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EuroVis Workshop on Reproducibility, Verification, and Validation in Visualization

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Preface

The sixth EuroRVVV (EuroVis Workshop on Reproducibility, Verification, and Validation in Visualization) workshop was co-organized by Noeska Smit (University of Bergen, Norway), Kai Lawonn (University of Koblenz - Landau, Germany), Lars Linsen (Universität Münster, Germany), and Robert Kosara (Tableau, USA). The call for papers this year focused on the topic of 'Uncertainty in Visualization'. Submitted papers underwent a one-stage peer-review process, and five papers were accepted for presentation. The full program featured a combination of paper presentations and invited talks.

International Programme Committee

Christian Hansen, Otto von Guericke University, Germany
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Keynote

Making Uncertainties Explicit

Hans-Christian Hege
Head of the Visual Data Analysis Department at Zuse Institute Berlin (ZIB), Germany

Abstract
Data comes either from measurements that directly capture properties of reality, or from simulations that provide properties of models that represent the parts of reality. All data, with a few exceptions, is subject to uncertainties. In the computational processes during data analysis additional uncertainties might creep in. When drawing conclusions from data, e.g. when testing hypotheses or making decisions, significant uncertainties need to be considered. In visualizations, such uncertainties should therefore be indicated or, if desired by the user, presented in detail. This requires two basic capabilities: (i) quantification of uncertainties and (ii) visualization of quantified uncertainties. The presentation discusses the different types of uncertainties and provides a brief overview of formal means of representing and quantifying uncertainties. It will be explained, how uncertainties propagate along the visualization pipeline and where additional uncertainties might slip in. Examples will be presented of how data afflicted with uncertainties can be visualized. Finally, various challenges in visually supported analysis of uncertain data will be discussed.

Invited Talks

Visualizing Temporal Uncertainty

Theresia Gschwandtner
Scientific researcher at the Visual Analytics group, Institute of Visual Computing and Human-Centered Technology, TU Wien

Abstract
Real world datasets often contain some amount of uncertainty. This is especially true for time series data which might contain uncertainties about the timing of past and future events. Simply neglecting these uncertainties when visualizing data might result in wrong interpretations and misjudgements of the viewer. However, it is still not clear which techniques are best suited to visualize temporal uncertainties, what representations are best understood and intuitive, and if the explicit visualization of temporal uncertainty information is beneficial at all. In this talk, I will present examples of past, present, and future work, and I will outline different research challenges in the field of temporal uncertainty visualization.

Perception, Comparison, and Models for Uncertainty

Michael Gleicher
Professor at the Department of Computer Sciences, University of Wisconsin, Madison, USA

Keynote

Ensemble Visualization - Visualizing the Uncertainty That is Represented by an Ensemble of Fields

Rüdiger Westermann
Head of the chair for Computer Graphics and Visualization at Technische Universität München, Germany

Abstract
Each member of an ensemble simulation shows a possible occurrence of one or several physical fields, and domain experts are concerned with analyzing the uncertainty that is represented by these fields. Due to the sheer volume of such ensembles, their inherent spatial and temporal aspects, as well as the complex spatio-temporal relations between features in these fields, classical data mining and statistical analysis techniques become increasingly limited. While simple analysis tasks, like finding commonalities or differences at fixed locations in space and time, can be realized in an automated way, a meaningful and intuitive depiction of the uncertainty that is carried by an ensemble is challenging. When directional quantities and spatio-temporal relations between ensemble members have to be analyzed, the limitations of available techniques become even more severe and new approaches are required. In this talk I will shed light on the relation between ensemble and uncertainty visualization, and I will discuss a variety of visualization techniques for scalar- and vector-valued ensemble fields. This is followed by a summary of current and future challenges in ensemble visualization.