA, August 9-12 2007.
21. C.-R. Ji, Y. Mishchenko, "Application of particle physics to Cosmology: correlation of the mass scale between dark matter and Quantum Chromodynamics", UKC 2007 Conference, Washington, DC, USA, August 9-12 2007.
22. Y. Mishchenko, A. Koulakov, D. Chklovskii, "Neuronal circuits reconstruction with full 3D segmentation of serial thin section electron micrographs", CSHL Meeting on "Neuronal Circuits: From Structure To Function", Cold Spring Harbor, NY, USA, March 9-12 2006.
23. Y. Mishchenko, A. Koulakov, D. Chklovskii, "Automated 3D reconstruction of neuronal circuitry from serial electron micrographs", in Proceedings of SfN Meeting, Washington, DC, USA, November 12-16 2005.
24. Y. Mishchenko, C.-R. Ji, "Exploring the properties of dark and visible mass distributions on different scales in the universe", in Proceedings of DPF Meeting, Riverside, CA, USA, August 26-31 2004.
25. Y. Mishchenko, C.-R. Ji, "New approach to variational method for the quantum field theory: example of critical phenomena in 2+1 dimensional nonlinear sigma model", in Proceedings of DPF Meeting, Riverside, CA, USA, August 26-31 2004.
26. Y. Mishchenko, C.-R. Ji, "Phase structure of $\phi^4_{1+1}$ scalar theory with non-zero magnetic field", talk, DPF meeting, Williamsburg, VA, USA, May 24-28 2002.
27. Y. Mishchenko, C.-R. Ji, "The general quantum field theory of flavor mixing", in Proceedings of SESAPS Conference, Auburn, AL, USA, October 31 - November 2 2002.

28. Y. Mishchenko, C.-R. Ji, "Nonperturbative vacuum effect in meson mixing", in Proceedings of SESAPS Conference, Charlottesville, VA, USA, November 4-6 2001.

**Other Talks and Presentations**

29. Y. Mishchenko "Bayesian inference of neural connectivity from calcium imaging data in the presence of hidden inputs", Center for Theoretical Neuroscience Seminar, Columbia University, New York, NY, USA, December 3, 2010.
30. Y. Mishchenko "Strategies for recovering exact structure of neural circuits with broadly targeted fluorescent connectivity probes", Princeton Theoretical Group Colloquium, Princeton University, Princeton, NJ, USA, April 23, 2009.
31. J. Vogelstein, Y. Mishchenko, A. Packer, T. Machado, R. Yuste, L. Paninski "Towards confirming neural circuit inference from population calcium imaging", NIPS 2009 Workshop on Connectivity Inference in Neuroimaging, Whistler, Canada, December 12, 2009.
32. Y. Mishchenko, D. Chklovskii, "Automated large scale reconstruction of neural circuits using electron microscopy", Annual Meeting of the Sloan-Swartz Center for Theoretical Neurobiology, Sand Diego, CA, USA, July 28-31 2007.
33. C.-R. Ji, Y. Mishchenko, "Correlations of Mass Distributions between Dark Matter and Visible Matter", KIAS-APCTP-DMRC Workshop "The Dark Side of the Universe", Seoul, Korea, May 24-26 2005.
34. Y. Mishchenko, I. Simenog, "Nonperturbative mass renormalization in 2+1 scalar Yukawa model", talk, Annual Student Conference at National Kiev University of Taras Shevchenko, Kiev, Ukraine, May 2000.
35. Y. Mishchenko, I. Simenog, "Variational high-precision calculations of the meso-molecules ground states", talk, Annual Student Conference at National Kiev University of Taras Shevchenko, Kiev, Ukraine, May 1999.