

In Search of Lost Time - Restoring Chronologies of Individuals from Broken Cuneiform Resources

Background

The primary research question underlying this study is how to utilize the representations of individuals lives, interactions, and relationships over time to accurately reposition textual sources in their chronology when the original date is absent, consequently improving the accuracy of the representation for all the other individuals.

Missing text is an especially acute problem of ancient texts, from ancient Mesopotamian clay tablets to Egyptian papyri, to Aramaic and Greek Ostraca. Cuneiform tablets are especially numerous and cover more than three thousand years of history from the end of the 4th millennium BCE to the first centuries of the Common Era. However, they are prone to fragmentation, and damage to their written surface renders it challenging to recover the information recorded in the inscribed text fully [1].

This study focuses on Babylonian cuneiform sources from the 1st millennium BCE, which encompass a broad range of topics, including administrative and legal records, religious texts, and correspondence. While they provide plenty of information about the micro-history of individuals, such knowledge is not immediately accessible and requires a particular temporal aspect to represent the developments in the individual's life over time. It's therefore necessary to represent data using methods that enable tracking changes over time, in order to reach insightful observations about the lives of individuals and the communities in which they lived.

Methods and Data

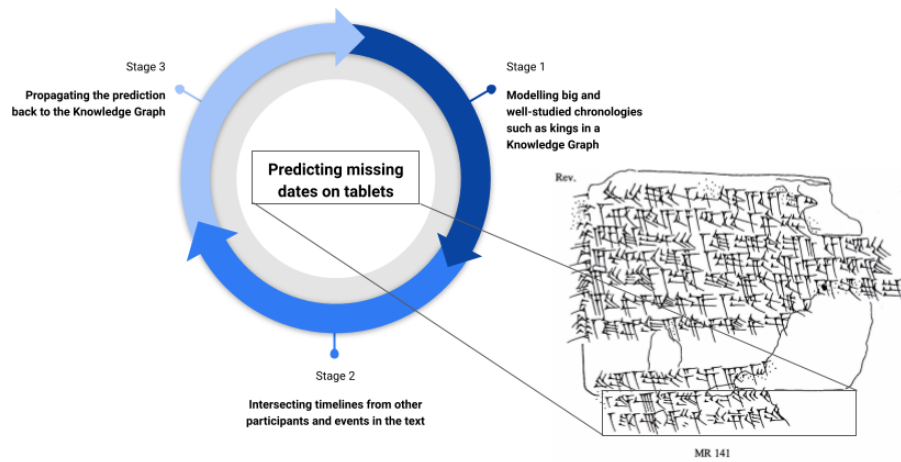
Knowledge graphs (KGs) are a popular and rapidly evolving data structure used in artificial intelligence to represent and connect various pieces of information. A KG is a collection of entities (like people, places, or things) and the relation-

ships between them, which can be used to store vast amounts of knowledge in an interconnected format. KGs outperform relational databases (RDB) in representing developments over time because RDBs use structured distributed data, while KGs are designed to model temporal relationships using hierarchies, node types and edge properties all in one place. In this study we model cuneiform texts in a KG and use the relationships between the entities and other information mentioned in the texts to help determine the chronology of events in texts with broken dates. Traditionally, this is done with prosopographical databases like Prosobab [3], but manually and on a relatively small scale since it's an RDB.

The first step in the KG modelling is to anchor all the possible texts to known and well-studied objects like important events or chronologies of kings. Then, for texts with missing dates we extract from the KG the temporal information available in the text, i.e. the participants identity and mentions of places or events. Then we calculate the intersection between the ranges to predict a possible year span for the missing date. Finally we validate the prediction by back-propagating it to the KG looking for contradictions. If there are none, this range can be used to enrich participants data and assist in predicting a range of dates for other missing texts.

Exemplary Findings

This example relies on a combination of several archives of Marduk-Rēmanni [2]. He was a trader and a priest, born in the reign of the last Babylonian king Nabonidus, who died as a subject of the Persian empire in the reign of Darius. Several thousand texts record his family, personal life and his interactions with the local urban community in those days. Taking Waerzeggers 2014, no.141 (BM 74533) [2], we can see its dating formula is broken. The anchoring to royal chronologies yields that this was during the rule of Darius (550-486 BCE). The range of years can be narrowed by extracting from the KG the years when Marduk-Rēmanni was active in the area of Sippar where this text is located. This yields a year span of 528-488 BCE, which can be narrowed further to his peak activity in those years between 519-509 BCE. It can be further narrowed by extracting when the other participants mentioned in this text were active. The KG shows that while most of them only appeared in this document, some were also mentioned in other documents from 514 to 507 BCE. The intersection of these ranges enable us to estimate the year of BM 74533 to be 514-509 BCE. This is a proof of concept to our method of placing and ordering events in an individual's lifespan based on the graphical representation of other objects in the document itself and in the relevant time frame.



References

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- [2] C. Waerzeggers. *Marduk-rēmānī: local networks and imperial politics in Achaemenid Babylonia*, volume 233. Peeters, 2014.
- [3] C. Waerzeggers, M. Groß, et al. Prosobab: Prosopography of babylonia (c. 620-330 bce). *Leiden University*. Available at <https://prosobab.leidenuniv.nl>, 2019.