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Topology-based methods are of increasing importance in the analysis and visualization of datasets from a wide variety of scientific domains such as biology, physics, engineering, and medicine. Current challenges of topology-based techniques include the management of time-dependent data, the representation large and complex datasets, the characterization of noise and uncertainty, the effective integration of numerical methods with robust combinatorial algorithms, etc. While there is an increasing number of high-quality publications in this field, many fundamental questions remain unsolved. New focused efforts are needed in a variety of techniques ranging from the theoretical foundations of topological models, algorithmic issues related to the representation power of computer-based implementations as well as their computational efficiency, user interfaces for presentation of quantitative topological information, and the development of new techniques for systematic mapping of science problems in topological constructs that can be solved computationally. The editors have brought together the most prominent and best recognized researchers in the field of topology-based data analysis and visualization for a joint discussion and scientific exchange of the latest results in the field. The 2009 "TopoInVis" workshop in Snowbird, Utah, follows the two successful workshops in 2005 (Budmerice, Slovakia) and 2007 (Leipzig, Germany).