Foreword to Special Section: Highlights from EuroVA 2025

EuroVA, the International Workshop on Visual Analytics, has shaped the European Visual Analytics research landscape for over one and a half decades. Through its discussion-oriented atmosphere, it continues to inspire and surprise with new ideas being presented every year. At the same time, the workshop advances the research field's self-conception by incorporating novel technologies on the side of computational analysis, such as LLMs, and on the side of visual-interactive analysis, such as analytic guidance. EuroVA 2025 took place in Luxembourg on June 2nd, 2025, in conjunction with the EuroVis International Conference. This special section of Computers & Graphics presents selected highlights from the workshop program, capturing the breadth and depth of the research presented there.

The work by Rakuschek et al. [1] investigates how to more effectively analyze periodic time series that exhibit overlapping cycles, global trends, outliers, and subtle secondary patterns—limitations that hinder conventional spiral visualizations. To this end, the authors introduce a guided analytical workflow centered on an enhanced time series spiral. The key novelty lies in integrating (1) a regression model tailored to periodic data to support data-driven period-length selection and expose secondary structures via residual analysis, (2) a circular visual guidance layer embedded at the spiral's center to highlight informative subsequences even under strong trends or skewed color distributions, and (3) interactive sector selection supported by interestingness measures. This combination is unique in enabling analysts to efficiently navigate the vast space of possible subsequences, thereby revealing hidden residual patterns and surfacing differences that are invisible in raw spirals.

A long-standing challenge in global nonlinear dimensionality reduction (DR) is how to preserve global high-dimensional structure while avoiding artifacts and prohibitive computational costs. Ros et al. [2] address this challenge by introducing Enhanced Force-Scheme (EFS), a fundamentally revised version of the Force-Scheme (FS) method that incorporates gradient-descent principles into the optimization process. EFS improves convergence, yields sharper and more reliable layouts, and preserves the global distance structure more effectively than FS and competing DR methods. The paper also proposes multiple acceleration strategies that maintain the algorithm's asymptotic complexity while enabling the projection of much larger datasets. This unifies the authors' earlier work (GFS and SFS) into a single robust framework. The results have a considerable impact because they show that global nonlinear DR, which are typically considered too slow for practical, possibly interactive use, can be made both accurate and scalable.

Joos et al. [3] tackle a common hurdle in modern academic research: the time-consuming, labor-intensive filtration of large literature corpora during the early phases of systematic literature reviews (SLRs). The authors present a semi-automatic, human-AI collaboration pipeline that employs multiple LLMs, each classifying papers using carefully crafted prompts, followed by a consensus-voting scheme to harmonize decisions. Uniquely, the method is operationalized through LLMSurver, an open-source visual analytics web interface that provides interactive prompt refinement, model comparison, inspection of disagreements, and real-time control over classification runs. The work shows how interactive visual steering, consensus visualization, and transparent human-in-the-loop design can bring rigor, scalability, and trustworthiness to AI-assisted research workflows. It advances visual analytics practice by positioning LLMs not as replacements for experts, but as collaborative partners whose outputs are made interpretable, inspectable, and controllable through visualization.

Multidimensional projections are ideally both parametric and invertible, enabling the embedding of new data without recomputation and the reconstruction or generation of high-dimensional samples from any point in a 2D projection space. Yet, existing dimensionality-reduction techniques such as t-SNE and UMAP are neither parametric nor invertible, limiting interactive exploration and counterfactual generation. To overcome these limitations, Dennig et al. [4] systematically investigate autoencoder-based architectures and introduce novel regularization strategies for jointly learning forward (parametric) and inverse mappings. In doing so, this paper makes an important contribution to Visual Analytics, as invertible parametric projections enable interactive data generation, classifier evaluation, and counterfactual creation, expanding analytic possibilities beyond static projections.

In many domains, actual data is unavailable due to privacy or confidentiality constraints, and data analysts must generate synthetic data as a placeholder to test their analysis pipelines. The paper by Sachdeva et al. [5] examines how to systematically validate LLM-generated structured data, addressing fragmentation, heterogeneity, and the lack of conceptual grounding across existing validation approaches. To tackle this, the authors present a novel five-dimensional design space that captures not only what is validated and at what level, but also how validation information is visually encoded, how users interact, and when validation occurs within analytic workflows. This results in a comprehensive conceptual structure that enables descriptive, evaluative, and generative analysis of

LLM-validation methods. The work uniquely incorporates non-textual explanations (e.g., attention scores) and provides task, visualization, and interaction semantics across the design space. In doing so, it unifies a previously disjoint research landscape, provides actionable guidance for designers, and reveals methodological blind spots—making an important contribution to the research and practice of Visual Analytics, which was awarded the EuroVA Best Paper Award 2025.

The papers in this special section provide an insightful glimpse into the topics the Visual Analytics community is currently concerned with and the directions we can expect future research to take. Besides the topics featured here, the workshop also discussed more fundamentally the role that AI will play in the field in general and in conducting Visual Analytics research in particular, and how this will mesh with progressive, immersive, and guided Visual Analytics. We can certainly expect more exciting research at the cross-sections of these topics to emerge over the coming years.

Hans-Jörg Schulz
Fernando V. Paulovich

References

[1] Julian Rakuschek, Helwig Hauser, Tobias Schreck: "*Guided spiral visualization for periodic time series and residual analysis*", Computers & Graphics, article no. 104535, 2026

[2] Jaume Ros, Alessio Arleo, Fernando Paulovich: "*Enhanced Force-Scheme: A fast and accurate global dimensionality reduction method*", Computers & Graphics, article no. 104536, 2026

[3] Lucas Joos, Daniel A. Keim, Maximilian T. Fischer: "*Leveraging LLMs for semi-automatic corpus filtration in systematic literature reviews*", Computers & Graphics, article no. 104537, 2026

[4] Frederik L. Dennig, Daniela Blumberg, Nina Geyer, Yannick Metz: "*Autoencoder-based regularization methods for parametric and inverse projections*", Computers & Graphics, article no. 104552, 2026

[5] Madhav Sachdeva, Christopher Narayanan, Marvin Wiedenkeller, Jana Sedlakova, Jürgen Bernard: "*Systematic validation of LLM-generated structured data — A design space and remaining challenges*", Computers & Graphics, article no. 104545, 2026

Hans-Jörg Schulz received his doctorate degree in Computer Science in 2010 from University of Rostock, Germany. Since 2018, he is an associate professor in the Department of Computer Science at Aarhus University in Aarhus, Denmark. His research interests include information visualization, visual analytics, and human-data interaction. Over the course of his career, he has contributed visual analytics methods and tool in application domains like food science, climate science, and system biology. More about him can be found at http://hjschulz.net Contact: hjschulz@cs.au.dk.

Fernando V. Paulovich is an Associate Professor in Visual Analytics for Data Science at the Department of Mathematics and Computer Science, Eindhoven University of Technology (TU/e), the Netherlands. Before moving to the Netherlands, he was a Professor and Canada Research Chair at Dalhousie University, Canada (2017-2022), and an associate professor at the University of São Paulo, Brazil (2009-2017). He has been researching information visualization and visual analytics, focusing on integrating machine learning and visualization, leveraging machine-learning-enabled automation and user knowledge to make sense of complex, massive datasets. Contact: f.paulovich@tue.nl.