

# Introduction to this Special Issue: Spatio-Temporal Uncertainty

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The impact of the imperfect knowledge on the reasoning and beliefs has been an important topic throughout all the stages of human civilization, for scientists, engineers, philosophers and logicians alike. With the advent of the computing, sensing and communications technologies, the importance of capturing the uncertain/probabilistic nature of the data has become vital in numerous application domains. When it comes to spatial and temporal – and, of course, spatio-temporal – data, the uncertainty arises not only because of the errors in measurements (e.g., the imprecision of the GPS devices), but also because continuous phenomena are attempted to be represented with finite/discrete number of values. What amplifies the impact of the spatio-temporal uncertainty in present day is the fact that data pertaining to (*location, time*) information are generated at unprecedented pace and volume, from variety of applications of high societal relevance and/or popularity – e.g., tweets, social networks, satellite images, tracking (GPS-based as well as based on other sensors).

Clearly, one would like to be able to somehow “capture” the uncertainty both at a formal/syntactic level, as well as in the algorithmic solutions for processing various queries or performing decision-making tasks. However, there are various facets of spatio-temporal uncertainty that may, in one way or another, exhibit different impacts and relationship with other context-attributes in different application.

This special issue aims at providing an overview of certain problems (and solutions) brought about by the impact of spatio-temporal uncertainty management from different perspectives. There are five contributions, each addressing a unique aspect of the problem.

The first contribution by Yaron Kanza overviews the causes of uncertainty in geosocial data management and elaborates on some of the advantages and disadvantages of using inaccurate or incomplete geosocial data. The second article in this issue, by Reynold Cheng, addresses the issue of modeling and querying uncertain spatial data. Andreas Zuefle, in the third contribution, discusses how Bayesian learning approach can be beneficial for unifying and integration of various types, resolutions, and levels of uncertainty of user location data. The fourth article, by Mihai Maruseac and Gabriel Ghinita, considers the impact of uncertainty which arises when one is compelled to incorporate/implement privacy concerns pertaining to users’ location data. The last contribution in this issue, by Jane Macfarlane and Matei Stroila, discusses the impact of uncertainty and its fusion and propagation in the settings of autonomous driving.

We hope that the readership will find this collection of articles touching upon various impacts of spatio-temporal uncertainty informative and useful in their work. Enjoy!