ChatKG: Visualizing Temporal Patterns as Knowledge Graph

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Abstract
Line-chart visualizations of temporal data enable users to identify interesting patterns for the user to inquire about. Using oracles, such as chat AIs, Visual Analytic tools can automatically uncover explicit knowledge related information to said patterns. Yet, visualizing the association of data, patterns, and knowledge is not straightforward. In this paper, we present ChatKG, a novel visualization strategy that allows exploratory data analysis of a Knowledge Graph which associates a dataset of temporal sequences, the patterns found in each sequence, the temporal overlap between patterns, and related explicit knowledge to each given pattern. We exemplify and informally evaluate ChatKG by analyzing the world's life expectancy. For this, we implement an oracle that automatically extracts relevant or interesting patterns, inquires chatGPT for related information, and populates the Knowledge Graph which is visualized. Our tests and an interview conducted showed that ChatKG is well suited for temporal analysis of temporal patterns and their related knowledge when applied to history studies.
CCS Concepts
• Human-centered computing → Visual analytics; • Computing methodologies → Knowledge representation and reasoning;
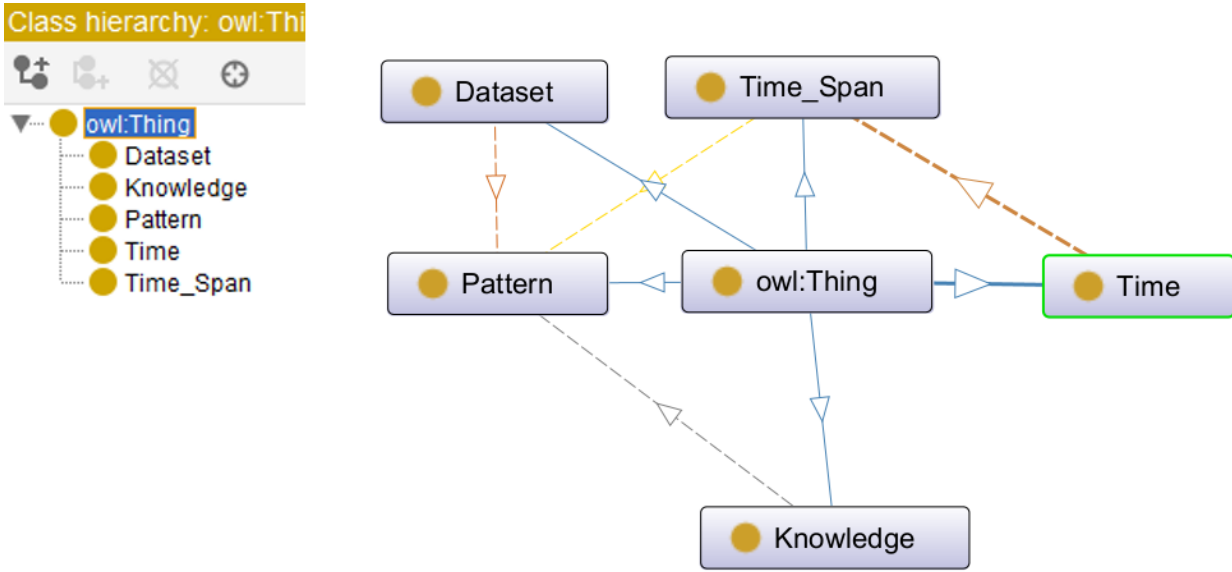
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1. Screenshot of the Tools

Figure 1: *Design of our Knowledge Graph following the Web Ontology Language. It defines the classes and their relationships that will be visualized by ChatKG.*
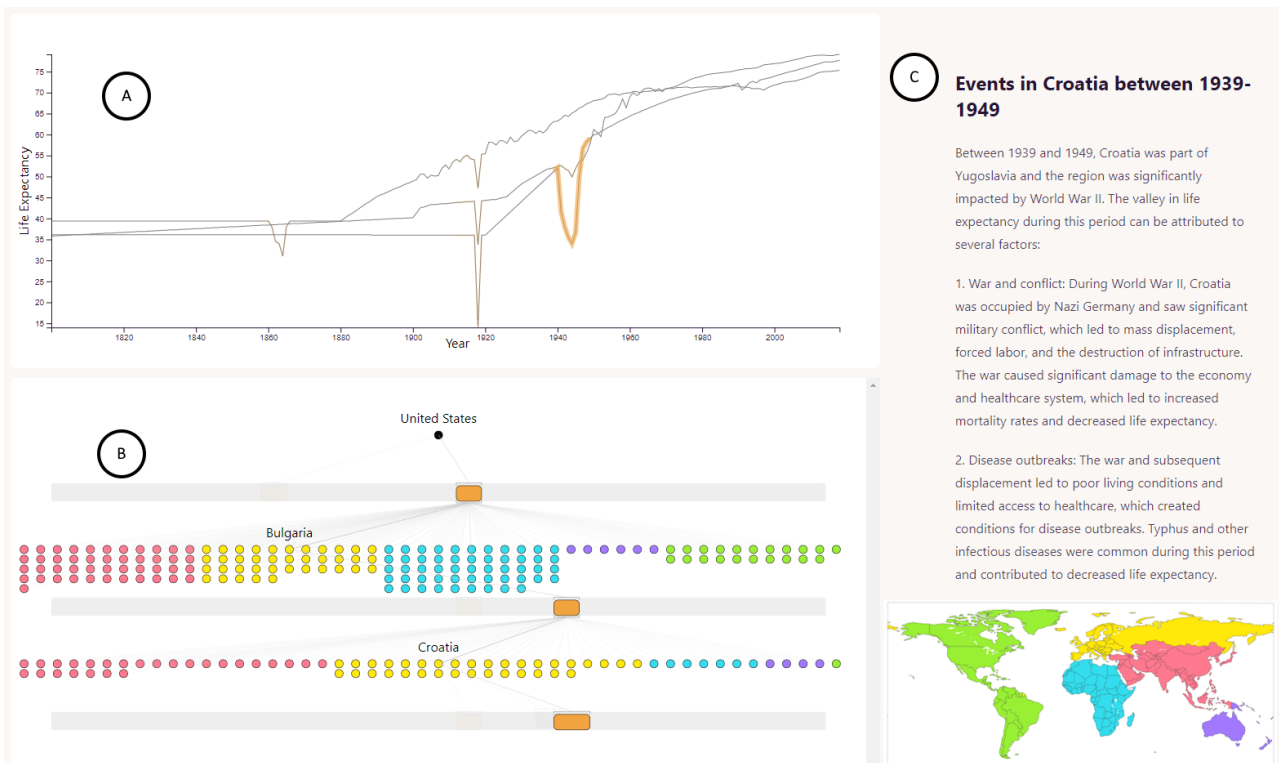

Figure 2: *Example of ChatKG being used to investigate the life expectancy dataset. USA's valley between 1912-1924 shows a large number of other countries with patterns in the same time period. Of them, Bulgaria was selected. By selecting Bulgaria's right-most pattern, it was found that Croatia has two overlapping patterns with Bulgaria, and when hovering the patterns in ChatKG, chatGPT says both countries were impacted by WWII at that time.*
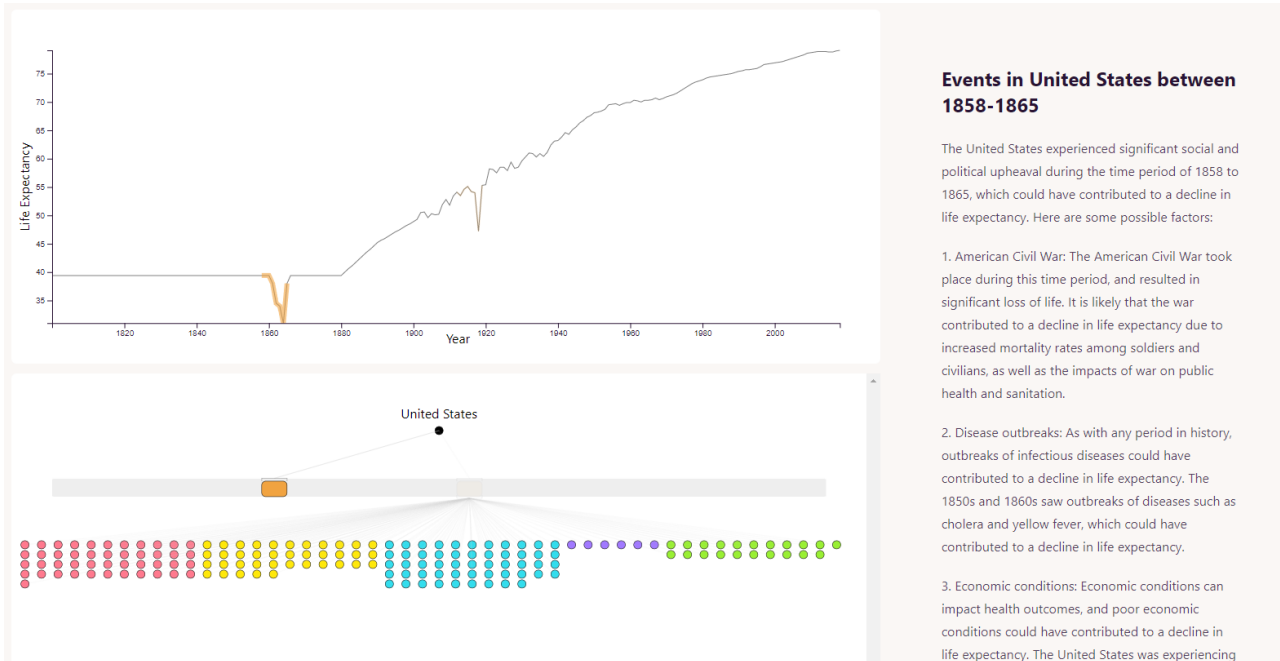
Figure 3: *Example of ChatKG being used to investigate the life expectancy in the USA. The first valley from 1858-1868 was likely caused by the American Civil War as per ChatGPT.*
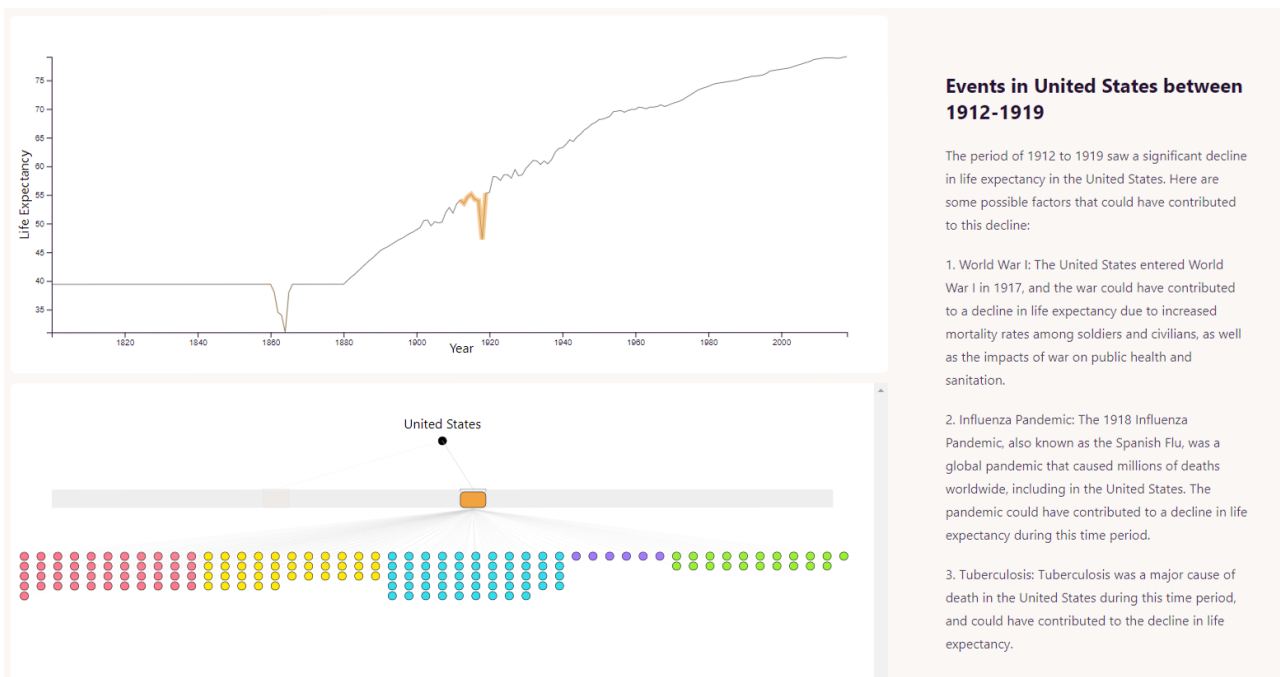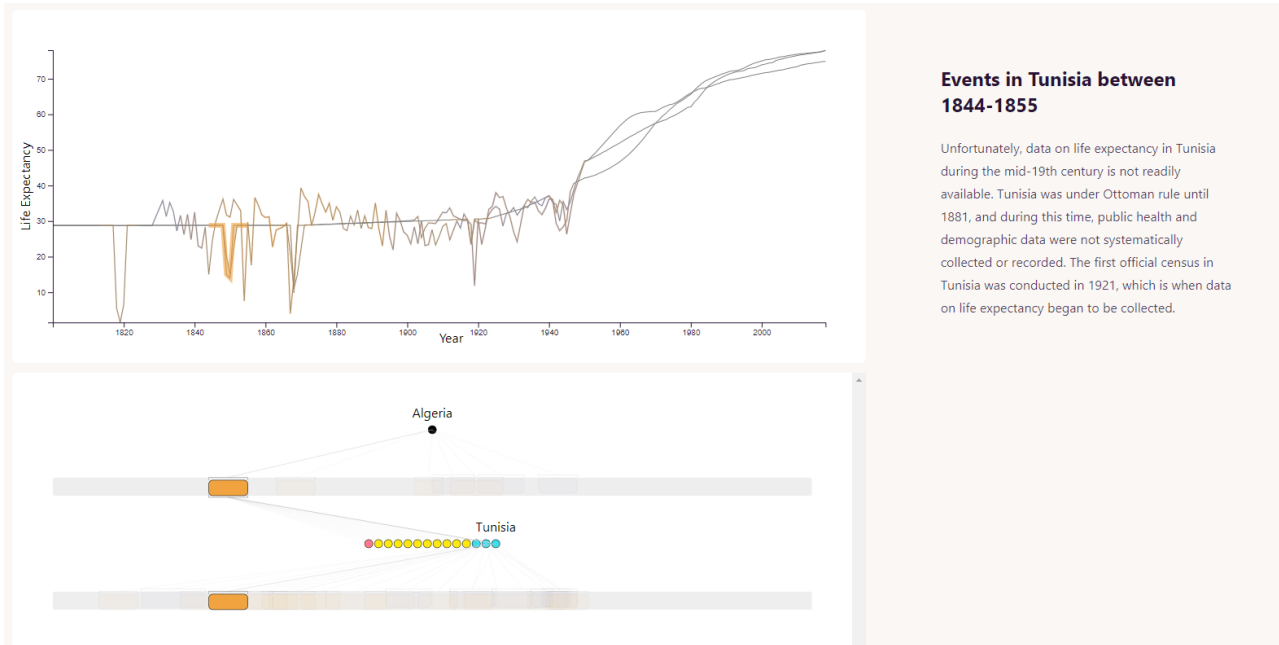

Figure 4: *Example of ChatKG being used to investigate the life expectancy in the USA. The second valley from 1912-1924 was likely caused by World War I, Influenza, and other factors, as per ChatGPT. Additionally, from the number of circles in ChatKG we conclude that many countries have also had some impact on their life expectancy during the same period.*

Figure 5: *Example of ChatKG being used to investigate the life expectancy in Algeria. The left-most pattern (1844-1855) has 3 African countries (in cyan) with patterns in the same period: Tunisia, Mauritius, and Algeria. The results from ChatGPT show that Algeria and Mauritius were colonies at the time of France and Great Britain, respectively, and Tunisia was under Ottoman Rule.*