

CONTACT
INFORMATION

Laboratory for Machine Learning and Knowledge
Representation
Ruđer Bošković Institute
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CURRENT
POSITION

Research Associate at Ruđer Bošković Institute, Croatia, 11/2017 – present

RESEARCH
INTERESTS

- interpretable and scalable machine learning and deep learning
- data science and big data methodologies and applications
- computational sciences: social science, neuroscience and medicine
- complex networks, agent based modeling and simulation
- human behavior modeling, socio-technical systems, smart cities
- cloud and ubiquitous computing, human-driven computing and affective computing
- self-aware, self-adaptive and self-organizing systems

RESEARCH
EXPERIENCE

Research Assistant at Ruđer Bošković Institute, Croatia, 02/2010 – 11/2017

Scientific, research and development activities in diverse topic areas focused around visual analysis, distributed computing, big data analysis and data science in general. Actively participating in different national, bilateral and international industry and scientific projects. Preparing project proposals for international (FP7 and Horizon 2020) and national project initiatives.

Visiting research scholar at Center for Polymer Studies, Department of Physics, Boston University, United States, 09/2014 - 09/2015

Collaboration with Professor H. Eugene Stanley. Worked on modeling and analysis of complex networks vulnerabilities to failures and attacks, with application to socio-technical and socio-economic systems. Results published in two top-tier multidisciplinary journals.

EDUCATION

University of Zagreb, Faculty of Electrical Engineering and Computing, Croatia

PhD in Computer Science (February 2010 – March 2017)

Thesis: *Vulnerability of dynamic complex networks with local dependencies and recovery process*, scientific contributions published in top journals and conference proceedings, developed modular simulation framework for dynamic complex networks analysis on distributed computing environment

- **Extended theory and concepts in the field of complex networks**, with specific focus on modeling and evaluating vulnerabilities of dynamic complex networks with local-dependencies and active recovery process to cascade failures caused by continuous ongoing time-dependent attacks and by consequences of initiating an attack on a competing network.
- **Application of the complex network framework to the theory-based data analysis** of stability in emerging large scale socio-technical and socio-economic systems.

MSc in Computer Science (October 2004 – September 2009)

Thesis: *Widget-based Environment For Textual Web Content Translation*

Awarded with State scholarship for gifted students. Prize awarded solutions in three research and development challenges related to visual analytics and future emerging Web technologies. Internship at Ericsson Nikola Tesla summer camp. Worked as a demonstrator.

RESEARCH
PROJECTS

Biomedical imaging of breast carcinoma (BOBCat), research project lead by University of Zagreb, School of Medicine founded by Croatian Science Foundation (HRZZ), January 2020 - July 2024, scientific collaborator, designing explainable AI techniques for medical image analysis and diagnosis

National Initiatives for Open-Science in Europe (NI4OS), EU H2020, (September 2019 - August 2022), scientific collaborator, incorporating FAIR principles in scientific services

A Machine Learning Approach to Identifying Healthy Aging: Developing Healthy Aging Phenotypes and Personas in the Canadian Longitudinal Study on Aging, Catalyst Grant (prof. Susan Kirkland), scientific collaborator on analysis of CLSA data

Understanding immigration and integration through interdisciplinary models of social dynamics, Slovenian Research Agency (ARRS) Grant (prof. Boris Podobnik), scientific collaborator, designing and developing online surveys and social experiments based on game theory models on oTree platform.

Network for Sustainable Ultrascale Computing, COST Action IC1305 (March 2014 - March 2018), project and organizing initiatives related to data science and distributed computing.

Scalable Big Data Bioinformatics Analysis in the Cloud bilateral project with Medical University of Innsbruck, Austria funded by Ministry of Science, Education and Sports, Croatia (January 2014 - December 2015), prepared the project proposal and worked on the deployment of Big Data analysis stacks and workflows on Clouds.

SCI-BUS: Scientific gateway Based User Support funded by Seventh Framework Programme (FP7), European Commission (October 2012 - October 2015), extended functionally of WSPGRADE gUSE framework for running job workflows on Sun Grid Engine-based computing environments and established application-specific end-user gateway (AdriaScience) on Croatian national cluster and Grid computing infrastructure.

Optimization of energy consumption in distributed computing systems bilateral project with Jozef Stefan Institute, Ljubljana, Slovenia funded by Ministry of Science, Education and Sports, Croatia (January 2012 - December 2013), prepared project proposal and worked in two research directions: (1) the evaluation parallel and distributed applications energy consumption on different computational environments for defining execution-energy policies and (2) consolidation and auto-scaling computational resources in Cloud environment according to application specific needs.

Methods of Scientific Visualization funded by Ministry of Science, Education and Sports, Croatia (September 2007 - December 2013), worked on visual analysis and biomedical 3D imaging/thermography.

4D TG: 4D Thermography System for Non-invasive diagnostics funded by Business Innovation Center of Croatia (February 2011 - September 2011), prepared project proposal, co-led design and development of software (control, calibration, visualization) for multi-resolution 3D thermal imaging system consisted of high-resolution offline 3D scanner and a real-time low-resolution 3D scanner (depth camera – Microsoft Kinect), both of them paired together with a thermal imaging camera.

EmbAssi: Reconfigurable embedded systems based assistive applications for elderly people bilateral project with Budapest University of Technology and Economics, Hungary funded by Ministry of Science, Education and Sports, Croatia (September 2009 - September 2011), worked in the fields of ambient intelligence and biomedical monitoring with focus on elderly assisted living applications.

TEACHING	<p><u>University of Zagreb, Faculty of Science, Department of Mathematics, Croatia</u> As a teaching assistant prepared and held lectures and laboratory sessions, prepared and graded exams, held office hours for the Machine learning (summer 2011/2012, 2012/2013, 2013/2014, 2017/2018, 2018/2019) and Artificial intelligence (winter semester 2011/2012) courses.</p> <p><u>Algebra University Collage, Zagreb, Croatia</u> Prepared and held lectures for the Advanced Machine Learning Methods and Data Preparation courses.</p> <p><u>College of Business and Management "Baltazar Adam Krčelić", Croatia</u> Prepared and held lectures on augmented reality and applications based on 3D graphics, and mentoring student final projects for Multimedia Communications (summer 2010/2011, 2011/2012, 2012/2013, 2013/2014) course.</p> <p><u>University of Zagreb, Faculty of Electrical Engineering and Computing, Croatia</u> As a demonstrator held laboratory sessions, graded exams and final projects for Programming language translation (winter 2007/2008, 2008/2009) and Introduction to theoretical computer science (summer 2007/2008, 2008/2009) courses.</p>
PROFESSIONAL TRAINING	<p><u>Summer schools and workshops</u></p> <p>BigBrain Workshop 2019 Düsseldorf: AI methods and HPC based processing, Haus der Universität Düsseldorf & Forschungszentrum Jülich (20-21 August, 2019)</p> <p>From Game Theory to Computational Social Science and Beyond, ETH Zurich, Horizon2020 project SoBigData (4-5th June, 2019)</p> <p>BIOTS 2018 – Blockchain & IoT School, ETH Zurich (12-16th February, 2018)</p> <p>CryptoDatathon, ETH Zurich, Switzerland (4-9th June, 2018)</p> <p>First International Summer School on Data Science, Split, Croatia, Center of Research Excellence for Data Science and Advanced Cooperative Systems (26-30th September, 2016)</p> <p>Third European Ph.D. School on Mathematical Modelling of Complex Systems, Technological Educational Institute of Crete, Heraklion, Greece (13th - 28th July, 2013)</p> <p>WS-PGRADE/gUSE Code Camp, the Computer and Automation Research Institute, Hungarian Academy of Sciences, Budapest, Hungary (28th - 30th November, 2012), hands-on introduction to the latest developments in Grid/Cloud computing and scientific gateway technologies.</p> <p><u>Internships</u></p> <p>Ericsson Summer Camp funded by Ericsson Nikola Tesla, Zagreb, Croatia (June 2008 – August 2008), worked on an automatic translation of TTCN-2 test suites to C code. Technical report: T. Lipic and B. Drazic: <i>TTCN-2 to C translator</i>, Ericsson Nikola Tesla & Faculty of Electrical Engineering and Computing, Zagreb, Croatia, 2008</p>
ORGANIZING & LECTURING ACTIVITIES	<p>22st International Conference on Discovery Science (22-25th January, 2018), Split, Croatia, Organizational board of PhD Symposium</p> <p>DC - Distributed Computing in Data Science and Biomedical Engineering, MIPRO (2017-), Steering Committee</p> <p>Brainhack Zagreb, Zagreb, Croatia (2018, 2019)</p>

NESUS Winter School and PhD Symposium on Heterogeneous Computing and Data Science, Zagreb, Croatia, COST Action NESUS (22-25th January, 2018)

Second International Summer School on Data Science, Split, Croatia, Center of Research Excellence for Data Science and Advanced Cooperative Systems (25-29th September, 2017)

AWARDS

- 2015, 2018 Annual award for best scientific papers, Ruđer Bošković Institute.
- 2011 Best poster award, event *Scientific Encounters of the Third Kind*, Ruđer Bošković Institute. Poster title: *3D Thermography and Medical Applications*.
- 2010 Member of a team awarded the VIDI e-Novation Award *Golden Tesla's Egg*
- 2008 Member of a team awarded the Migrant Boat Mini Challenge Award: Simple and Effective Integrated Display award in IEEE VAST 2008 Challenge
- 2008 Member of a team awarded the 3rd Prize in e-business project contest awarded by Agrokor, leading Croatian food and retail conglomerate
- 2008 Member of a team awarded the 1st award in Silverlight Web Start Contest organized by student organization e-Student sponsored by Microsoft
- 2004 - 2009 State student scholarship for gifted students

TECHNICAL SKILLS

Very good knowledge and work experience with:

- **Programming Languages:** Java, Python, C#, C++/C, Scala and Julia
- **Mathematical and statistical computing:** Python, R (R studio), Matlab
- **Data processing and analysis frameworks and platforms:** pytorch, tensorflow, caffe, RapidMiner, Weka, Hadoop, Spark, Flink, Storm
- **Agent-based modeling:** Mason/DMason and GAMA
- **Network analysis:** GraphStream/SNAP, graph-tool/igraph/NetworkX, Gephi/Cytoscape
- **Behavioral research:** oTree, nodeGame, jsPsych, Breadboard
- **Databases technologies:** Microsoft SQL Server (ADO.NET, Entity Framework), PostgreSQL, MySQL, MongoDB, HBase, Neo4j, Redis, HDF5 and SciDB
- **Web development (Internet and Web technologies):** ASP.NET, Java EE (Servlet, JSP, JSF), Django, PHP, JavaScript, AJAX, REST, Comet, HTML5, CSS3
- **Other:** Repositories (Git, SVN), TeX, Microsoft Office, OmniGraffle, Inkscape

ORGANIZATIONAL & SOCIAL SKILLS

Perennial teamwork experience
 Project leadership experience on several research and development projects
 Communicative, easily approachable
 Willing to learn and teach and share knowledge

PUBLICATIONS

Journal papers

- [1] Cetinić, E., Lipic, T., Grgic, S. "Learning the Principles of Art History with convolutional neural networks", *Pattern recognition letters*, 129, 2020, 56-62, doi: 10.1016/j.patrec.2019.11.008
- [2] Kulikovskikh I., Prokhorov S, Lipic T., Legovic T., Šmuc T. BioGD: Bio-inspired robust gradient descent. *PLoS ONE* 14(7): e0219004, 2019, doi: 10.1371/journal.pone.0219004
- [3] Cetinic, E., Lipic, T., Grgic, Sonja. "A Deep Learning Perspective on Beauty, Sentiment and Remembrance of Art", *IEEE Access*, 2019, doi: 10.1109/ACCESS.2019.2921101
- [4] Cetinic, E., Lipic, T., Grgic, Sonja. "Fine-tuning Convolutional Neural Networks for fine art classification", *Expert systems with applications*, 114 (2018), 107-118 doi: 10.1016/j.eswa.2018.07.026
- [5] Podobnik, B., Lipic, T., Bojic, I., Antulov-Fantulin, N., "Cities' influence on spatial epidemics: Comment on "Pattern transitions in spatial epidemics: Mechanisms and emergent properties" by Gui-Quan Sun et al.", *Physics of life reviews*, Vol. 19, 2016, pp. 90-92.
- [6] Podobnik, B., Lipic, T., Horvatic, D., Majdandzic, A., Bishop, S., Stanley, H.E. "Predicting the Lifetime of Dynamic Networks Experiencing Persistent Random Attacks", *Nature Scientific Reports*, Vol. 5, No. 14286, 21 September 2015, doi: 10.1038/srep14286.
- [7] Podobnik, B., Horvatic, D., Lipic, T., Perc, M., Buldu, J.M., Stanley, H.E. "The Cost of Attack in Competing Networks", *Journal of the Royal Society Interface*, Volume 12, Issue 112, November 2015, 20150770, doi:10.1098/rsif.2015.0770.
- [8] Davidovic D., Depolli, M., Lipic, T., Skala, K., Trobec, R. "Energy Efficiency of Parallel Multicore Programs", *Scalable Computing: Practice and Experience*, Vol. 16, No. 4, 2015., pp. 437-448.
- [9] Skala, K., Lipic, T., Sovic, I., Grubisic, I. "Dynamic Thermal Models for Human Body Dissipation". *Periodicum Biologorum*. Vol. 117, No. 1, pp. 167-176, 2015.
- [10] Skala, K., Davidovic, D., Lipic, T., Sovic, I. "G-Phenomena as a Base of Scalable Distributed Computing —G-Phenomena in Moore's Law". *International Journal of Internet and Distributed Systems*. Vol 2, No. 1, pp. 1-4, 2014.
- [11] Skala, K., Lipic, T., Sovic, I., Grubisic, I., Grbesa, I. "Towards 3D thermal models standardisation for human body in motion". *Quantitative InfraRed Thermography Journal*. Vol. 10, No. 2, pp. 207-221, 2013.
- [12] Bojic, Iva; Lipic, T., Kusek, M., Ježic, G. "Extending the JADE Agent Behaviour Model with JBehaviourTrees Framework". *Lecture Notes in Computer Science*, 2011.
- [13] Grubisic, I., Gjenero, L., Lipic, T., Sovic, I., Skala, K. "Medical 3D thermography system". *Periodicum Biologorum*, Vol. 4, No. 4, pp. 401-406, 2011.
- [14] Skala, K., Lipic, T., Sovic, I., Gjenero, L., Grubisic, I. "4D Thermal Imaging System for Medical Applications". *Periodicum Biologorum*, Vol. 4, No. 4, pp. 407-416, 2011.

- [15] Sovic, I., Lipic, T., Gjenero, L., Grubisic, I., Skala, K. "Experimental verification of heat source parameter estimation from 3D thermograms", *Periodicum Biologorum*, Vol. 4, No. 4, pp. 417-423, 2011.
- [16] Skala Kavanah, H.; Dubravic, A.; Grazio, S; Lipic, T., Sovic, I. "Computer supported thermography monitoring of hand strength evaluation by electronic dynamometer in rheumatoid arthritis – a pilot study", *Periodicum Biologorum*, Vol. 4, No. 4, pp. 433-437, 2011.

Book chapters

- [17] Bojic, Iva; Lipic, T., Podobnik, V. "Bio-inspired Clustering and Data Diffusion in Machine Social Networks". *Computational Social Networks: Mining and Visualization* (Abraham, Ajith; ed.), Series in Computer Communications and Networks, Springer Verlag, London, 2011, pp. 51-79.

Publications in conference proceedings (full papers)

- [18] Cetinic, E., Lipic, T. and Grgic, S. "How Convolutional Neural Networks Remember Art", *IWSSIP 2018: 25th International Conference on Systems, Signals and Image Processing*, 1-5, June 2018, IEEE.
- [19] Lipic, T., Skala, K., Afgan, E. "Deciphering Big Data Stacks: An Overview of Big Data Tools", *Big Data Analytics: Challenges and Opportunities (BDAC-14)*, 2014., New Orleans, LA, USA.
- [20] Bojic, Iva; Lipic, T., Kusek, M. "Scalability Issues of Firefly-Based Self-Synchronization in Collective Adaptive Systems". *2nd FoCAS Workshop on Fundamentals of Collective Systems at SASO 2014*. 08.09.2014, London, United Kingdom, 2014.
- [21] Forer, Lukas; Lipic, T., Schönherr, S., Weissensteiner, H., Davidovic, D., Kronenberg, F., Afgan, Enis. "Delivering Bioinformatics MapReduce Applications in the Cloud". *MIPRO 2014: Proceedings of the 37th International Convention on Information and Communication Technology, Electronics and Microelectronics*, 388-392, 2014, Rijeka, Croatia.
- [22] Grubisic, I., Grbesa, I., Lipic, T., Skala, K., Zrinscak, O., Ivekovic, R., Vatavuk, Z. "Natural eye gaze computer interaction for medical oculography diagnosis: Current status and future prospects". *MIPRO 2014: Proceedings of the 37th International Convention on Information and Communication Technology, Electronics and Microelectronics*, 421-425, 2014, Rijeka, Croatia.
- [23] Afgan, E., Skala, K., Davidovic, D., Lipic, T., Sovic, I. "CloudMan as a tool execution framework for the cloud. *MIPRO 2012*": *Proceedings of the 35th International Convention on Information and Communication Technology, Electronics and Microelectronics*, Vol. DC-VIS, pp. 437-441, 21-25 May 2012, Rijeka, Croatia.
- [24] Kolaric, D., Lipic, T., Grubisic, I., Gjenero, L., Skala, K. "Application of Infrared Thermal Imaging in Blade System Temperature Monitoring", *ELMAR 2011: Proceedings of the 53rd International Symposium on Electronics in Marine*, pp. 309-312, 14-16 Sept. 2011.
- [25] Kiss, N., Patai, G., Hanák, P, Lipic, T., Skoda, P, Gjenero, L., Dubravic, A., Medved Rogina, B., Skala, K. "Vital Fitness and Health Telemonitoring of Elderly People". *MIPRO 2011: Proceedings of the 34th International Convention on Information and Communication Technology, Electronics and Microelectronics*, Vol. 1: MEET&GVS, 310-315, 2011, Rijeka, Croatia.

- [26] Skoda, P. Lipic, T., Srp, Ágoston; Medved Rogina, B., Skala, K., Vajda, F. "Implementation Framework for Artificial Neural Networks on FPGA". MIPRO 2011: Proceedings of the 34th International Convention on Information and Communication Technology, Electronics and Microelectronics, Vol. 1: MEET&GVS, 274 – 278, 2011, Rijeka, Croatia.
- [27] Grubisic, I., Gjenero, L., Lipic, T., Sovic, I., Skala, K. "Active 3D scanning based 3D thermography system and medical applications", MIPRO 2011: Proceedings of the 34th International Convention on Information and Communication Technology, Electronics and Microelectronics, Vol. 1: MEET&GVS, 300-304, 2011, Rijeka, Croatia.
- [28] Sovic, I., Lipic, T., Gjenero, L., Grubisic, I., Skala, K. "Heat source parameter estimation from scanned 3D thermal models". MIPRO 2011: Proceedings of the 34th International Convention on Information and Communication Technology, Electronics and Microelectronics, Vol. 1: MEET&GVS, 283-287, 2011, Rijeka, Croatia.
- [29] Matijas, M., Lipic, T. "Application of Short Term Load Forecasting using Support Vector Machines in RapidMiner 5.0", RapidMiner Community Meeting and Conference – RCOMM2010, Dortmund, Germany, September 2010.
- [30] Trobec, R., Depolli, M., Skala, K., Lipic, Tomislav. "Energy Efficiency in Large-Scale Distributed Computing Systems". MIPRO 2013: Proceedings of the 36th International Convention on Information and Communication Technology, Electronics and Microelectronics, 2013, Rijeka, Croatia.
- [31] Davidovic, D., Lipic, T., Skala, K. "AdriaScience Gateway: Application Specific Gateway for Advanced Meteorological Predictions on Croatian Distributed Computing Infrastructures", MIPRO 2013: Proceedings of the 36th International Convention on Information and Communication Technology, Electronics and Microelectronics, 2013, Rijeka, Croatia.
- [32] Miklin, R. Lipic, T., Konyha, Z., Beric, M., Freiler, W., Matkovic, K., Gracanin, Denis. "Migrant boat mini challenge award: Simple and effective integrated display geo-temporal analysis of migrant boats", VAST '08: Symposium on Visual Analytics Science and Technology, Oct. 2008. pp. 19-24, doi:10.1109/VAST.2008.4677387

Abstracts

- [33] Stajduhar A., Lipic T., Judas M., "Computational neuron-level analysis of laminar structure in histological images of human brain", OHBM 2019 - Organization for Human Brain Mapping, Rome, Italy, June 2019. (poster, peer review, abstract, scientific).
- [34] Lipic, T., Skala, K., "The Key Drivers of Emerging Socio-Technical Systems: A Perspective of Dew computing in Cyber-Physical Systems". MIPRO DEWCOM 2017, Opatija, Croatia, May 2017. (talk, abstract, scientific)
- [35] Kovacevic, G., Lipic, T., Skala, K., Capan, I., Pivac, B., "Breakdown simulation in thin dielectric films based on DLA model", E-MRS 2010 Spring Meeting BOOK OF ABSTRACTS, Strasbourg, 2010. (poster, peer review, abstract, scientific).