Rolf Fest

A symposium celebrating
Rolf Niedermeier
and fixed-parameter tractability

July 21, 2026

Friedrich Schiller University Jena
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ORGANIZED BY

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Contents and program

Program

Time	Activity
09:45–10:00	Arrival
10:00–10:15	**Opening**
10:15–11:25	**Remembering Rolf** Speakers: Christian Komusiewicz (FSU Jena) Mike Fellows (LAU Beirut) • Peter Rossmanith (RWTH Aachen) Falk Hüffner (TomTom) • Stefan Schmid (TU Berlin) Till Fluschnik (HU Berlin)
11:30–12:00	**Rolf's open questions**
12:00–13:50	**Lunch**
13:50–14:00	Photo show
14:00–15:30	**Opus Magnum I** Speakers: Piotr Faliszewski (AGH University of Krakow) Dušan Knop (TU Prague) • Hendrik Molter (HPI Potsdam)
15:30–16:00	**Coffee break**
16:00–17:00	**Opus Magnum II** Speakers: Manuel Sorge (TU Wien) • Vincent Froese (TU Berlin)
17:00–17:30	**Open problem session and voting**
17:30–18:15	**Zukunftsmusik** Moderation: Erik Jan van Leeuwen (Utrecht Uni) Panel: Niclas Boehmer (HPI Potsdam) • Eva Deltl (TU Clausthal) André Nichterlein (TU Berlin) Peter Rossmanith (RWTH Aachen) • Jörg Rothe (HHU Düsseldorf)
18:15–18:45	Reception
18:45–20:00	**Quiz à la Rolf**

Talks and abstracts

14:00–14:30

Piotr Faliszewski

Nearly Group-Separable Elections

Abstract. Given an election E = (C,V), we ask for the fewest swaps of adjacent candidates do we need to perform so that the election becomes group-separable (GS). In particular, we are interested in distance to being group-separable with respect to either caterpillar (GS/cat) or balanced trees (GS/bal) as these two domains received significant attention recently. We show that the problem is NP-complete for various cases, but that there are very efficient FPT algorithms parameterized by either the number of candidates or the distance from the closest election of a given type. These results are interesting for several reasons. First, parameterization by the number of candidates is rarely interesting on the technical level, but here we obtain interesting algorithm. Second, parameterization by the distance yields algorithms that are much faster in practice than their running-time analysis suggests. Indeed, both types of FPT algorithms seem to perform much better than ILP formulations, which typically outperform direct combinatorial algorithms. Finally, we find FPT algorithms parameterized by distance which apply not only to GS/cat or GS/bal, but to all domains defined by forbidden subelections, which we believe to be a significant progress in the area.

Joint work with Jan Jabrocki, Stanislaw Kazmierowski, Kristýna Pekárková, Simon Schierreich, and Ildikó Schlotter

14:30–15:00

Dušan Knop

Makespan Minimization Parameterized by the Largest Processing Time

Abstract. I will cover the story of FPT algorithms for $P||C_{\max}$ parameterized by $p_{\max}$ mostly with the relation to N-fold IPs. I shall cover the existence of a polynomial kernel for $P||C_{\max}$ ($p_{\max}$). On the way, we shall discuss polynomial kernels for N-fold IPs for the combined parameter 1) number of brick types, 2) brick dimension, and 3) largest coefficient in the constraint matrix. I will not cover full technical details; however, I will encourage using (N-fold) IPs for designing polynomial kernels. This is joint work with Martin Koutecky.

15:00–15:30

Hendrik Molter

On the parameterized complexity of temporal separation

Abstract. The talk will give a brief introduction to temporal graph algorithmics with temporal separation as a guiding exemplary problem. A temporal graph has an edge set that may change over discrete time steps, and temporal paths have to respect time, that is, they use edges at increasing time steps. A temporal (s,z)-separator is a vertex set such that when removed, the remaining graph does not contain any temporal path from s to z. This problem was one of the earliest studied temporal graph problems [Kempe, Kleinberg, Kumar STOC '00] and is known to be NP-hard. The talk focuses on early contributions of Rolf Niedermeier

to the study of the parameterized complexity of this problem and how they relate to current developments and open problems in the field.

16:00–16:30

Manuel Sorge

Learning Decision Trees from a Parameterized Algorithmics Point of View

Abstract. A decision tree recursively asks yes/no questions to arrive at a conclusion; if it is small, it can be effective in visualizing data or aiding human decision-making. When learning a decision tree, we thus often start from labeled input data and want to find a small tree that represents the data well. Much research since the 1960s focused on empirical and heuristic algorithm design. In the last five to ten years significantly more exact, optimal methods were studied as well. For such methods, it is useful to understand the algorithmic complexity of the learning problem, that is, what features make it hard or tractable. In this talk I plan to give an overview on the parameterized algorithmics in this area.

Based on joint work with Juha Harviainen, Christian Komusiewicz, Stephen G. Koubourov, Pascal Kunz, Maarten Löffler, Fabrizio Montecchiani, Sebastian Ordyniak, Marcin Pilipczuk, Ignaz Rutter, Raimund Seidel, Frank Sommer, Luca Staus, Stefan Szeider, and Jules Wulms.

16:30–17:00

Vincent Froese

Parameterized Complexity of ReLU Neural Networks

Abstract. Neural networks with ReLU activations are a widely used model in machine learning. It is thus important to have a profound understanding of the properties of the functions computed by such networks. Recently, there has been increasing interest in the (parameterized) computational complexity of ReLU network problems.

In this talk, we briefly introduce ReLU neural networks and give an overview of recent results with a focus on the parameterized complexity of training and verifying ReLU networks. We also discuss open questions and challenges for future research.

Open questions

OPEN QUESTION 1: Above Guarantee Parameterization for Planar Independent Set

Background: Independent Set is W[1]-hard wrt. solution size k. In planar graphs, however, the problem is FPT because the answer is "yes" whenever $k \leq \lceil n/4 \rceil$, making the parameter uninteresting in nontrivial instances. Can we instead parameterize by the distance from the lower bound?

Question: Is the problem to find an independent set of size $\lceil n/4 \rceil + k$ in an n-vertex planar graph fixed-parameter tractable wrt. k?

References: R. Niedermeier (2006). "Invitation to Fixed-Parameter Algorithms". Oxford University Press.

OPEN QUESTION 2: Linear-Vertex Kernel for Feedback Vertex Set

Background: Feedback Vertex Set (FVS) is among the most fundamental graph problems. From the viewpoint of kernelization, the problem is well understood: A kernel of size $O(k^2)$ is known, where k is the solution size, and no kernel of size $O(k^{2-\varepsilon})$ for any $\varepsilon > 0$ can exist under standard complexity assumptions. The same results hold for the closely related Vertex Cover. It, however, admits a kernel with $O(k)$ vertices. It remains open whether the same is true for FVS.

Question: Does FVS admit a kernel with $O(k)$ (or $O(k^{2-\varepsilon})$) vertices?

References: J. Guo and R. Niedermeier (2007). "Invitation to data reduction and problem kernelization". In: *ACM SIGACT News*, 38.1, pp. 31–45.

OPEN QUESTION 3: Cluster Editing with Bounded Edge Removals

Background: One of the most prolific areas in parameterized algorithms is the race to replace parameters that yield fixed-parameter tractability with smaller parameters that still maintain tractability. Yet some basic questions for prominent parameterized problems remain open: In Cluster Editing we are given an undirected graph and an integer k and ask whether at most k edges can be removed or added such that the graph becomes a disjoint union of cliques. It is FPT wrt. k and admits linear-vertex kernels. We obtain a more general problem by introducing an upper bound ℓ on the number of allowed edge removals. Note that for $\ell = 0$ the problem becomes trivial and by increasing ℓ we can search for successively more general solutions.

Question: Is Cluster Editing fixed-parameter tractable wrt. the number ℓ of allowed edge removals? Is there a polynomial-size problem kernel?

Note: This question has been resolved since Rolf Fest, publication forthcoming.

References: C. Komusiewicz and R. Niedermeier (2012). "New Races in Parameterized Algorithmics". In: *MFCS*, LNCS 7464, pp. 19–30.

OPEN QUESTION 4: W(Maj)-Hierarchy

Background: The W-hierarchy is defined through weighted satisfiability of circuits with NOT, AND, and OR gates. Majority-based problems, common in computational social choice through notions such as Condorcet winners, complicate membership proofs because majority is not readily simulated by a single large AND or OR gate. For example, Majoritywise Accepted Ballot is W[2]-hard parameterized by ballot size, but its membership in W[2] is open. Replacing the standard gates by majority gates yields the W(Maj)-hierarchy, where $\mathrm{W}[1]{=}\mathrm{W}[1](\mathrm{Maj})$ and $\mathrm{W}[t] \subseteq \mathrm{W}[t](\mathrm{Maj})$ for $t \geq 2$.

Question: How does the W(Maj)-hierarchy relate to the classical W-hierarchy? In particular, does $\mathrm{W}[t](\mathrm{Maj}) \subseteq \mathrm{W}[t]$ hold for $t \geq 2$? What are accessible complete problems for the W(Maj)-hierarchy?

References: R. Bredereck, J. Chen, P. Faliszewski, J. Guo, R. Niedermeier, and G. J. Woeginger (2014). "Parameterized Algorithmics for Computational Social Choice: Nine Research Challenges". In: *Tsinghua Science and Technology*, 19.4, pp. 358–373.
M. R. Fellows, J. Flum, D. Hermelin, M. Müller, and F. A. Rosamond (2010). "W-Hierarchies Defined by Symmetric Gates". In: *TOCS*, 46.2, pp. 311–331.

OPEN QUESTION 5: ILP-FPT vs. Direct Combinatorial FPT Algorithms

Background: For many voting problems, fixed-parameter tractability wrt. the number m of alternatives is established through an integer linear programming formulation. These results are often generic, whereas problem-specific combinatorial FPT algorithms remain unknown.

Question: Can these ILP-based FPT results be replaced by direct combinatorial algorithms with a better dependence on m or improved practical running times?

References: R. Bredereck, J. Chen, P. Faliszewski, J. Guo, R. Niedermeier, and G. J. Woeginger (2014). "Parameterized Algorithmics for Computational Social Choice: Nine Research Challenges". In: *Tsinghua Science and Technology*, 19.4, pp. 358–373.

OPEN QUESTION 6: Mixed Chinese Postman Parameterized by the Number of Odd-Degree Vertices

Background: Chinese Postman asks whether a weighted undirected graph admits a walk that traverses every edge at least once while staying within a given budget. It is polynomial-time solvable via matching; the directed variant is likewise polynomial-time solvable via network-flow techniques. In mixed graphs, containing both directed and undirected edges, the problem becomes NP-hard; we call this variant Mixed Chinese Postman. The source of hardness is the presence of odd-degree vertices: if every vertex has even degree, the problem is again polynomial-time solvable. This motivates parameterizing by the number of odd-degree vertices as a natural distance from tractability.

Question: Is Mixed Chinese Postman in XP or even FPT wrt. the number of odd-degree vertices?

References: R. van Bevern, R. Niedermeier, M. Sorge, and M. Weller (2015). "The Complexity of Arc Routing Problems". In: *Arc Routing: Problems, Methods, and Applications*. Ed. by A. Corberán and G. Laporte. Philadelphia: SIAM, pp. 19–52.
G. Gutin, M. Jones, and M. Wahlström (2016). "The Mixed Chinese Postman Problem Parameterized by Pathwidth and Treedepth". In: *SIDMA*, 30.4, pp. 2177–2205.

OPEN QUESTION 7: Linear-Time Kernelization for Matching

Background: The polynomial-time computable problem of finding a maximum cardinality matching has been well studied for decades. From the viewpoint of FPT-in-P, questions about linear-time kernelizations naturally arise.

Question: Is there a linear-time computable kernel for Matching parameterized by the treedepth ℓ (assuming that a corresponding decomposition is given)?

References: G. B. Mertzios, A. Nichterlein, and R. Niedermeier (2020). "The Power of Linear-Time Data Reduction for Maximum Matching". In: *Algorithmica*, 82.12, pp. 3521–3565.

OPEN QUESTION 8: Non-Strict Temporal Separation on Planar Graphs

Background: Temporal Separation is one of the earliest studied problems in temporal graph algorithmics. Here, we ask for a small vertex set that destroys all temporal paths between two given vertices s and z. In the strict case (time stamps on paths strictly increasing), the lifetime (total number of time steps in the graph) upper-bounds the length of any temporal path. This can be used to obtain an FPT algorithm for the parameter lifetime if the underlying graph is planar. In the non-strict case, this upper bound does not hold, and hence, the result does not transfer.

Question: What is the parameterized complexity of Non-Strict Temporal Separation wrt. the lifetime if the underlying graph is planar?

References: P. Zschoche, T. Fluschnik, H. Molter, and R. Niedermeier (2020). "The complexity of finding small separators in temporal graphs". In: *JCSS*, 107, pp. 72–92.

Rolfisms

Bitte entschuldigen Sie den langen Brief, ich hatte keine Zeit, einen kürzeren zu schreiben.

Ober sticht Unter

Ahoj

Der Weg ist das Ziel

Oachkatzelschwofl

urbi et orbi

Mehr top-down

Standing on the shoulders of giants

Warmduscher

Viertel vor vier trifft man sich hier

Nicht geschimpft ist genug gelobt

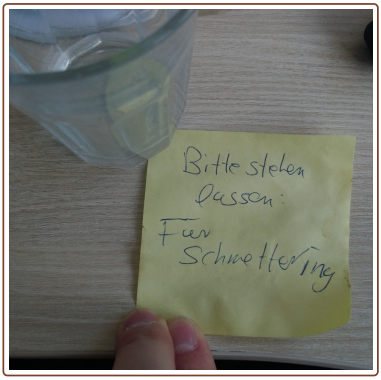
Service to the reader!

$O(1)$ (bzw. $O(5)$ etc.)

Es ist zwar schon alles gesagt, aber noch nicht von allen.

per aspera ad astra

Dafür lege ich Deine Hand ins Feuer



Hätt ich bloß geschwiegen

Carpe diem

In the winter of 2021/2022, a peacock butterfly spent at least a week in Rolf's office. He left sugar water for it. After Rolf's death, the cup was still on the windowsill with his note to the cleaning lady.

Bitte stehen lassen: Für Schmetterling

Tildenschlamperei

Die schärfsten Kritiker der Elche waren früher selber welche!

Erst zieht man sie groß, dann werden sie frech

Pass auf, sonst fällt der Watschnbaum um.

Da warst du noch in Abrahams Wurstkessel.

Lieber den Magen sich verrenkt als dem Wirt etwas geschenkt.

Zum Unterstreichen einer Aussage, sinngemäß: "Das sagte ich *ex cathedra*!"

Sagt der Scheich zum Emir: "Jetzt zahlen wir und dann gehn wir." Der Emir: "Da gehn wir lieber gleich!"

Vote on the open questions

Scan the QR code on the right or visit the following URL to rank the open questions.

https://ac.tuwien.ac.at/jchen/voting/

Thank you for celebrating Rolf with us.