

Visual Analytics Meets Temporal Reasoning: Challenges and Opportunities

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Abstract

Visual Analytics as the science of analytical reasoning facilitated by interactive visual interfaces aims to enable the exploration and the understanding of large, heterogeneous, and complex data sets.

Time is an important data dimension with distinct characteristics.

Intertwining Visual Analytics with time and temporal reasoning introduces outstanding challenges and opportunities, which I will illustrate in this talk.

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1 Extended Abstract

Visual Analytics integrates the outstanding capabilities of humans in terms of visual information exploration with the enormous processing power of computers to form powerful information and knowledge discovery environments. In other words, Visual Analytics is the science of analytical reasoning facilitated by interactive interfaces and captures the information discovery process keeping the human in the loop as well as gaining deeper insights into huge heterogeneous and complex data sources.

Time is an important data dimension with distinct characteristics. Time is common across many application domains (e.g., medical records, planning, or project management). In contrast to other quantitative data dimensions, which are usually “flat”, time has an inherent semantic structure, which increases time’s complexity substantially. The hierarchical structure of granularities in time (e.g., minutes, hours, days, weeks, or months), is unlike that of most other quantitative dimensions. Specifically, time comprises different forms of divisions (e.g., 60 minutes correspond to one hour, while 24 hours make up one day), and granularities are combined to form calendar systems (e.g., Gregorian, Julian, business, or academic calendars). Moreover, time contains natural cycles and re-occurrences, as for example seasons, but also social (often irregular) cycles, like holidays or school breaks. Therefore, time-oriented data, i.e., data that are inherently linked to time, need to be treated differently than other kinds of data and require appropriate visual, interactive, and analytical methods to explore and analyze them.

In this talk, I will illustrate the concepts of Visualization and Visual Analytics. I will characterize the dimension of time as well as time-oriented data as well as describe tasks that users seek to accomplish using temporal Visual Analytics methods. I will address three key questions: “what” is visualized, “why” is it visualized, and “how” it is visualized. Various examples will illustrate what has been achieved so far and show possible future directions and challenges.



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