Wojciech Jaśkowski

✉ *wjaskowski@cs.put.poznan.pl*
http://www.cs.put.poznan.pl/wjaskowski
wjaskowski

Research Interests

Current — Reinforcement learning, deep learning, learning and AI in games

Past — Competitive coevolution, genetic programming, visual learning, combinatorial optimization

Employment

2011–present — **Assistant Professor**, *Laboratory of Intelligent Decision Support Systems, Institute of Computing Science, Poznan University of Technology*, Poland.
Headed by prof. Roman Słowiński

2009–2011 — **Teaching Assistant (half-time)**, *Poznan University of Technology*, Poland.

2007–2011 — **Research Assistant (half-time)**, *Mobile Systems Research Labs*, Poland.
R&D in object recognition and AI planning, C++/C# programming, team leader

11/2006 — **Internship**, *Gas Powered Games*, Seattle, USA.
Worked on AI for Supreme Commander (an RTS game).

08/2005 — **Internship**, *Motorola Software Group*, Kraków, Poland.

Education

09/2011 — **Ph.D with honors in Computer Science**, *Poznan University of Technology*, Poland.

- Thesis: *Algorithms for test-based problems* (advisor: prof. Krzysztof Krawiec)
- Specialization: Intelligent Decision Support Systems.

07/2006 — **M.Sc in Computer Science**, *Poznan University of Technology*, Poland.

- Thesis: *Genetic Programming with Cross-task Knowledge Sharing for Learning of Visual Concepts,*
- Graduated *summa cum laude* (3 out of ca. 4000 alumni).

03–06/2006 — **Erasmus Programme**, *Faculté polytechnique de Mons*, Belgium.

2004 — **B.Sc in Computer Science**, *Poznan University of Technology*, Poland.

Languages

Polish — **Native**

English — **Proficient** — *Cambridge Certificate in Advanced English (C1)*

German — **Basic**

Achievements and Awards

2014 **1st place in World Coding Championship (Hello World Open)**, Helsinki, Finland.
Participants: 4000 programmers from 92 countries.
Task: programming an AI controller for a multiplayer racing game.

2012 **1st place in Google ROADEF/EURO Challenge (junior category)**, Vilnius, Lithuania.
3rd place overall (out of 82 teams). A combinatorial optimization contest organized by French Society of Operations Research and Decision Analysis (ROADEF) taking place biennial since 1999.

2008 **1st place in Balanced Diet contest at GECCO 2008**, Atlanta, USA.
Task: evolving a virtual autonomous agent for a given 2D environemnt.

2007 **4th place in RAIRO/ROADEF Challenge (junior category)**, Grenoble, France.

2007 **1st place in AntWars competition at GECCO 2007**, London, UK.
Task: evolving a strategy for a partially-observable two-player game.

2005 **1st place in Microsoft Imagine Cup**, Yokohama, Japan.
Participants: ca. 1000 student teams. Task: Programming AI for a two-player game.

2005 **1st place in Challenge24 – 5th International 24-hour Programming Contest**, Budapest, Hungary.
Participants in the finals: 30 European student teams.

2004 **1st place and the Multimedia Award in IEEE Computer Society International Design Competition (CSIDC)**, Washington DC, USA.
Participants: 240 students teams. Task: designing a hardware-software system solving a real-world problem.

2002–2008 **Collegiate Programming Contests**.
Collegiate Programming Championships of Poland: 10th place (2005), 4th place (2004), 15th place (2003), 8th place (2002); organizer and the main judge (2007, 2008);
ACM International Collegiate Programming Contest (ICPC), Central European Programming Contest (CEPC): 12th place (2003), 18th place (2004), 19th place (2005).

Stipends & Honors

2013–2016 **Stipend for outstanding young scientists (<35) from Polish Minister of Science and Higher Education**.
Success rate: 137/~700

2012 **Distinction in the contest for the best doctoral thesis in AI**, Poland.
Received from Polish Artificial Intelligence Society, a member of ECCAI.

2012 **Laureate of the program START by Foundation for Polish Science**.
A program for young (<30) researchers from Poland (success rate: 117/968)

2008 **Scholarship for Ph.D students of Poznań region**.

2007 **City of Poznań Scholarship for Young Researchers.**.

2005, 2006 **Outstanding Student Scholarships from Polish Minister of Science and Higher Education**.

Grants Received

2014–2016 **Research grant from Polish National Science Centre**.
Title: *Multi-criteria methods for designing algorithms that learn combinatorial games strategies*; success rate: 23%.

2012–2014 **Research grant for young scientists awarded by the Faculty of Computing, Poznan University of Technology (Pro-IDEAS)**.

2009–2011 **Research grant from Polish National Science Centre**.
Title: *Algorithms for tests based problems*

2008–2010 **Travel/Conference Grants**.
Foundation for Polish Science for GECCO 2008, CIS/IEEE for WCCI 2010, SIGEVO/ACM for GECCO 2007, 2008

Scientific Activities

Reviews for journals: Computation Intelligence and AI in Games, IEEE Transactions on; Evolutionary Computations, IEEE Transactions on; System, Man and Cybernetics Part C: Applications and Reviews, IEEE Transactions on; Soft Computing; European Journal of Operational Research; Annals of Operations Research; Computers & Operations Research.

Program Commities: IEEE Conference on Computational Intelligence and Games 2014, 2015;

Conference Reviews: IEEE Conference on Computational Intelligence and Games 2014, 2015; International Conference on Methods and Model in Automation and Robotics 2015

Proposal Reviews: Polish National Centre for Research and Development.

Other: Organized a competition at GECCO 2015;

Conferences participation: European Conference of Operational Research (EURO) 2012; Genetic and Evolutionary Computation Conference (GECCO) 2007, 2008, 2011, 2013, 2015; World Congress on Computational Intelligence (WCCI/CEC) 2010; European Conference on Genetic Programming (EuroGP) 2008; European Conference on the Applications of Evolutionary Computation (EvoApplications) 2014; Krajowa Konferencja Algorytmy Ewolucyjne i Optymalizacja Globalna (KAEiOG) 2007; IEEE Symposium on Computational Intelligence and Games (CIG) 2009; IEEE Conference on Computational Intelligence and Games (CIG) 2014.

Grants participation
New Computational Paradigms for Explanatory Modeling of Complex Systems (Polish National Science Centre, DEC-2011/01/B/ST6/07318, 2011–2014); PROTEUS – Integrated Mobile Systems for Counterterrorism and Rescue Operations (POIG.01.02.01-00-014/08, team leader, 2009–2013); INDECT – Intelligent information system supporting observation, searching and detection for security of citizens in urban environment (grant no. 218086, UE 7th Framework Programme, 2009–2013); Techniques for modeling, optimization and simulation of complex adaptive systems (Polish National Science Centre, N N519 441939, 2010–2013); Evolutionary learning systems for artificial and real-world environments (Polish National Science Centre, N N519 350533, 2007–2010); Mobile, network-centric support system operational work of the Police (R00 016 02, 2006–2009); Methods and algorithms in network-centric mobile computing systems for supporting the operational work of the Police (T00C 002 31/0020, 2006–2008).

Miscellaneous
Article *Genetic Programming for Cross-Task Knowledge Sharing* (with K. Krawiec and B. Wieloch) nominated to the best paper award at GECCO 2007.

Teaching

2012–present **Methods of Artificial and Computational Intelligence**.
Responsible for the entire course. Students' evaluations:
- spring 2015: 4.62 (2.0 – worst, 5.0 – best); Rank: 3/54 graduate CS program courses.
- spring 2014: 4.96 (2.0 – worst, 5.0 – best); Rank: 1/32 graduate CS program courses.
- spring 2013: 4.92 (2.0 – worst, 5.0 – best);

2006–present **Human-Computer Interaction**.
Since 2012 responsible for the entire course. Students evaluations:
- autumn 2014: 4.42 (2.0 – worst, 5.0 – best); Rank: 3/25 undergraduate courses in CS program
- autumn 2013: 4.4 (2.0 – worst, 5.0 – best); Rank: 3/33 undergraduate courses in CS program

2007 **Statistics and Data Analysis**, *classes*.

2006 **Data Mining and Analysis**, *classes*.

Publications

Journal Publications

1 Jaśkowski, W. & Szubert, M. Coevolutionary CMA-ES for Knowledge-Free Learning of Game Position Evaluation. *IEEE Transactions on Computational Intelligence and AI in Games* **(accepted)** (2016).

2 Jaśkowski, W., Szubert, M. & Gawron, P. A Hybrid MIP-based Large Neighborhood Search Heuristic for Solving the Machine Reassignment Problem. *Annals of Operations Research* **242**, 33–62 (2016).

3 Jaśkowski, W., Krawiec, K. & Wieloch, B. Cross-Task Code Reuse in Genetic Programming Applied to Visual Learning. *International Journal of Applied Mathematics and Computer Science* **24**, 183–197 (2014).

4 Jaśkowski, W. Systematic N-Tuple Networks for Othello Position Evaluation. *ICGA Journal* **37**, 85–96 (2014).

5 Szubert, M., Jaśkowski, W. & Krawiec, K. On Scalability, Generalization, and

Hybridization of Coevolutionary Learning: a Case Study for Othello. *IEEE Transactions on Computational Intelligence and AI in Games* **5**, 214–226 (2013).

6 White, D. R., McDermott, J., Castelli, M., Manzoni, L., Goldman, B., Kronberger, G., Jaśkowski, W., O'Reilly, U.-M. & Luke, S. Better GP benchmarks: community survey results and proposals. *Genetic Programming and Evolvable Machines* **14**, 3–29 (2013).

7 Jaśkowski, W. & Krawiec, K. Formal Analysis, Hardness and Algorithms for Extracting Internal Structure of Test-Based Problems. *Evolutionary Computation* **19**, 639–671 (2011).

8 Krawiec, K., Jaśkowski, W. & Szubert, M. Evolving Small-Board Go Players using Coevolutionary Temporal Difference Learning with Archive. *International Journal of Applied Mathematics and Computer Science* **21**, 717–731 (2011).

9 Szubert, M., Jaśkowski, W. & Krawiec, K. Learning Board Evaluation Function for Othello by Hybridizing Coevolution with Temporal Difference Learning. *Control and Cybernetics* **40**, 805–831 (2011).

10 Jaśkowski, W., Krawiec, K. & Wieloch, B. Evolving Strategy for a Probabilistic Game of Imperfect Information using Genetic Programming. *Genetic Programming and Evolvable Machines* **9**, 281–294 (2008a).

11 Jaśkowski, W., Krawiec, K. & Wieloch, B. Multitask Visual Learning using Genetic Programming. *Evolutionary Computation* **16**, 439–459 (2008b).

12 Jaśkowski, W. & Komosiński, M. The Numerical Measure of Symmetry for 3D Stick Creatures. *Artificial Life* **14**, 425–443 (2008).

13 Jaśkowski, W., Blazewicz, J., Lukasiak, P., Milostan, M. & Krasnogor, N. 3D-Judge — A Metaserver Approach to Protein Structure Prediction. *Foundations of Computing and Decision Sciences* **32**, 3–14 (2007).

Book Chapters

14 Jaśkowski, W., Krawiec, K. & Wieloch, B. Genetic Programming for Generative Learning and Recognition of Hand-Drawn Shapes. In *Evolutionary Image Analysis and Signal Processing* (ed. Cagnoni, S.), vol. 213 of *Studies in Computational Intelligence*, 281–290 (Springer Berlin / Heidelberg, 2009).

Refereed Conference Publications

15 Kempka, M., Wydmuch, M., Runc, G., Toczek, J. & Jaśkowski, W. ViZDoom: A Doom-based AI Research Platform for Visual Reinforcement Learning. In *IEEE Conference on Computational Intelligence and Games*, 20–23 (IEEE, Santorini, Greece, 2016).

16 Kurek, M. & Jaśkowski, W. Heterogeneous Team Deep Q-Learning in Low-Dimensional Multi-Agent Environments. In *IEEE Conference on Computational Intelligence and Games*, 20–23 (IEEE, Santorini, Greece, 2016).

17 Jaśkowski, W., Szubert, M., Liskowski, P. & Krawiec, K. High-Dimensional Function Approximation for Knowledge-Free Reinforcement Learning: a Case Study in SZ-Tetris. In *GECCO'15: Proceedings of the 17th annual conference on Genetic and Evolutionary Computation*, 567–574. ACM (ACM Press, Mardid, Spain, 2015).

18 Szubert, M., Jaśkowski, W., Liskowski, P. & Krawiec, K. The Role of Behavioral Diversity and Difficulty of Opponents in Coevolving Game-Playing Agents. In *EvoApplications 2015* (eds. Mora, A. M. & Squillero, G.), vol. 9028 of *Lecture Notes in Computer Science*, 394–405 (Springer, Copenhagen, Denmark, 2015).

19 Jaśkowski, W., Szubert, M. & Liskowski, P. Multi-Criteria Comparison of Coevolution and Temporal Difference Learning on Othello. In *EvoApplications 2014* (eds. Esparcia-Alcazar, A. I. & Mora, A. M.), vol. 8602 of *Lecture Notes in Computer Science*, 301–312 (Springer, 2014).

20 Szubert, M. & Jaśkowski, W. Temporal Difference Learning of N-Tuple Networks for the Game 2048. In *IEEE Conference on Computational Intelligence and Games*, 1–8 (IEEE, Dortmund, 2014).

21 Jaśkowski, W., Liskowski, P., Szubert, M. & Krawiec, K. Improving Coevolution by Random Sampling. In *GECCO'13: Proceedings of the 15th annual conference on Genetic and Evolutionary Computation* (ed. Blum, C.), 1141–1148 (ACM, Amsterdam, The Netherlands, 2013).

22 Szubert, M., Liskowski, P., Jaśkowski, W. & Krawiec, K. Shaping Fitness Function for Evolutionary Learning of Game Strategies. In *GECCO'13: Proceedings of the 15th annual conference on Genetic and Evolutionary Computation* (ed. Blum, C.), 1149–1156 (ACM, Amsterdam, The Netherlands, 2013).

23 McDermott, J. *et al.* Genetic Programming Needs Better Benchmarks. In *Proceedings of the fourteenth international conference on Genetic and evolutionary computation conference* (ed. Soule, T.), 791–798. ACM (ACM, 2012).

24 Jaśkowski, W. & Krawiec, K. Coordinate System Archive for Coevolution. In *Evolutionary Computation (CEC), 2010 IEEE Congress on*, 1–10 (IEEE, Barcelona, 2010).

25 Jaśkowski, W. & Krawiec, K. Formal Analysis and Algorithms for Extracting Coordinate Systems of Games. In *IEEE Symposium on Computational Intelligence and Games*, 201–208 (Milano, Italy, 2009).

26 Lichocki, P., Krawiec, K. & Jaśkowski, W. Evolving Teams of Cooperating Agents for Real-Time Strategy Game. In *Applications of Evolutionary Computing, EvoWorkshops* (eds. Giacobini, M. *et al.*), vol. 5484 of *Lecture Notes in Computer Science*, 333–342 (Springer, 2009).

27 Szubert, M., Jaśkowski, W. & Krawiec, K. Coevolutionary Temporal Difference Learning for Othello. In *IEEE Symposium on Computational Intelligence and Games*, 104–111 (Milano, Italy, 2009).

28 Jaśkowski, W., Krawiec, K. & Wieloch, B. Winning Ant Wars: Evolving a Human-Competitive Game Strategy using Fitnessless Selection. In *Genetic Programming 11th European Conference, EuroGP 2008, Proceedings* (ed. O'Neill, M.), vol. 4971 of *Lecture Notes in Computer Science*, 13–24 (Springer-Verlag, 2008a).

29 Jaśkowski, W., Wieloch, B. & Krawiec, K. Fitnessless Coevolution. In *GECCO '08: Proceedings of the 10th annual conference on Genetic and evolutionary computation* (ed. Keijzer, M.), 355–362. Association for Computing Machinery (Association for Computing Machinery, Atlanta, GA, USA, 2008b).

30 Jaśkowski, W., Krawiec, K. & Wieloch, B. Multi-Task Code Reuse in Genetic Programming. In *GECCO-2008 Late-Breaking Papers* (eds. Ebner, M. *et al.*), 2159–2164. Association for Computing Machinery (Association for Computing Machinery, Atlanta, GA, USA, 2008c).

31 Jaśkowski, W. & Kotłowski, W. On Selecting the Best Individual in Noisy Environments. In *GECCO '08: Proceedings of the 10th annual conference on Genetic and evolutionary computation* (eds. Keijzer, M. *et al.*), 961–968. Association for Computing Machinery (Association for Computing Machinery, Atlanta, GA, USA, 2008).

32 Jaśkowski, W., Krawiec, K. & Wieloch, B. Genetic Programming for Cross-Task Knowledge Sharing. In *GECCO '07: Proceedings of the 9th annual conference on Genetic and evolutionary computation* (ed. Thierens, D.), vol. 2, 1620–1627. Association for Computing Machinery (Association for Computing Machinery, London, 2007a). Nominated to the Best Paper Award in GP track.

33 Jaśkowski, W., Krawiec, K. & Wieloch, B. Evolutionary Learning with Cross-Class Knowledge Reuse for Handwritten Character Recognition. In *Proceedings of Planning to Learn Workshop, PlanLearn'07* (eds. Brazdil, P. & Bernstain, A.), 21–30 (2007b).

34 Jaśkowski, W., Krawiec, K. & Wieloch, B. Knowledge Reuse for an Ensemble of GP-based Learners. In *Evolutionary Computation and Global Optimization 2007* (ed. Arabas, J.), vol. 160 of *Prace Naukowe Politechniki Warszawskiej*, 135–142 (Oficyna Wydawnicza Politechniki Warszawskiej, Bedlewo, Poland, 2007c).

35 Jaśkowski, W., Krawiec, K. & Wieloch, B. Learning and Recognition of Hand-drawn Shapes using Generative Genetic Programming. In *Applications of Evolutionary Computing, EvoWorkshops 2007: EvoCOMNET, EvoFIN, EvoIASP, EvoInteraction, EvoMUSART, EvoSTOC, EvoTransLog* (ed. Giacobini, M.), vol. 4448 of *LNCS*, 281–290 (Springer Verlag, Valencia, Spain, 2007d). EvoWorkshops2007.

36 Jaśkowski, W., Krawiec, K. & Wieloch, B. Knowledge Reuse in Genetic Programming Applied to Visual Learning. In *GECCO '07: Proceedings of the 9th annual conference on Genetic and evolutionary computation* (ed. Thierens, D.), vol. 2, 1790–1797. Association for Computing Machinery (Association for Computing Machinery, London, 2007e).

Theses

37 Jaśkowski, W. *Algorithms for Test-Based Problems*. Ph.D. thesis, Institute of Computing Science, Poznan University of Technology, Poznań, Poland (2011). Adviser: Krzysztof Krawiec.

38 Jaśkowski, W. *Genetic Programming with Cross-task Knowledge Sharing for Learning of Visual Concepts*. Master's thesis, Poznan University of Technology, Poznań, Poland (2006).

Non-refereed Publications

39 Jaśkowski, W. Mastering 2048 with Delayed Temporal Coherence Learning, Multi-State Weight Promotion, Redundant Encoding and Carousel Shaping. Tech. Rep. arXiv:1604.05085, Institute of Computing Science, Poznan University of Technology, Poznań, Poland (2016).

40 Jaśkowski, W. Systematic N-tuple Networks for Position Evaluation: Exceeding 90% in the Othello League. Tech. Rep. RA-06/2014, arXiv:1406.1509, Institute of Computing Science, Poznan University of Technology, Poznań, Poland (2014).

41 Jaśkowski, W. & Krawiec, K. How many Dimensions in Cooptimization? In *Proceedings of the 13th Annual Conference Companion on Genetic and Evolutionary Computation* (ed. Krasnogor, N.), 829–830 (Association for Computing Machinery, 2011).

42 Jaśkowski, W., Krawiec, K. & Wieloch, B. NeuroHunter — an Entry for the Balanced Diet Contest. Tech. Rep. RA-10/08, Institute of Computing Science, Poznan University of Technology, Poznań, Poland (2008).

43 Jaśkowski, W., Krawiec, K. & Wieloch, B. BrilliANT: The Winner Entry of the GECCO'2007 Ant Wars Contest. Tech. Rep. RA-05/07, Institute of Computing Science, Poznan University of Technology, Poznań, Poland (2007).

44 Jaśkowski, W. & Komosiński, M. Measuring Symmetry of Moving Stick Creatures. Tech. Rep. RA-020/06, Institute of Computing Science, Poznan University of Technology, Poznań, Poland (2006).

45 Jaśkowski, W., Jędrzejek, K., Kniat, J., Nyczkowski, B. & Skowronek, S. Lifetch — Life Saving System. Tech. Rep. RA-008/04, Poznan University of Technology, Institute of Computing Science, Poznan University of Technology, Poland (2004). The winning project of the CSIDC (Computer Science International Design Competition) 2004 Competition. Published also in: Pro Dialog 19 (2005), 17-38, Wydawnictwo NAKOM – Poznań.