

CURRICULUM VITAE for Dr. Martin Horvat

Personal information:

Date of Birth: April 25, 1977 in Maribor, Slovenia
Address: Ulica Nikola Tesla 9a, SI-1230 Domžale, Slovenia
Marital status: Married
Children: 2
Nationality: Slovenian
Languages: Slovene (native), English (active), German and Serbo-Croatian (passive)

Work contact:

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Professional Preparation:

1996 - 2000 Undergraduate in physics, Faculty of Mathematics and Physics, University of Ljubljana, Slovenia
2001 BSc, Title »Nonlinear dynamical model of field and particle interaction« (advisor: Tomaž Prosen)
2001 - 2004 Postgraduate in cond. matter physics, Faculty of Mathematics and Physics, University of Ljubljana
2006 PhD, Title »Uni-directional transport in billiard chains« (advisor: Tomaž Prosen)
2006 - 2007 Post-doc at Department of Mathematics, University of Bologna, Italy.
2008 - 2009 Post-doc at Department of Physics, University of Ljubljana, Slovenia
2010 - 2011 Royal Society Visiting Fellow in Nonlinear Biomedical Physics Group, Lancaster University, UK
2016 - 2017 Sabbatical at Department of astrophysics and planetary sciences, Villanova university, USA.

Work history:

2001 - 2006 Teaching assistant at the Faculty of Mathematics and Physics, Dep. of physics, University of Ljubljana.
2006 - 2007 Post-doc researcher at Department of Mathematics, University of Bologna, Italy.
2007 - Teaching assistant and researcher at the Faculty of Mathematics and Physics, Dep. of Physics, University of Ljubljana with a permanent position from 2011
2016 - 2017 Post-doc researcher at Department of astrophysics and planetary science, Villanova university, USA.

Appointments:

2001 - 2006 Teaching assistant at the Faculty of Mathematics and Physics, University of Ljubljana.
2007 - 2008 Researcher at the Faculty of Mathematics and Physics, Dep. of Physics, University of Ljubljana.
2011 - 2018 Researcher and teaching assistant at the Faculty of Mathematics and Physics, University of Ljubljana
2018 - Assistant professor at the Faculty of Mathematics and Physics, University of Ljubljana

Teaching experience:

2000 - 2002 Assistant at Laboratory work (Auto Cad, Digital imaging)
2001 - 2004, 2005 - 2006, 2007 - 2014, 2017- Assistant at Physical laboratory course II, 2nd year students
2004 - 2006 Assistant at Basic course in applied mathematics, 3rd year students
2007 - 2008 Assistant at Physics I at Faculty of Natural sciences, 1st year students
2011 - 2014 Assistant at Physics 2, 2nd year students
2010 - 2015 Assistant at Physics for student of pharmacy, 1st year students
2015 - 2016 Assistant at Modern physics 1, 2nd year students
2015 - 2016, 2017 - Assistant at Theory of dynamical systems, master level course
2017 - 2016, 2017 - Assistant at Computer tools for physicists, 1st year students
2017 - 2020 Assistant at Physical laboratory course III, 3rd year students
2020- Lectures Proseminar B, 1st year students
2021- Lectures Numerical modeling of the Atmosphere, master level course

Leadership experience:

2005 -	Leading system linux administrator and computer systems designer on the Dep. of physics, FMF
2007 - 2018	Substitute head of Physical laboratory course II, 2nd year students
2018 -	Head of Physical laboratory course II, 2nd year students
2010 - 2014	Head of Central inventory management commission, FMF
2009 - 2012	Substitute head and after that head of the Council of the computer center, FMF
2017 - 2020	Representative of the Dep. of Physics in the Council of the computer center, FMF

Research interests:

The spectrum of my research interests is quite broad and usually connected to my primary fields of interest, i.e. the theory of dynamical systems, applied mathematics and mathematical physics. Main research topics are

- **studying dynamical properties of classical and quantum systems** such as ergodicity, mixing property and classical-quantum correspondence in classical phase space-time
- **transport properties of extended structures** from different view points, especially by using scattering formalism, and on this basis developing concepts of thermo-electrical heat engines with high efficiency
- **development of relativistic global navigation system**, which is autonomous and self-assembled.

Currently, I focus on the following projects:

- **understanding and mathematical modeling of different astrophysical bodies** in collaboration with the group in University of Villanova, US.
- **modeling of weather forecast uncertainty** of global ensemble prediction system in collaboration with N. Žagar (University of Ljubljana, SLO)
- development of software package for 2D radiative transfer equations applied to medical physics problem with M. Milanic and R. Jeraj (University of Ljubljana, SLO & University of Wisconsin, US)
- **statistical properties of linear predictor resonance in the presence of noise**, which I believe should be the essential part of any signal analysis.

In future is would like to deepen the knowledge of dynamical systems with the emphasis on mathematical-physical content and renew research on the project

- **influence of dynamical properties of thermo-electrical engines** in collaboration with the researchers at University of Como (IT)

Computer related skills:

- Languages: basic assembler, (Free)Pascal, Delphi/Lazarus, C/C++, Bash/awk/perl scripting, Python
- Computational: Mathematica, Matlab
- Operating systems: MS Windows, Linux (RedHat, Debian, Ubuntu, ...)
- HPC: administration of linux systems, planning, building and managing computing clusters
- Singleboard computers/microcontrollers: pic micro-controllers, Arduino, raspberry Pi

Collaboration on scientific projects (last 5+ years)

<i>Provider</i>	<i>Title and my role in the project</i>	<i>Duration</i>	<i>PI</i>
EU FP6	<i>Brain, Respiration And Cardiac Causalities In Anaesthesia (BRACCIA)</i> Applying standard classification schemes to processed cardio-vascular data through WAKE and developing new classification scheme derived from their previous analysis.	2006-2009	Aneta Stefanovska
ESA	Relativistic global navigation satellite system (RGNSS) Development of computational background (integrations, special functions, ..) for testing ideas related to possible self-assembly of relativistic reference frame and coordinate system based on inter-communication satellites, with emphasis on multi-precision calculation.	2011-2014	Andreja Gomboc
ARRS*	Thermodynamics of dissipative nanosystems Providing computational and technical support on clusters.	2016-2018	Žnidarič Marko
ARRS*	Open multiparticle systems	2014-2017	Prosen Tomaž

	Working on scientific problems, dealing with mathematical details and providing computational and technical support.		
ARRS*	Integrability and ergodic theory of nonequilibrium quantum many-body systems	2013-2016	Prosen Tomaž
	Working on mathematical details and providing computational and technical support on clusters.		
Villanova	Simulation of binary eclipsing stars	2016-2017	Andrej Prša
	Developing the computational intensive part of the PHysics Of Eclipsing BinariEs (PHOEBE) backend involving generation and deformations of triangular meshes of implicitly defined surfaces, and obtaining analytical estimates of properties of different astrophysical bodies.		
ARRS	Infrastructure center of FMF	2018-	Anton Ramšak
	Leading most of infrastructural projects connect to network and major computer resources at the Department of physics from technical point of view: planing, advising and implementing.		
ESA/ HORIZON	Relativistic Positioning Systems experiment	2020-2021	Martin Horvat
	PI investigator at FMF developing a new processing strategy for orbit and clock solution using only Inter-Satellites Links observables apply it for the first time to real data.		
HORIZON	EuroCC – National Competence Centers within the EuroHPC	2020-	
	Advising people how to perform HPC at Department of physics and how to eventually use RIVR HPC cluster in Maribor (Slovenia).		

*ARRS – Slovenian research agency

Full bibliography:

Articles

- Horvat, Martin** and Tomaž Prosen (2003a). "Value statistics of chaotic Wigner function". In: Prog. Theor. Phys. Suppl. 150, pp. 348–352. eprint: quant-ph/0602007.
- Horvat, Martin** and Tomaž Prosen (2003b). "Wigner function statistics in classical chaotic systems". In: J. Phys. A: Math. Gen 36, pp. 4015–4034. eprint: quant-ph/0601165.
- Horvat, Martin** and Tomaž Prosen (2004). "Uni-directional transport properties of a serpent billiard". In: J. Phys. A: Math. Gen 37, pp. 3133–3145. eprint: nlin.CD/0601055.
- Martin Horvat** Tomaž Prosen, and Mirko Degli Esposti (2006). "Quantum-classical correspondence on compact phase space". In: Nonlinearity 19, pp. 1–23. eprint: quant-ph/0601139.
- Žnidarič, Marko and **Martin Horvat** (2006). "Exponential complexity of an adiabatic algorithm for an NP-complete problem". In: Phys. Rev. A 73, p. 022329. eprint: quant-ph/0509162.
- Horvat, Martin** and Mirko Degli Esposti (2007). "The Egorov property in perturbed cat maps". In: J. Phys. A: Math. Theor. 40, pp. 9771–9781. eprint: arXiv:0706.4397v2[quant-ph].
- Horvat, Martin** and Tomaž Prosen (2007a). "Dynamical approach to the linear chains of scatterers". In: J. Phys. A: Math. Theor. 40, pp. 11593–11606. eprint: arXiv:0708.1288v1[quant-ph].
- Horvat, Martin** and Tomaž Prosen (2007b). "The bends on a quantum waveguide and cross-products of Bessel functions". In: J. Phys. A: Math. Theor. 40, pp. 6349–6379. eprint: arXiv:0705.3581v1[quant-ph].
- Horvat, Martin** (2009). "The ensemble of random Markov matrices". In: J. Stat. Mech. 2009, P07005. eprint: arXiv:0812.0567v2[math.ST].
- Martin Horvat** Tomaž Prosen, and Giulio Casati (2009). "An exactly solvable model of a highly efficient thermoelectric engine". In: Phys. Rev. E 80, p. 010102. eprint: arXiv:0905.3997v2[cond-mat.stat-mech].
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- Martin Horvat** Tomaž Prosen, and Giulio Casati (2011). "Nanocooler". In: J. Stat. Mech. 2011, P10026. eprint: arXiv:1107.5421v1.
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- Žnidarič, Marko and **Martin Horvat** (2013). "Transport in a disordered tight-binding chain with dephasing". English. In: The European Physical Journal B 86.2, 67, p. 11. issn: 1434-6028. doi: 10.1140/epjb/e2012-30730-9.
- Gomboc, Andreja, **Martin Horvat** et al. (2014). "Relativistic Positioning Systems and Gravitational Perturbations". In: Acta Futura 7, pp. 79–85. url: <http://dx.doi.org/10.2420/AF07.2013.79>.
- Kenwright, D. A., **Martin Horvat** et al. (2015). "The discriminatory value of cardiorespiratory interactions in distinguishing awake from anaesthetised states: a randomised observational study". In: Anaesthesia, n/a–n/a. issn: 1365-2044. doi: 10.1111/anae.13208.
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Books/Manuscripts

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