Curriculum Vitae of Igor V. Tarasyuk

- **Personal data**

  Name: IGOR VALERIEVICH TARASYUK.

  Date and place of birth: 1971, Novosibirsk, Russia.

  Position: Senior Researcher.

  Work address: Dr. Igor V. Tarasyuk, Laboratory for Theory of Concurrent Processes, A.P. Ershov Institute of Informatics Systems, Siberian Branch of the Russian Academy of Sciences (IIS SB RAS, `http://www.iis.nsk.su`), 6, Acad. Lavrentiev pr., Novosibirsk 630090, Russian Federation.

  Phone: +7 383 330 63 60 (ext. 23 27). Fax: +7 383 332 34 94.
  E-mail: itar@iis.nsk.su. Internet: `http://itar.iis.nsk.su`.

- **Academic degrees**

  1992 Bachelor's degree in Mathematics and Applied Mathematics with thesis "Transformation formulas of algebra AFP_2 into canonical form". Department of Mathematics and Mechanics, Novosibirsk State University (NSU, `http://www.nsu.ru`), Novosibirsk, Russia.

  1994 Master's degree in Mathematics and Computer Science with thesis "Equivalences on Petri nets". Chair of Computing Systems, Department of Mathematics and Mechanics, NSU.

  1997 Candidate's grade in Physics and Mathematics (Ph.D. in Mathematics and Computer Science) with thesis "Equivalence notions for models of concurrent and distributed systems". Speciality code 05.13.11 (Mathematical and Programming Support for Computers, Computer Systems and Computer Networks). Specialized Council K 003.93.01, IIS SB RAS.

- **Stages of education**

  1978–1988 Secondary education at Secondary School 8 (SS8, `http://nsk.fio.ru/works/bbe/u6/index.htm`), Berdsk, Novosibirsk region, Russia. Diploma of secondary education with excellence — Silver Medal.

  1985–1988 Supplementary scientific education at Mathematics Department, Specialized Scientific Study Center (SSC, `http://sscadm.nsu.ru`) of NSU. Graduation with excellence.

  1986–1988 Supplementary vocational education at Electrical Appliances Department, Trade School N 56, Berdsk. Graduation with excellence.

  1988–1992 Bachelor's course at Mathematics and Mechanics Department, NSU (1990–1992 — study in specialized Computer Science Group). Specialization at Computing Systems Chair (supervisors DR. LUDMILA A. CHERKASOVA, `http://www.hpl.hp.com/personal/Lucy_Cherkasova/`, and SERGEJ P. MYLNIKOV). Bachelor's diploma.

  1992–1994 Master's course at Mathematics and Mechanics Department, NSU. Specialization at Computing Systems Chair (supervisor PROF. DR. IRINA B. VIRBITSKAITE, `http://persons.iis.nsk.su/en/erson/virbitskaite/`). Master's diploma.

  1994–1997 Post graduate course at Theoretical Programming Laboratory, IIS SB RAS (supervisors PROF. DR. IGOR V. POTTOSIN and PROF. DR. IRINA B. VIRBITSKAITE). Ph.D. thesis has been prepared.

- **Supplementary language education**

  1997–1998 October 1997 – March 1998 — 6-month German language course organized by General Consulate of Germany in Novosibirsk (GCGN, `http://www.nowosibirsk.diplo.de/Vertretung/nowosibirsk/ru/Startseite.html`) .

  1998 August – September — 2-month German language course (Basic Level 3) at Goethe Institute of Bremen (GIB, `http://www.goethe.de/ins/de/ort/bre/enindex.htm`), Germany. Certificate Goethe-Institut, Grundstufe 3.

  1998–1999 October 1998 – January 1999 — 4-month German language course (Medium Levels 1 and 2) at Carl von Ossietzky University of Oldenburg (CvO UO, `http://www.uni-oldenburg.de`), Germany. Certificate DSH (Deutsche Sprachprufung für den Hochschulzugang ausländischer Studienbewerber, `http://www.daad.de/deutschland/de/2.5.2.7.html`).

  1999 April – June — 3-month German language course on communication at CvO UO.

2001–2002 October 2001 – January 2002 — 4-month Italian language course (Basic Level 1) at Lehrzentrum Sprachen und Kulturen (LSK, `http://www.tu-dresden.de/lsk/`) of Technical University of Dresden (TUD, `http://www.tu-dresden.de`), Germany. Certificate with excellence.

- **Foreign languages**

  - *English* (high level).
  - *German* (high level).
  - *Italian* (basic level).

- **Professional background**

1997 October – December — Minor Researcher at Theoretical Programming Laboratory, IIS SB RAS. December — Defence of Ph.D. thesis at IIS SB RAS.

1998–2008 January 1998 – November 2008 — Researcher at Theoretical Programming Laboratory, IIS SB RAS. January 2008 — Presentation of results at a meeting of the scientific council of IIS SB RAS, `http://itar.iis.nsk.su/files/itar/pages/iistalk.pdf` (in Russian). November 2008 — The result of the author "Development and investigation of stochastic models for specification and performance analysis of concurrent systems" (concerning discrete time stochastic Petri nets and process algebras as well as the net and algebraic stochastic equivalences, performance evaluation and reduction) is recognized as **one of the most significant annual achievements of IIS SB RAS**, `http://itar.iis.nsk.su/files/itar/pages/iis08tar.pdf` (in Russian).

2008–2011 December 2008 – June 2011 — Senior Researcher at Theoretical Programming Laboratory, IIS SB RAS.

2011–now July 2011 – till now — Senior Researcher at Laboratory for Theory of Concurrent Processes, IIS SB RAS. November 2013 — The result of the author "Construction of new stochastic process algebras for specification and performance analysis of concurrent systems" (concerning discrete time stochastic process algebras with and without immediate multiactions as well as the algebraic stochastic equivalences, performance evaluation and reduction) is recognized as **one of the most significant annual achievements of IIS SB RAS**, `http://itar.iis.nsk.su/files/itar/pages/iis13tar.pdf` (in Russian).

- **Research abroad**

1995–1996 December 1995 – February 1996 — Guest Researcher, grant VS I/70 564, at Institute of Computer Science, University of Hildesheim (UH, `http://www.uni-hildesheim.de`) (supervisors Prof. Dr. E. Best, `http://www.uni-oldenburg.de/informatik/parsys/kontakte/best/`, and Prof. Dr. I.B. Virbitskaite).

1997 March – April — Guest Researcher, grant VS I/70 564, at Institute of Computer Science, UH (supervisors Prof. Dr. E. Best and Prof. Dr. I.B. Virbitskaite).

1998–1999 October 1998 – July 1999 — Guest Researcher, grant DAAD A/98/38518, at Department of Computer Science, CvO UO (supervisor Prof. Dr. E. Best).

2000–2002 April 2000 – March 2002 — Post-Doctoral Guest Researcher at Faculty of Computer Science, TUD (supervisors Prof. Dr. P. Buchholz, `http://www4.cs.uni-dortmund.de/~Buchholz/`, and Prof. Dr. H. Reichel, `http://wwwtcs.inf.tu-dresden.de/~reichel/`.

2005 June – August — Guest Researcher, grant DAAD A/05/05334, at Department of Computer Science, CvO UO (supervisor Prof. Dr. E. Best).

2008 September – October — Guest Researcher, grant DAAD A/08/08590, at Department of Computer Science, CvO UO (supervisor Prof. Dr. E. Best).

2010 April — Guest Researcher, grants DFG 436 RUS 113/1002/01 and RFBR 09-01-91334, at Department of Computer Science, CvO UO (supervisors Prof. Dr. E. Best and Prof. Dr. I.B. Virbitskaite).

2011 May – June — Guest Researcher, "Invited Researchers" grant of UCLM (`http://www.uclm.es`), at High School of Computer Science Engineering of Albacete (ESII, `http://esiiab.uclm.es`), Spain. September – October — Guest Researcher, grants DFG 436 RUS 113/1002/01 and RFBR 09-01-91334, at Department of Computer Science, CvO UO (supervisors Prof. Dr. E. Best and Prof. Dr. I.B. Virbitskaite).

2014 November 19 – December 19 —- Guest Researcher, grants DFG BE 1267/14-1 and RFBR 14-01-91334, at Faculty of Computer Science, Technical University of Dortmund (TUDort), `http://www.tu-dortmund.de` (supervisor Prof. Dr. Peter Buchholz.

2015 September 1 – September 21 —- Guest Researcher, grant of Spanish Government (Ministry of Science and Innovation) and European Regional Development Foundation (FEDER) TIN2012-36812-C02-02, at ESII (supervisor Prof. Dr. Valentin Valero Ruiz, `http://www.dsi.uclm.es/personal/ValentinValero/`.

October 1 – October 30 — Guest Researcher, grants DFG BE 1267/14-1 and RFBR 14-01-91334, at Faculty of Computer Science, TUDort (supervisor Prof. Dr. Peter Buchholz.

2016 October 2 – October 31 — Guest Researcher, grants DFG BE 1267/14-1 and RFBR 14-01-91334, at Faculty of Computer Science, TUDort (supervisor Prof. Dr. Peter Buchholz).

2018 April 1 – April 30 — Guest Researcher, grant DFG BE 1267/14-1, at Faculty of Computer Science, TUDort (supervisor Prof. Dr. Peter Buchholz).

- **Teaching experience**

1997–1998 September 1997 – January 1998 — Lecturer on Pascal programming at High College of Computer Science (HCCS, `http://www.ci.nsu.ru/`) of NSU.

1999–2000 November 1999 – March 2000 — Lecturer of Mathematics at the Berdsk branch of Novosibirsk Institute of the Humanities (NIH).

February – March 2000 — Lecturer of Pascal Programming at NSU.

2001 April – July — Delivering a lecture course "Equivalence relations for net and algebraic models of concurrency" (`http://itar.iis.nsk.su/files/itar/pages/lectsld.pdf`) at Faculty of Computer Science, TUD.

2005 June — Delivering a lecture "Discrete time stochastic Petri nets: a model for analysis of stochastic concurrent systems" (`http://itar.iis.nsk.su/files/itar/pages/lecoffis.pdf`) at the Oldenburger Forschungs- und Entwicklungsinstitut für Informatik-Werkzeuge und -Systeme (OFFIS, `http://www.offis.de`), Oldenburg, Germany.

2008 October — Delivering a lecture "Performance evaluation in $dtsPBC$" (`http://itar.iis.nsk.su/files/itar/pages/dtspbcsm_pe.pdf`) in the context of the seminar "Students and Doctoral students" at Division of Theoretical Computer Science, Department of Computer Science, CvO UO.

2009 May — Delivering a lecture course "Algebra $dtsPBC$: a discrete time stochastic extension of Petri box calculus" (`http://itar.iis.nsk.su/files/itar/pages/dtspbcsm.pdf`) in the context of the seminar "Models for the analysis and design of concurrent systems" at High School of Computer Science Engineering of Albacete (ESII, `http://esiiab.uclm.es`), Spain.

2011 October — Delivering a lecture "Performance evaluation of the shared memory system in $dtsPBC$" (`http://itar.iis.nsk.su/files/itar/pages/oldb11sld.pdf`) at the workshop in the context of "Computer Science Colloquium" at Department of Computer Science, CvO UO.

2011 October — Delivering a lecture "Stochastic equivalence for modular performance evaluation in discrete time stochastic Petri box calculus" (`http://itar.iis.nsk.su/files/itar/pages/dort11sld.pdf`) in the context of "Chair Colloquium" at Chair of Practical Computer Science, Faculty of Computer Science, Technical University of Dortmund (`http://ls4-www.cs.tu-dortmund.de/cms/de/ls4/`), Germany.

2015 October — Delivering a lecture "Performance evaluation in stochastic process algebra $dtsiPBC$" (`http://itar.iis.nsk.su/files/itar/pages/albc15sld.pdf`) at ESII, Spain.

- **Conferences organization**

2000 February – March — Scientific Secretary of IIS SB RAS subsection within "Computing methods and computer science" section at 4th *Siberian Congress On Industrial And Applied Mathematics - 00 (INPRIM'00)*, Novosibirsk, June 26 - July 1, 2000, `http://www.math.nsc.ru/conference/inprim2000/`.

2008 February – April — Head of two subsections of the "Information technologies" section at 46th *International Scientific Student Conference "A student and scientific and technical progress" - 08 (ISSC'08)*, Novosibirsk, April 26–30, 2008, `http://www.nsu.ru/conf/issc/2008/`.

2009 February – April — Head of two subsections of the "Information technologies" section at 47th *International Scientific Student Conference "A student and scientific and technical progress" - 09 (ISSC'09)*, Novosibirsk, April 11–15, 2009, http://www.nsu.ru/conf/issc/2009/.

- **Conference reviewer activity**

  1. 30th *IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science - 10 (FSTTCS'10)*, Chennai, India, December 15–18, 2010, http://www.fsttcs.org.

  2. 8th *Ershov Informatics Conference - 11 (PSI'11)*, Akademgorodok, Novosibirsk, Russia, June 27 – July 1, 2011, http://psi.nsc.ru.

  3. 23rd *International Conference on Concurrency Theory - 12 (CONCUR'12)*, Newcastle upon Tyne, UK, September 3–8, 2012, http://conferences.ncl.ac.uk/concur-2012/.

  4. 1st *Symposium on Dependable Software Engineering: Theories, Tools and Applications - 15 (SETTA'15)*, Nanjing, China, November 4–6, 2015, http://cs.nju.edu.cn/setta/.

  5. 38th *International Conference on Applications and Theory of Petri Nets and Concurrency - 17 (PN'17)*, Zaragoza, Spain, June 25–30, 2017, http://pn2017.unizar.es.

  6. 39th *International Conference on Applications and Theory of Petri Nets and Concurrency - 18 (PN'18)*, Bratislava, Slovakia, June 24–29, 2018, http://interes.institute/petrinets2018/.

- **Supplementary employment**

  1985 August — Research Assistant at Gravimetry Laboratory, Institute of Automation and Electrometry SB RAS (IAE SB RAS, http://www.iae.nsk.su), Novosibirsk.

  1987 June — Electrician's practice at Electrical Equipment Shops, Berdsk Plant of Biological Substances "Sibbiofarm" (SBF, http://www.sibbio.ru).

  1993 June – August — Programmer of statistical programs (C programming language) at Research and Design Institute of Biologically Active Substances SB RAS (IBAS SB RAS, http://www.vector.nsc.ru/ibav-e.htm), Berdsk.

  See the author's computer programs CORRANAL for correlation analysis, http://itar.iis.nsk.su/files/itar/pages/corranal.zip, and LD50 for 50% lethal dose calculation, http://itar.iis.nsk.su/files/itar/pages/ld50.zip, in biological experiments.

  1994 May – August — Leading economist at Department of Marketing and External Economic Activity, Berdsk Electro-Mechanical Plant (BEMP, http://www.betro.ru).

  1995 February – July — Programmer of medical and financial programs (FoxPro) at Central Municipal City Hospital, Berdsk.

  1999 April – July — German-English Translator of Homepage content, Department of Computer Science, CvO UO.

  2003 September – October — German-Russian and English-Russian Translator at Translation Agency "Aum", http://www.aum.ru, Novosibirk.

  2004 June – September — Programmer of data bases (FoxPro) at software development company "Pulsplus", Berdsk.

- **Research projects**

  1. *An Investigation of Methods for Analysis and Verification of Concurrent Computing Systems, Programs and Processes.* Russian Foundation for Basic Research (RFBR, http://www.rfbr.ru), grant 93-01-00986, headed by DR. VALERY A. NEPOMNIASCHY, 1993–1995.

  2. *Models for Formal Semantics of Reactive Systems.* International Association for Promotion of Cooperation with Scientists from the Former Soviet Union (INTAS, http://www.intas.be), grant 1010-CT93-0048, headed by DR. VALERY A. NEPOMNIASCHY, 1993–1995.

  3. *Formal Methods in Design of Concurrent / Distributed Systems (FOMD).* Volkswagen Stiftung (VS, http://www.volkswagen-stiftung.de), grant I/70 564, headed by PROF. DR. EIKE BEST and PROF. DR. IRINA B. VIRBITSKAITE, 1995–1997. See research report http://itar.iis.nsk.su/files/itar/pages/repvstar.zip.

  4. *Development and Investigation of Semantic Methods and Tools of Specification and Verification of Concurrent Systems and Processes.* RFBR, grant 96-01-01655, headed by PROF. DR. IRINA B. VIRBITSKAITE, 1995–1997.

5. *Methods and Tools for Verification and Analysis of Distributed Systems.* INTAS-RFBR, grant 95-0378, headed by Dr. Valery A. Nepomniaschy, 1997–1999.

6. *Equivalences for Models of Concurrent and Distributed systems.* Foundation for Promotion of Young Scientists of Siberian Branch of the Russian Academy of Sciences (FPYS SB RAS), headed by Dr. Igor V. Tarasyuk, 1998–1999. See research report http://itar.iis.nsk.su/files/itar/pages/repysc.zip.

7. *Design and Investigation of Methods and Tools for Specification and Verification of Complex Distributed Real Time Systems.* RFBR, grant 00-01-00898, headed by Prof. Dr. Irina B. Virbitskaite, 2000–2002.

8. *Equivalences of Algebraic and Net Specifications and Verification of Concurrent Real Time Systems.* Program for Support of Scientific Projects of Young Scientists RAS (SPYS RAS) no. 6, grant 114, headed by Dr. Igor V. Tarasyuk, 2000–2002. See research report http://itar.iis.nsk.su/files/itar/pages/repysr.zip.

9. *Formal Methods in Design and Analysis of Distributed and Real Time Systems (DARTS).* Deutsche Forschungsgemeinschaft (DFG, http://www.dfg.de), grant 436 RUS 113/1002/01, and RFBR, grant 09-01-91334, headed by Prof. Dr. Eike Best and Prof. Dr. Irina B. Virbitskaite, 2009–2012.

10. *Modeling and Formal Analysis of Contracts and Web Services with Distributed Resources (ESTuDIo).* Spanish Government (Ministry of Science and Innovation) and European Regional Development Foundation (FEDER), grant TIN2012-36812-C02-02, headed by Dr. Maria E. Cambronero Piqueras, 2013–2015.

11. *Comparative Analysis and Verification for Concurrent Correctness-Critical Systems (CAVER).* DFG, grant BE 1267/14-1, and RFBR, grant 14-01-91334, headed by Prof. Dr. Eike Best and Prof. Dr. Irina B. Virbitskaite, 2014–2019.

12. *Formal Analysis and Applications of Web Services and Electronic Contracts (DArDOS).* Spanish Government (Ministry of Science and Innovation) and European Regional Development Foundation (FEDER), grant TIN2015-65845-C03-02, headed by Dr. Gregorio Diaz Descalzo and Dr. Maria E. Cambronero Piqueras, 2016–2018.

- **Research interests**

  - standard, time, stochastic Petri nets and process algebras;
  - behavioral equivalences respecting concurrency and time;
  - modal logics, term rewrite systems, reduction;
  - Markov chains, performance evaluation.

- **Conferences participation**

  1. 4th *International Conference on Applied Logics - 95 (AL'95)* and 2nd *Workshop on Non-Standard Logics and Logical Foundations of Computer Science - 95 (NSL'95)*, Irkutsk, Russia, June 15–18, 1995, http://www.amast.org/archive/amast/links/v02/i01/AL0201CC.html.

  2. 5th *Workshop on Concurrency, Specification and Programming - 96 (CS&P'96)*, Humboldt-University of Berlin, Germany, September 25–27, 1996, http://www.ki.informatik.hu-berlin.de/veranstaltungen/.

  3. 4th *Symposium on Logical Foundations of Computer Science - 97 (LFCS'97)*, State University of Yaroslavl, Russia, July 6–12, 1997, http://www.informatik.uni-trier.de/~ley/db/conf/lfcs/lfcs1997.html.

  4. 4th *Workshop on Logic, Languages, Information and Computation - 97 (WoLLIC'97)*, Fortaleza (Ceará), Brazil, August 19–22, 1997, http://www.di.ufpe.br/~wollic/wollic97/wollic97.html.

  5. 3rd *Siberian Congress on Applied and Industrial Mathematics - 98 (INPRIM'98)*, Novosibirsk, June 22–27, 1998, http://www.math.nsc.ru/conference/inprim98/inprim98.html.

  6. *Mathematical Foundations of Computer Science - 98 (MFCS'98) Workshop on Concurrency*, Brno, Czech Republic, August 27–29, 1998, http://www.fi.muni.cz/mfcs98/.

  7. *International Refinement Workshop and Formal Methods Pacific - 98 (IRW/FMP'98)*, Canberra, Australia, September 29 – October 2, 1998, http://cs.anu.edu.au/irw/.

8. *Workshop on the Graduate Programme of Technical University of Dresden - 00: Specification of Discrete Processes and Systems of Processes by Operational Models and Logics, Graduiertenkolleg 334 (SPOML'00)*, Reinhardtsdorf (Schöna), Saxony, Germany, February 7–11, 2000, `http://www.orchid.inf.tu-dresden.de/gk-spezifikation/ws00.html`. My talk: *τ-equivalences and refinement*, `http://itar.iis.nsk.su/files/itar/pages/eqtbrsld.zip`.

9. *Workshop on the Graduate Programme of Technical University of Dresden - 01: Specification of Discrete Processes and Systems of Processes by Operational Models and Logics, Graduiertenkolleg 334 (SPOML'01)*, Reinhardtsdorf (Schöna), Saxony, Germany, February 5–9, 2001, `http://www.orchid.inf.tu-dresden.de/gk-spezifikation/ws01.html`. My talk: *A class of stochastic Petri nets with step semantics and related equivalence notions*, `http://itar.iis.nsk.su/files/itar/pages/spneqsld.zip`.

10. *Joint Workshop of the Graduate Programme of Technical University of Dresden - 02: Specification of Discrete Processes and Systems of Processes by Operational Models and Logics, Graduiertenkolleg 334, and that of Ludwig-Maximilian University of Munich: Logic in Computer Science, Graduiertenkolleg 301 (JWS'02)*, Gorisch, Saxony, Germany, February 11–13, 2002, `http://www.orchid.inf.tu-dresden.de/gk-spezifikation/ws03.html`.

11. *Research Seminar on Stochastic Models - 05 (RSSM'05)*, Real-Time and Concurrent Systems group (ReTiCS, `http://www.info-ab.uclm.es/retics/`), High School of Computer Science Engineering of Albacete (ESII), Albacete, Spain, July 6–7, 2005, `http://itar.iis.nsk.su/files/itar/pages/albsempr.pdf`. My *invited* talk: *Labeled DTSPNs as a semantic area for stochastic process algebras*, `http://itar.iis.nsk.su/files/itar/pages/lectuclm.pdf`.

12. *Seminar on Dependability Engineering - 05 (SDE'05)*, Graduiertenkolleg TrustSoft (`http://trustsoft.uni-oldenburg.de`), Carl von Ossietzky University of Oldenburg (CvO UO), Oldenburg, Germany, July 21, 2005, `http://se.informatik.uni-oldenburg.de/lehre/sose2005/seminar-programme/`. My *invited* talk: *Equivalences for net models of concurrent stochastic systems*, `http://itar.iis.nsk.su/files/itar/pages/lectruste.pdf`.

13. *18th Workshop on Concurrency, Specification and Programming - 09 (CS&P'09)*, Kraków-Przegorza-ły, Poland, September 28–30, 2009, `http://csp2009.mimuw.edu.pl`. My talk: *Performance evaluation in dtsPBC*, `http://itar.iis.nsk.su/files/itar/pages/csp09sld.pdf`.

14. *8th Ershov Informatics Conference - 11 (PSI'11)*, Novosibirsk, Akademgorodok, Russia, June 27 – July 1, 2011, `http://psi.nsc.ru`. My presentation: *Performance analysis of the dining philosophers system in dtsPBC*, `http://itar.iis.nsk.su/files/itar/pages/psi11sld.pdf`.

15. *Russian Conference on Modeling of Informatics Systems - 11 (MSI'11)*, Novosibirsk, November 8–11, 2011, `http://www.msi.sibsutis.ru/drupal/`. My talk: *Equivalences of Petri nets with invisible transitions*, `http://itar.iis.nsk.su/files/itar/pages/msi11sld.pdf`.

16. *6th International Workshop on Practical Applications of Stochastic Modelling - 12 (PASM'12)*, Imperial College London, UK, September 17, 2012, `http://homepages.cs.ncl.ac.uk/nigel.thomas/PASM12.htm`. Our talk: *Discrete time stochastic Petri box calculus with immediate multiactions*, `http://itar.iis.nsk.su/files/itar/pages/pasm12sld.pdf`.

17. *24th International Conference on Analytical and Stochastic Modelling Techniques and Applications - 17 (ASMTA'17)*, Newcastle upon Tyne, UK, July 10–11, 2017, `http://asmta.ugent.be`.

- **Computer science schools participation**

  1. *International Summer School Marktoberdorf on Computational Logic - 97 (CL'97)*, Marktoberdorf, Germany, July 29 – August 10, 1997, `http://www4.in.tum.de/misc/summerschool/index97.html`.

  2. *Summer School in Semantics of Computation - 99 (SemSum'99)*, Institute of Basic Research in Computer Science (BRICS), University of Aarhus, Denmark, May 3–7, 1999, `http://www.brics.dk/Activities/99/SemanticsSchool/`.

  3. *International Student Week in Ilmenau - 99 (ISWI'99)*, Computer Ethics Group, Technical University of Ilmenau, Germany, May 8–16, 1999, `http://iswi.tu-ilmenau.de/iswi99/`.

  4. *5th International Summer School on Distributed Computing: Advanced Distributed Computing - 99 (ISSDC'99)*, University of Siena, Certoza di Pontignano, Pontignano (Siena), Italy, June 21–27, 1999, `http://www.mat.unisi.it/web/lodie/school99.htm`.

5. 1st *Euro Summer School on Trends in Computer Science - 00 (FMPA'00)*, Berg en Dal (Nijmegen), The Netherlands, July 3–7, 2000, `http://fmt.cs.utwente.nl/conferences/fmpa2k/`.

6. 1st *International School on Formal Methods for the Design of Computer, Software and Communication Systems - 01: Process Algebras (SFM-01:PA)*, Bertinoro, Italy, July 23–28, 2001, `http://www.sti.uniurb.it/events/sfm01pa/`.

7. 13th *European Summer School on Logic, Language and Information - 01 (ESSLLI'01)*, Helsinki University, Helsinki, Finland, August 13–24, 2001, `http://www.helsinki.fi/esslli/`.

8. 2nd *EEF Summer School on Specification, Refinement and Verification - 02 (SRV'02)*, Turku Center for Computer Science (TUCS), Turku, Finland, August 19–30, 2002, `http://www.tucs.fi/srv2002/`.

9. 1st *Summer School of the Rheinland-Pfalz Cluster of Excellence "Dependable Adaptive Systems and Mathematical Modeling" - 06 (DASMOD'06)*, University of Kaiserslautern, Kaiserslautern, Germany, July 31 – August 13, 2006, `http://www.dasmod.de/twiki/bin/view/DASMOD/SummerSchool`.

- **Awards and scholarships**

  1. *Post Graduate Scholarship.* International Soros Science Education Programme (ISSEP, `http://www.issep.rssi.ru`), grant a97-683, 1997. See research report `http://itar.iis.nsk.su/files/itar/pages/repisf.zip`.

  2. *Award of All-Russia Scientific Programme Young Talents – 97.* International Humane Foundation "Znanie", RAS and Joint-Stock Company "Gazprom", 1997. Project title: "Equivalences for models of concurrent and distributed systems".

  3. *Award for Writing a Paper in a Russian Central Scientific Journal.* IIS SB RAS, May 1997.

  4. *Award for Completing Ph.D. Thesis.* IIS SB RAS, May 1997.

  5. *Grant towards participation Summer School CL'97.* Organizing Committee and NATO Research Foundation, August 1997.

  6. *Research Scholarship.* DAAD. 2-month language course at GIB and 10-month research work at Department of Computer Science, CvO UO, grant A/98/38518, supervisor Prof. Dr. Eike Best, August 4, 1998 – July 31, 1999. Project title: "Äquivalenzen für Modelle paralleler und verteilter Systeme". See research report `http://itar.iis.nsk.su/files/itar/pages/repdaad.zip`.

  7. *Grant towards participation Summer School SemSum'99.* Organizing Committee, May 1999.

  8. *Grant towards participation Summer School ISSDC'99.* Organizing Committee, June 1999.

  9. *Post Doctoral Scholarship.* Graduiertenkolleg 334 (GRK 334, `http://www.orchid.inf.tu-dresden.de/gk-spezifikation/`). Faculty of Computer Science, TUD, supervisors Prof. Dr. Peter Buchholz and Prof. Dr. Horst Reichel, April 2000 – March 2002. See research report `http://itar.iis.nsk.su/files/itar/pages/repdfg.zip`.

  10. *State Scholarship for Talented Young Scientists of Russia.* RAS, 2000–2002.

  11. *Grant towards participation Summer School FMPA'00.* Organizing Committee, July 2000.

  12. *Grant towards participation Summer School SFM-01:PA'00.* Organizing Committee, July 2001.

  13. *Grant towards participation Summer School ESSLLI'01.* Organizing Committee, August 2001.

  14. *Equipment Grant.* DAAD, 2001.

  15. *Scientific Literature Grants.* DAAD, 2001–2018.

  16. *Grant towards participation Summer School SRV'02.* Organizing Committee, August 2002.

  17. *Research Scholarship "Re-invitations for Former Scholarship Holders".* DAAD. 3-month research work at Department of Computer Science, CvO UO, grant A/05/05334, supervisor Prof. Dr. Eike Best, June 1 – August 31, 2005. Project title: "Net and algebraic models for concurrent stochastic systems".

  18. *Grant towards participation Research Seminar RSSM'05.* ESII, July 2005.

  19. *Honorary Diploma for Scientific Achievements.* SB RAS, 2006.

  20. *Grant towards participation Summer School DASMOD'06.* Organizing Committee, August 2006.

  21. *Research Scholarship "Re-invitations for Former Scholarship Holders".* DAAD. 2-month research work at Department of Computer Science, CvO UO, grant A/08/08590, supervisor Prof. Dr. Eike Best, September 1 – October 31, 2008. Project title: "Equivalences for calculi of concurrent stochastic processes".

22. *Grant "Invited Researchers" towards delivering a lecture course.* UCLM. Department of Computer Science Systems, ESII, UCLM, supervisor Prof. Dr. Valentin Valero Ruiz, May 2009.

23. *Grant "Invited Researchers" towards scientific research.* UCLM. 1-month research work over project "Stochastic equivalences for modular performance analysis in dtsiPBC" at Department of Computer Science Systems, ESII, UCLM, supervisor Prof. Dr. Valentin Valero Ruiz, May – June 2011.

- **Description of research**

See slides that present the research: *Equivalence Relations for Net and Algebraic Models of Concurrency* (http://itar.iis.nsk.su/files/itar/pages/lectsem.pdf).

Last years, computing machines and systems with parallel and distributed architecture became widespread, since they provide a possibility to solve a permanently growing volume of computation problems. But the problem of behavioral analysis for such concurrent systems appeared to be more complex than that for usual sequential systems, because some components of the former can work with partial of complete independence each of another. Therefore, such a branch of computer science as theory of parallel systems and processes becomes more and more important. It deals with an investigation of behavior of concurrent systems with the use of different mathematical formalisms.

In concurrency theory, from the very beginning, a great attention was to a development of formal models for specification and analysis of systems with independent occurrence of actions. In addition to such standard models as languages, automata and transition systems, also that like Petri nets, process algebras, Hoare traces, Mazurkiewicz traces , synchronization trees, event structures and many others have been introduced.

A classification of such a model diversity can be arranged via the following dichotomies:

1. structure / behavior;
2. interleaving / true concurrency;
3. linear time / branching time.

In structure models, the states of systems are clearly described, and behavioral aspects are hidden. In behavior models, the actions fulfilled by systems are explicit ones, and the states can be derived from behavior.

In interleaving models, concurrency of actions is simulated by their nondeterministic interleaving (i.e occurrence in all possible orders). In true concurrency models, it is interpreted as causal independence of actions.

In linear time models, conflict is not respected, i.e. the moment of behavior when nondeterministic choice among several ways of further computations ("futures" or "branches") happens. In branching time models, this information is completely represented.

Changing a particular model corresponds to the choice of an abstraction level of behavior, i.e. to the changing of semantics.

An alternative (and more convenient) approach consists in the choice of an expressive enough (structural or behavioral) formal model and consideration of different equivalences which provide one with a semantics or an equality criteria for a proper abstraction level corresponding to the two remaining dichotomies.

Among these formalisms, a structural model of Petri nets and a behavioral model of process algebras became most popular. The main advantages of Petri nets are in their ability for clear description of concurrency and long experience in both specification and analysis of parallel systems. In addition, the have useful graph representation. The main advantages of process algebras are in their modular nature, well developed equivalence notions, algebraic rules and complete proof systems. A considering these models together (in particular, a definition of a net semantics for algebraic formulas) provides one with a possibility to combine the best properties of both the formalisms.

A notion of equivalence is central in any theory of systems. Behavioral equivalences allow to compare systems taking into account particular aspects of their behavior and abstract from the peculiarities of a model used for their specification. Hence it constitutes a part of the semantics of formal models. In particular, it provides a basis for the correct (i.e. semantics-preserving) simplification of systems. At the verification level, equivalences give a possibility to check whether an implementation satisfy a specification, and whether two implementations correspond to the same specification.

Our results in this scientific area are the following.

1. On Petri nets both without and with silent transitions a wide set of behavioral equivalences has been proposed and investigated. It provides one with an ability to abstract from structural and behavioral properties of modeled systems. These relations are distributed in the semantics from interleaving to true concurrency and from linear to branching time ones.

   – A diagram of interrelations of the mentioned equivalences has been obtained. A logical characterization of a number of equivalence notions has been proposed which can be used for treating behavior of concurrent systems in terms of temporal formulas. A method of effective net reduction has been designed that preserves their behavior modulo the equivalences.
   – Compositional aspects of behavior properties preservation for modeled systems have been investigated.
   – Interrelation of equivalence notions on subclasses of nets has been established to simplify comparing their behavior and better understanding a nature of the relations.

2. On time Petri nets both without and with silent transitions a number of time, untime and regional equivalences have been investigated, which are able in different degree to take into account time aspects of behavior of modeled systems.

   – A correlation of the mentioned equivalences has been clarified. A regional characterization of time equivalences has been proposed, which simplifies check of the latter.
   – A compositional approach to the check of equivalences has been investigated.
   – Interrelations of equivalences on subclasses of time nets have been established.

3. On a new class of Discrete Time Stochastic Petri Nets (DTWSPNs) with concurrent transition firings proposed by PROF. DR. PETER BUCHHOLZ a number of equivalence relations has been introduced. They extend the well-known trace and bisimulation ones for systems with step semantics to DTWSPNs.

   – A lattice of interrelations for the equivalence notions has been established.
   – A logical characterization of the equivalences has been presented via formulas of the new probabilistic modal logics.
   – It has been demonstrated how the equivalences can be used to compare stationary behavior of stochastic nets.

4. Semantic equivalences of algebraic calculi and their extensions have been treated as well as their connections with net equivalence relations.

   – A new calculus of labeled nondeterministic concurrent processes $AFLP_2$ has been proposed, which is an extension of the known algebra AFP_2 (introduced by PROF. DR. VADIM E. KOTOV and DR. LJUDMILA A. CHERKASOVA) by labeling function. This labeling has offered a possibility of specifying much wider class of processes that of AFP_2.
   – A complete and correct axiomatization of the equivalences w.r.t. denotational semantics of the mentioned algebras has been proposed as well as operational characterization of these equivalences which can be used for comparing these notions with behavioral relations.
   – Interrelations of the algebraic and net equivalences have been established. The result is the translation of net specifications into algebraic and vice versa with preservation of behavior. It has integrated the advantages of both nets and algebras.
   – A term rewrite system to arrange automatic check of semantic equivalences has been defined. On its basis, a computer program CANON for check of formulas for equivalence has been designed `http://itar.iis.nsk.su/files/itar/pages/canonm.zip`.

5. Semantic equivalences of stochastic extensions of well-known process algebras have been defined and investigated.

   – A discrete time stochastic extension $StAFP_0$ of Algebra of Finite Processes AFP_0 (introduced by PROF. DR. VADIM E. KOTOV and DR. LJUDMILA A. CHERKASOVA) has been proposed. Formulas of $StAFP_0$ specify Stochastic A-nets (SANs), a subclass of DTWSPN's.
   – A sound axiomatization of the net equivalence of $StAFP_0$ (an isomorphism of net representations of formulas) has been presented.
   – A discrete time stochastic extension $dtsPBC$ of finite Petri Box Calculus PBC enriched with iteration has been constructed.
   – Step operational semantics of $dtsPBC$ has been defined in terms of labeled probabilistic transition systems based on action and inaction rules. Denotational semantics has been defined in terms of a subclass of labeled DTSPNs (LDTSPNs), called discrete time stochastic Petri boxes (dts-boxes).

- To evaluate performance in $dtsPBC$, the corresponding to the both semantics stochastic process which is a discrete time Markov chain (DTMC) has been analyzed.
- Algebraic stochastic equivalences of $dtsPBC$ have been introduced which allow one to identify stochastic processes with similar behaviour. The interrelations of all the introduced probabilistic equivalences have been investigated.
- It is explained how the equivalences we proposed can be used to reduce transition systems of expressions of $dtsPBC$.
- A logical characterization of the equivalences of $dtsPBC$ has been presented via formulas of the new probabilistic modal logics.
- It has been demonstrated how to apply the equivalences of $dtsPBC$ to compare stationary behaviour.
- A problem of preservation of the equivalences by algebraic operations of $dtsPBC$ has been discussed.
- It has been explained how to analyze performance of systems within $dtsPBC$.
- The algebraic models of shared memory system and dining philosophers one as well as their reductions have been presented and analyzed in $dtsPBC$.
- An extension $dtsiPBC$ of $dtsPBC$ with immediate multiactions has been proposed.
- Step operational semantics of $dtsiPBC$ has been constructed via labeled probabilistic transition systems. Denotational semantics of $dtsiPBC$ has been defined on the basis of a subclass of labeled discrete time stochastic Petri nets with immediate transitions (LDTSIPNs), called discrete time stochastic and immediate Petri boxes (dtsi-boxes).
- To evaluate performance in $dtsiPBC$, the corresponding to the both semantics stochastic process which is a semi-Markov chain (SMC) has been analyzed, as well as the (reduced) discrete time Markov chain (RDTMC), obtained by removal of vanishing states.
- Step stochastic bisimulation equivalence is defined and used to reduce transition systems and underlying semi-Markov chains of expressions as well as to compare the stationary behaviour.
- A case study of the shared memory system has been considered as an example of specification, modeling, behaviour analysis and performance evaluation in $dtsiPBC$.