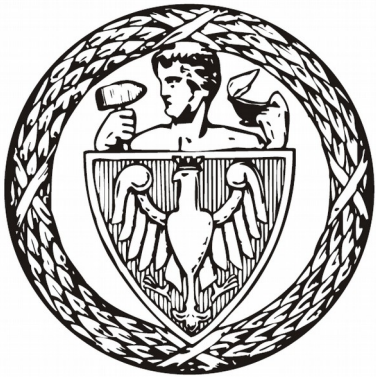


From heuristic algorithms to metaheuristics



Jarosław Arabas

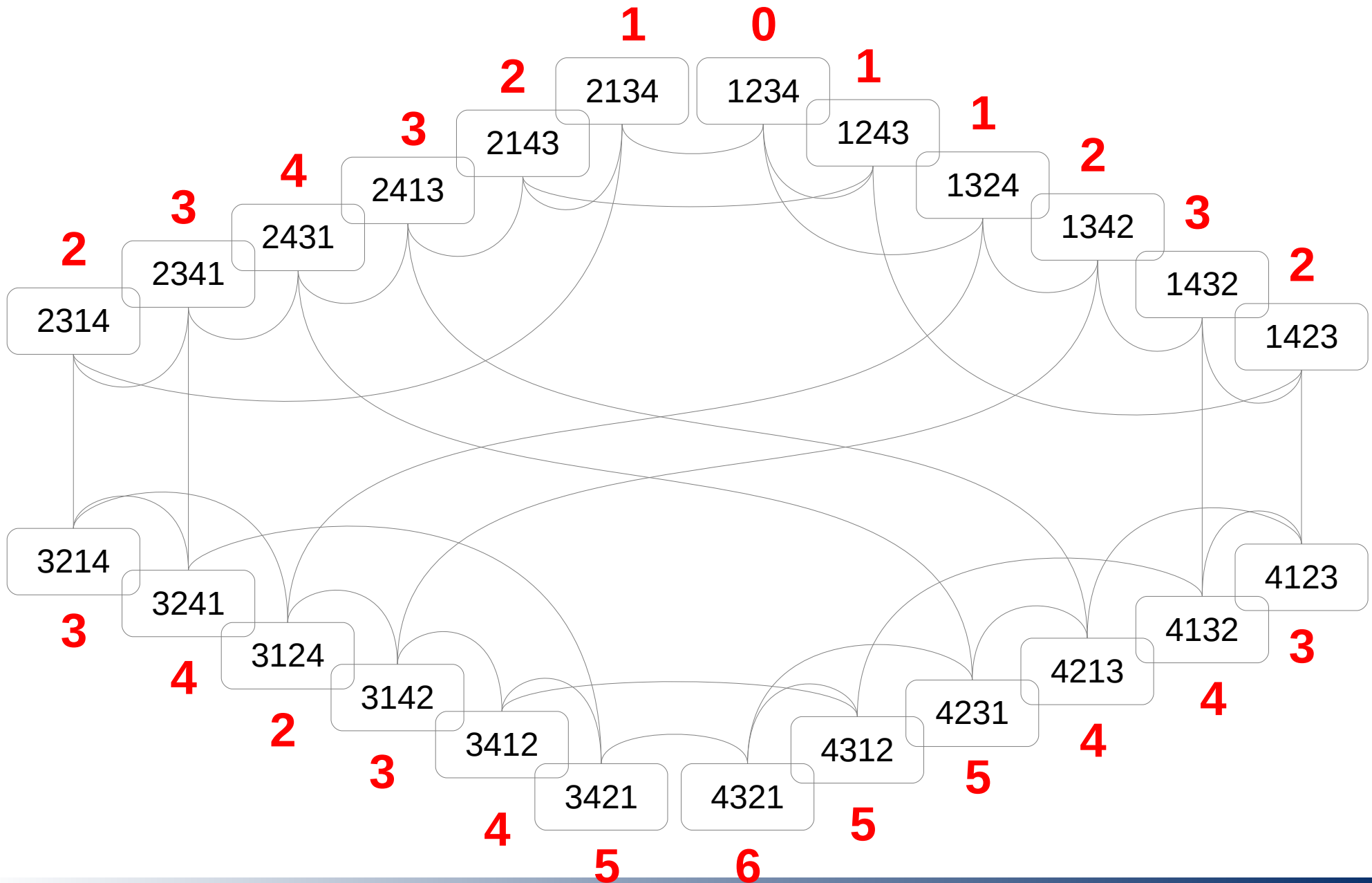
Warsaw University of Technology

Institute of Computer Science

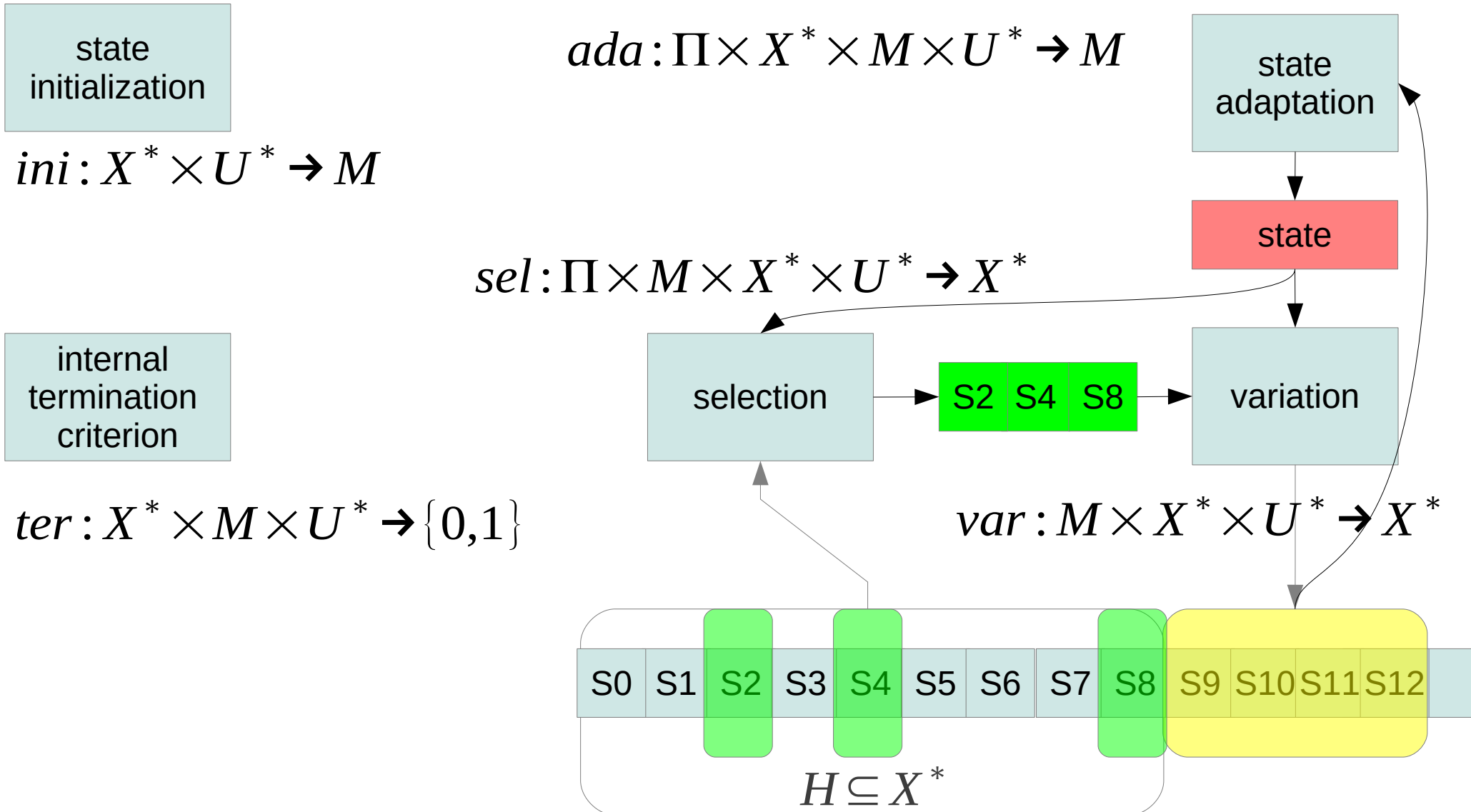
Research directions

- General research in metaheuristics
- Development of theory of evolutionary computation
- Development of effective metaheuristics for continuous optimization
- Metaheuristics and constraints
- Applications

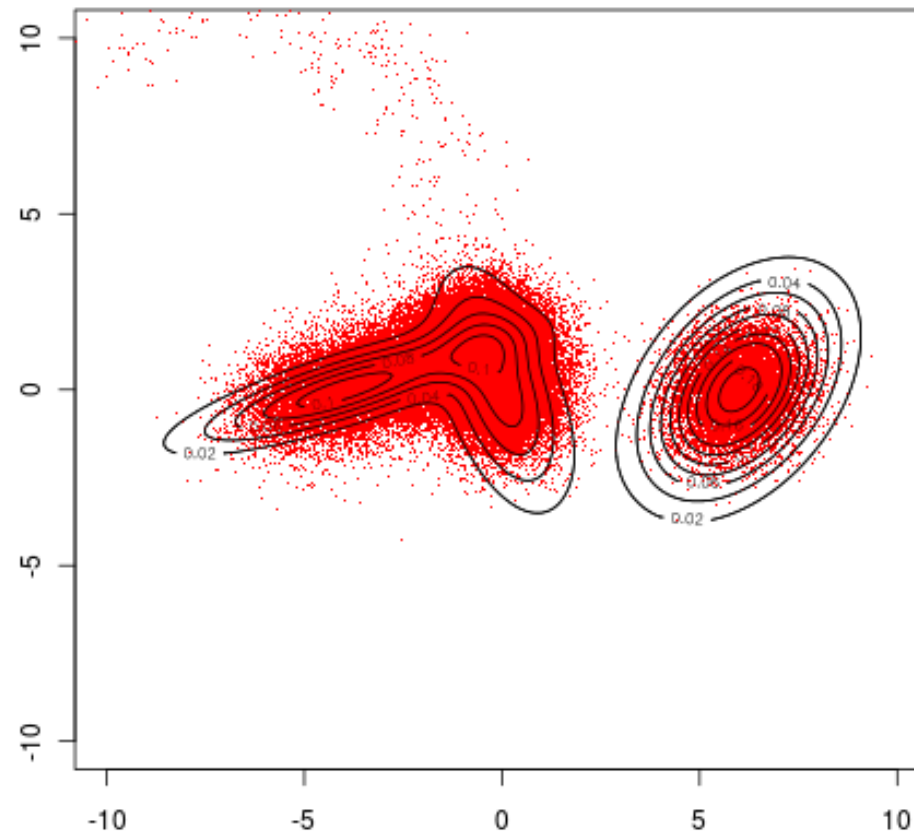
General research in metaheuristics



General research in metaheuristics



Development of theory of evolutionary computation



Development of theory of evolutionary computation

- Prediction of the population diversity for evolutionary computation
 - J. Arabas(2012), "Approximating the Genetic Diversity of Populations in the Quasi-Equilibrium State," in IEEE Trans. Evol. Comp., vol. 16, no. 5, pp. 632-644.
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- Analysis of differential evolution
 - K. Opara, J. Arabas (2018), Comparison of mutation strategies in Differential Evolution – A probabilistic perspective, Swarm and Evolutionary Computation, vol. 39, pp. 53-69,
 - K. Opara, J. Arabas (2019), Differential Evolution: A survey of theoretical analyses, Swarm and Evol. Comp., vol. 44, pp. 546-558

Development of metaheuristics for continuous optimization

- Differential evolution and CMA-ES
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 - J. Arabas, D. Jagodziński (to appear), "Towards a Matrix-free Covariance Matrix Adaptation Evolution Strategy", IEEE Trans. Evol. Comp.
 - R. Biedrzycki (2017), "A version of IPOP-CMA-ES algorithm with midpoint for CEC 2017 single objective bound constrained problems", IEEE Congr. Evol. Comp. (CEC), San Sebastian, pp. 1489-1494.
- Midpoint evaluation
 - J. Arabas, R. Biedrzycki (2017), "Improving Evolutionary Algorithms in a Continuous Domain by Monitoring the Population Midpoint" , vol. 21, no. 5, pp. 807-812.

Metaheuristics and constraints

- Experimental analysis of constraint handling methods
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Applications

- Graph optimization problems

- J. Arabas, S. Kozdrowski (2001), "Applying an evolutionary algorithm to telecommunication network design," in IEEE Transactions on Evolutionary Computation, vol. 5, no. 4, pp. 309-322.
- Jacek Wojciechowski, Jarosław Arabas, Błażej Sawionek (2006), Heuristic maximization of the number of spanning trees in regular graphs, Journal of the Franklin Institute, Volume 343, Issue 3, pp. 309-325,

- Identification of model parameters

- J. Arabas, L. Bartnik, S. Szostak and D. Tomaszewski (2009), "Global extraction of MOSFET parameters using the EKV model: Some properties of the underlying optimization task," MIXDES-16th Int. Conf. Mixed Design of Integrated Circuits & Systems, Lodz, pp. 67-72.
- Biedrzycki, R. Jackiewicz, D. Szewczyk, R. (2014), Reliability and Efficiency of Differential Evolution Based Method of Determination of Jiles-Atherton Model Parameters for X30CR13 Corrosion Resisting Martensitic Steel, Journal of Automation Mobile Robotics and Intelligent Systems, Vol. 8, No. 4, pp. 63-68
- A. Lewandowski, W. Wiatr, L. J. Opalski and R. Biedrzycki (2015), "Accuracy and Bandwidth Optimization of the Over-Determined Offset-Short Reflectometer Calibration," in IEEE Trans. Microwave Theory and Tech., vol. 63, no. 3, pp. 1076-1089.

- Manufacturing

- Biedrzycki R. et al. (2014) Application of Evolutionary Methods to Semiconductor Double-Chirped Mirrors Design. in: PPSN XIII.
- D. Iwanicki , E. Warchulski , M. Ożga , M. Świniarski, A. Gertych, I. Pasternak, M. Zdrojek , M. Godlewski, J. Arabas, R. Mroczyński (2019), Optimization of ultra-thin magnetron sputtered aluminum films, Conf. ELTE