

Jakub Kowalski

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Research interests

AI Algorithms for Games, Competitive AI, Search Methods, Procedural Content Generation, Evolutionary Computations, Game Design, Monte Carlo Methods, General Game Playing, Černý Conjecture

Work experience

2018 – now ADIUNKT (~ASSISTANT PROFESSOR), University of Wrocław, Institute of Computer Science
2016 – 2018 RESEARCH ASSISTANT, University of Wrocław, Institute of Computer Science
2014 – 2016 COMPUTER SCIENCE TEACHER, 3rd High School in Wrocław

Education

2011 – 2016 PHD STUDIES, Computer Science, University of Wrocław, Department of Mathematics and Computer Science
PhD Thesis: *General Game Description Languages*
Supervisor: Prof. Andrzej Kisielewicz
Defended: 09.06.2017
2009 – 2011 MASTER STUDIES, Computer Science, University of Wrocław, Department of Mathematics and Computer Science
Master Thesis: *Programming games management system „Meridius”*
Supervisor: Prof. Krzysztof Loryś
2006 – 2009 BACHELOR STUDIES, Computer Science, University of Wrocław, Department of Mathematics and Computer Science
Bachelor Project: *AI fight environment „QUAIKE”*

Grants and scholarships

2023 – 2027 Management Committee member and co-leader of Working Group 1 (*Search, Planning, Learning, and Explainability*) in COST Action CA22145 *Computational Techniques for Table-top Games Heritage (GameTable)*
2022 – 2026 Investigator in the National Science Centre, Poland, Opus grant number 2021/41/B/ST6/03691:

Finite automata: selected problems and applications connecting different areas.

- 2018 – 2021 Investigator in the National Science Centre, Poland, Opus grant number 2017/25/B/ST6/01920: *Classical problems in the theory of finite automata: new approaches, variants, and applications.*
- 2016 – 2019 Investigator in the National Science Centre, Poland, Opus grant number 2015/17/B/ST6/01893: *Algorithmic aspects of synchronization.*
- 2015 – 2018 Principal investigator of the National Science Centre, Poland, Preludium grant number 2014/13/N/ST6/01817: *Languages and Learning in General Game Playing.* 148,200 PLN
- 2013 – 2015 Investigator in the Iuventus Plus grant number IP2012 052272: *Finite automata synchronization - theory, algorithms, tools, and applications.*
- 2012 – 2019 Seven faculty grants for smaller projects from Department of Mathematics and Computer Science, University of Wrocław.

Peer-reviewed publications

All papers are available at jakubkowalski.tech/Publications.

- 2024 J. Kowalski, E. Doe, M. H. M. Winands, D. Górski, D. J. N. J. Soemers, *Proof Number Based Monte-Carlo Tree Search*, IEEE Transactions on Games, pages 1–10.
- 2024 D. J. N. J. Soemers, J. Kowalski, E. Piette, A. Morenville, W. Crist, *GameTable Working Group 1 meeting report on search, planning, learning, and explainability*, ICGA Journal, Volume 46, Number 1, pages 28–35.
- 2024 J. Kowalski, R. Miernik, K. Polak, D. Budzki, D. Kowalik, *Introducing Tales of Tribute AI Competition*, IEEE Conference on Games, pages 1–8.
- 2024 A. Gańczorz, L. Gasieniec, T. Jurdzinski, J. Kowalski, G. Stachowiak, *Selective Population Protocols*, Symposium on Stabilization, Safety and Security of Distributed Systems.
- 2024 M. Maras, M. Kępa, J. Kowalski, M. Szykuła, *Fast and Knowledge-Free Deep Learning for General Game Playing (Student Abstract)*, AAAI Conference on Artificial Intelligence, Volume 36, Number 21, pages 23576–23578.
- 2023 J. Kowalski, R. Miernik, *Summarizing Strategy Card Game AI Competition*, IEEE Conference on Games, pages 1–8.
- 2022 J. Kowalski, M. Mika, W. Pawlik, J. Sutowicz, M. Szykuła, M.H.M. Winands, *Split Moves for Monte-Carlo Tree Search*, AAAI Conference on Artificial Intelligence, Volume 36, Number 9, pages 10247–10255.
- 2022 D. Kowalczyk, J. Kowalski, H. Obrzut, M. Maras, S. Kosakowski, R. Miernik, *Developing a Successful Bomberman Agent*, International Conference on Agents and Artificial Intelligence, Volume 2, pages 335–344.
- 2022 R. Miernik, J. Kowalski, *Evolving Evaluation Functions for Collectible Card Game AI*, International Conference on Agents and Artificial Intelligence, Volume 3, pages 253–260.
- 2020 J. Kowalski, R. Miernik, M. Mika, W. Pawlik, J. Sutowicz, M. Szykuła, A. Tkaczyk, *Efficient Reasoning in Regular Boardgames*, IEEE Conference on Games, pages 455–462.
- 2020 J. Kowalski, R. Miernik, *Evolutionary Approach to Collectible Card Game Arena Deckbuilding using Active Genes*, IEEE Congress on Evolutionary Computation, pages 1–8.
- 2020 J. Kowalski, M. Szykuła, *Experimental Studies in General Game Playing: An Experience Report*, AAAI Workshop on Reproducible AI (RAI).

- 2019 J. Kowalski, M. Mika, J. Sutowicz, M. Szykuła, *Regular Boardgames*, AAAI Conference on Artificial Intelligence, Volume 33, Number 1, pages 1699–1706.
- 2018 C. Siwek, J. Kowalski, C. Sironi, M. Winands, *Implementing Propositional Networks on FPGA*, AI 2018: Advances in Artificial Intelligence, Volume 11320 of LNCS, pages 133–145.
- 2018 J. Kowalski, A. Kisielewicz, *Regular Language Inference for Learning Rules of Simplified Boardgames*, IEEE Conference on Computational Intelligence and Games, pages 78–85.
- 2018 J. Kowalski, R. Miernik, P. Pytlik, M. Pawlikowski, K. Piecuch, J. Sękowski *Strategic Features and Terrain Generation for Balanced Heroes of Might and Magic III Maps*, IEEE Conference on Computational Intelligence and Games, pages 86–93.
- 2018 J. Kowalski, A. Liapis, Ł. Żarczyński, *Mapping Chess Aesthetics onto Procedurally Generated Chess-Like Games*, EvoApplications 2018: Applications of Evolutionary Computation, Volume 10784 of LNCS, pages 325–341.
- 2017 B. Kostka, J. Kwiecień, J. Kowalski, P. Rychlikowski, *Text-based Adventures of the Golovin AI Agent*, IEEE Conference on Computational Intelligence and Games (*best paper nominee*), pages 181–188.
- 2017 J. Kowalski, Ł. Żarczyński, A. Kisielewicz, *Evaluating Chess-like Games Using Generated Natural Language Descriptions*, International Conference on Advances in Computer Games, Volume 10664 of LNCS, pages 127–139.
- 2017 J. Kowalski, A. Roman, *A New Evolutionary Algorithm for Synchronization*, EvoApplications 2017: Applications of Evolutionary Computation, Volume 10199 of LNCS, pages 620–635.
- 2016 A. Kisielewicz, J. Kowalski, M. Szykuła, *Experiments with Synchronizing Automata*, Implementation and Application of Automata, Volume 9705 of LNCS, pages 176–188.
- 2016 J. Kowalski, M. Szykuła, *Evolving Chess-like Games Using Relative Algorithm Performance Profiles*, Applications of Evolutionary Computation, Volume 9597 of LNCS, pages 574–589.
- 2016 J. Kowalski, A. Kisielewicz, *Towards a Real-time Game Description Language*, Proceedings of the 8th International Conference on Agents and Artificial Intelligence, Volume 2, pages 494–499.
- 2015 J. Kowalski, A. Kisielewicz, *Game Description Language for Real-time Games*, Proceedings of the IJCAI-15 Workshop on General Game Playing (GIGA’15), pages 23–30.
- 2015 J. Kowalski, A. Kisielewicz, *Testing General Game Players Against a Simplified Boardgames Player Using Temporal-difference Learning*, IEEE Congress on Evolutionary Computation, pages 1466–1473.
- 2015 A. Kisielewicz, J. Kowalski, M. Szykuła, *Computing the shortest reset words of synchronizing automata*, Journal of Combinatorial Optimization, Volume 29, Issue 1, pages 88–124.
- 2014 J.Kowalski, *Embedding a Card Game Language into a General Game Playing Language*, Frontiers in Artificial Intelligence and Applications, Volume 264: STAIRS 2014, pages 161–170
- 2013 J. Kowalski, M. Szykuła, *Game Description Language Compiler Construction*, AI 2013: Advances in Artificial Intelligence, volume 8272 of LNCS, pages 234–245.
- 2013 A. Kisielewicz, J. Kowalski, M. Szykuła, *A Fast Algorithm Finding the Shortest Reset Words*, Computing and Combinatorics, volume 7936 of LNCS, pages 182–196.

INVITED TALKS

- 2021 *Regular Boardgames: Efficient and Modern GGP Language*, Workshop on Game Intelligence and Informatics at PAKDD

PROGRAM COMMITTEES & REVIEWS

- 2025 AAAI Conference on Artificial Intelligence
2024 AAAI Conference on Artificial Intelligence
2024 Conference on Neural Information Processing Systems
2024 European Conference on Artificial Intelligence
2024 IEEE Conference on Games
Computers and Games
2024 AAAI Conference on Artificial Intelligence
2023 European Conference on Artificial Intelligence
2023 IEEE Conference on Games
2023 Foundations of Digital Games
2022 IEEE Transactions on Games
2022 IEEE Conference on Games
2022 Foundations of Digital Games
2022 Computers and Games
2021 IEEE Conference on Games
2021 IEEE Symposium Series on Computational Intelligence
2021 Advances in Computer Games
2021 Monte Carlo Search Workshop at IJCAI
2020 IEEE Conference on Games
2019 IEEE Conference on Games

ORGANIZED COMPETITIONS

- 2024 *Tales of Tribute AI Competition* at IEEE Conference on Games
2023 *Tales of Tribute AI Competition* at IEEE Conference on Games
2022 *Strategy Card Game AI Competition* at IEEE Conference on Games
2021 *Strategy Card Game AI Competition* at IEEE Conference on Games
2021 *Strategy Card Game AI Competition* at IEEE Congress on Evolutionary Computation
2020 *Strategy Card Game AI Competition* at IEEE Conference on Games
2020 *Strategy Card Game AI Competition* at IEEE Congress on Evolutionary Computation
2019 *Strategy Card Game AI Competition* at IEEE Conference on Games
2019 *Strategy Card Game AI Competition* at IEEE Congress on Evolutionary Computation
2018 *Legends of Code and Magic* as CodinGame Community Contest

Teaching

SUPERVISED THESES

Defended: 5 master theses, 24 bachelor/engineer theses.
All theses are available at jakubkowalski.tech/Supervising.

COMPETITIVE AI AND TEAM MANAGEMENT

- 2024 *CodinGame Fall Challenge*: 1st place in the University ranking, 2/3970 individually.
- 2024 *CodinGame Summer Challenge*: 1st place in the University ranking, 4/5237 individually.
- 2023 *CodinGame Fall Challenge*: 1st place in the University ranking, 42/4669 individually.
- 2023 *Reply Challenge*: 1st place in the University ranking.
- 2023 *CodinGame Spring Challenge*: 1st place in the University ranking, 16/5290 individually.
- 2022 *CodinGame Fall Challenge*: 2nd place in the University ranking, 112/4577 individually.
- 2022 *Cultist Wars*: 2nd place in the University ranking, 18/544 individually.
- 2022 *Green Circle*: 2nd place in the University ranking, 30/1758 individually.
- 2022 *CodinGame Spring Challenge*: 1st place in the University ranking, 38/7695 individually.
- 2021 *CodinGame Spring Challenge*: 1st place in the University ranking, 68/6867 individually.
- 2020 *CodinGame Fall Challenge*: 1st place in the University ranking, 67/7011 individually.
- 2020 *CodinGame Spring Challenge*: 1st place in the University ranking, 118/4955 individually.
- 2020 *CodinGame Ocean of Code*: 1st place in the University ranking, 119/2279 individually.

INSTITUTE OF COMPUTER SCIENCE, UNIVERSITY OF WROCLAW

- 2024/2025 Artificial Intelligence 2: Games (lecture; laboratory, 1 group).
- 2024/2025 Seminar: Explainable AI for Board Games (seminar, 1 group).
- 2023/2024 Artificial Intelligence for Games: A Bit of Classics (lecture; laboratory, 1 group).
- 2023/2024 Seminar: Game Botting (seminar, 1 group).
- 2023/2024 Seminar: Competitive Artificial Intelligence (seminar, 1 group).
- 2022/2023 Project: Competitive Artificial Intelligence (project, 1 group).
- 2022/2023 Artificial Intelligence (exercises+laboratory, 2 groups).
- 2022/2023 Seminar: Competitive Artificial Intelligence (seminar, 1 group).
- 2021/2022 Artificial Intelligence (exercises+laboratory, 1 group).
- 2021/2022 Reinforcement Learning for Games (seminar, 1 group).
- 2021/2022 Artificial Intelligence for Games: Advanced Topics (seminar, 1 group).
- 2021/2022 Artificial Intelligence for Games (lecture; laboratory, 1 group).
- 2020/2021 Artificial Intelligence (exercises+laboratory, 1 group).
- 2020/2021 Project: Programming Programming Games (project, 1 group).
- 2020/2021 Artificial Intelligence for Games (lecture; laboratory, 3 groups).
- 2019/2020 Artificial Intelligence (exercises+laboratory, 2 groups).
- 2019/2020 Objective Programming (laboratory, 1 group).
- 2019/2020 Algebra (exercises, 1 group).
- 2019/2020 Machine Learning (exercises+laboratory, 1 group).
- 2019/2020 Extended Python Course (laboratory, 3 groups)
- 2018/2019 Lua Course (lecture; laboratory, 2 groups).

2018/2019 Artificial Intelligence for Games: Advanced Topics (seminar, 1 group).
 2018/2019 Objective Programming (laboratory, 2 groups).
 2018/2019 Artificial Intelligence for Games (lecture; laboratory, 1 group).
 2017/2018 Lua Course (lecture; laboratory, 1 group).
 2017/2018 Artificial Intelligence for Games: group projects (project, 1 group).
 2017/2018 Artificial Intelligence for Games (lecture; laboratory, 1 group).
 2017/2018 Introduction to Python Programming (laboratory, 2 groups).
 2016/2017 Lua Course (lecture; laboratory, 1 group).
 2016/2017 Artificial Intelligence for Games: group projects (project, 1 group).
 2016/2017 Artificial Intelligence for Games (lecture; laboratory, 2 groups).
 2016/2017 Introduction to Python Programming (laboratory, 2 groups).
 2015/2016 Artificial Intelligence (exercises+laboratory, 1 group).
 2015/2016 Extended Python Course (laboratory, 1 group).
 2015/2016 Introduction to Python Programming (laboratory, 1 group).
 2014/2015 Introduction to Python Programming (laboratory, 2 groups).
 2013/2014 Introduction to Python Programming (laboratory, 1 group).
 2013/2014 Artificial Intelligence (in English) (exercises+laboratory, 1 group).
 2012/2013 Seminar: General Game Playing (seminar, 1 group).
 2012/2013 Introduction to Python Programming (laboratory, 2 groups).
 2011/2012 Creating Interactive Applications in Python (laboratory, 2 groups).
 2011/2012 Introduction to Python Programming (laboratory, 2 groups).

3RD HIGH SCHOOL IN WROCLAW TEACHER

2015/2016 Computer Science, III year (2 groups).
 2014/2015 Computer Science, II year (2 groups).