Temporal Information Retrieval and Question Answering in the Age of LLMs

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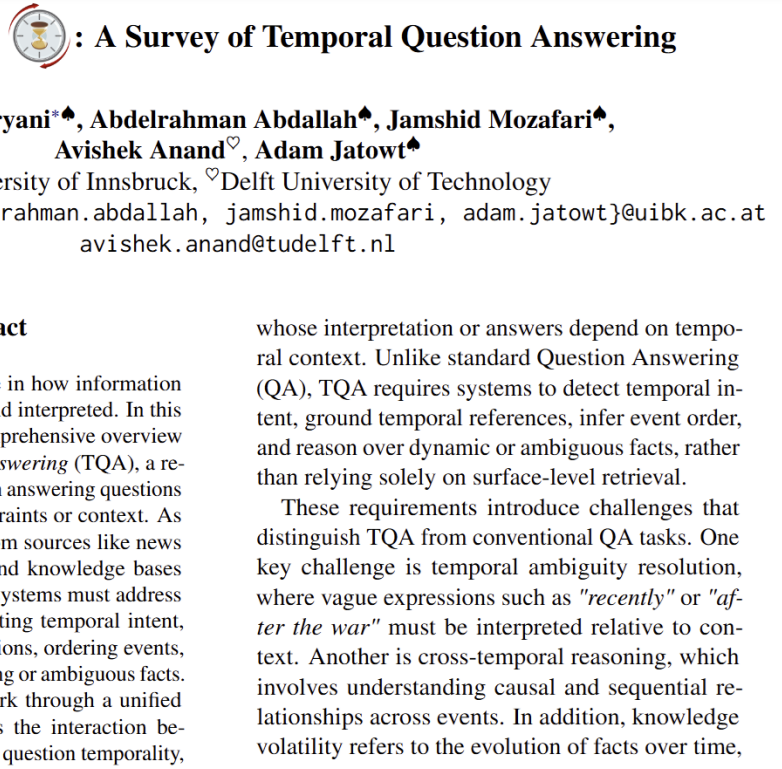
Recent Survey

Significant portions of tutorial are based on the latest survey **“It's High Time: A Survey of Temporal Question Answering”** (to appear at ACL 2026).

Bhawna Piryani, Abdelrahman Abdallah, Jamshid Mozafari, Avishek Anand, and Adam Jatowt. 2026. It’s High Time: A Survey of Temporal Question Answering. In *Proceedings of the 64th Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*, pages 28852–28881, San Diego, California, United States. Association for Computational Linguistics.



It’s High Time : A Survey of Temporal Question Answering

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Abstract

Time plays a critical role in how information is generated, retrieved, and interpreted. In this survey, we provide a comprehensive overview of *Temporal Question Answering* (TQA), a research area that focuses on answering questions involving temporal constraints or context. As time-stamped content from sources like news articles, web archives, and knowledge bases continues to grow, TQA systems must address challenges such as detecting temporal intent, normalizing time expressions, ordering events, and reasoning over evolving or ambiguous facts. We organize existing work through a unified perspective that captures the interaction between corpus temporality, question temporality, whose interpretation or answers depend on temporal context. Unlike standard Question Answering (QA), TQA requires systems to detect temporal intent, ground temporal references, infer event order, and reason over dynamic or ambiguous facts, rather than relying solely on surface-level retrieval.

These requirements introduce challenges that distinguish TQA from conventional QA tasks. One key challenge is temporal ambiguity resolution, where vague expressions such as *"recently"* or *"after the war"* must be interpreted relative to context. Another is cross-temporal reasoning, which involves understanding causal and sequential relationships across events. In addition, knowledge volatility refers to the evolution of facts over time,

01

SECTION 1 · 10 min

Introduction & Motivation

Establishing why time is a fundamental dimension in how information is generated, retrieved, and interpreted.

Presenter: Adam Jatowt

Why time matters in IR and QA

Information needs are often time-dependent. A relevant document is not only about the right topic, but also concerning the right time periods.

“Best practices for React development”
Technology evolves rapidly; documents that were once authoritative may become outdated.

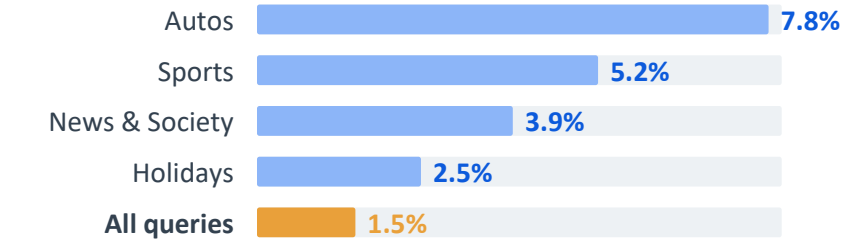
“What was the EU's stance on encryption in 2024?”
Policies and regulations change over time, requiring temporally valid information.

“Apple earnings in Europe during COVID-19 outbreak”
Users often seek the most recent information, making freshness a key relevance signal.

How common are temporal queries?

Users rarely state time outright — yet most searches carry a temporal dimension the system has to infer.

Share of queries with an explicit temporal expression, by topic



Nunes, Ribeiro & David, ECIR 2008 — overall ≈ 1.5% of web queries

≈90%

of queries show temporal dynamics — only ~10% never spike over a 10-week window.

Kulkarni et al., WSDM 2011

Mostly implicit

Temporal intent is usually unstated — carried by entities and events (“Olympics,” “latest Mac Book”) rather than dates.

Metzler et al., SIGIR 2009

Nunes, Sérgio, Cristina Ribeiro, and Gabriel David. **"Use of temporal expressions in web search."** In European Conference on Information Retrieval, pp. 580-584. Berlin, Heidelberg: Springer Berlin Heidelberg, 2008.
Kulkarni, Anagha, Jaime Teevan, Krysta M. Svore, and Susan T. Dumais. **"Understanding temporal query dynamics."** In Proceedings of the fourth ACM international conference on Web search and data mining, pp. 167-176. 2011.
Metzler, Donald, Rosie Jones, Fuchun Peng, and Ruiqiang Zhang. **"Improving search relevance for implicitly temporal queries."** In Proceedings of the 32nd international ACM SIGIR conference on Research and development in information retrieval, pp. 700-701. 2009.

What is Temporal IR?

Temporal Information Retrieval (TIR) retrieves documents that are not only topically relevant but also aligned with the query's temporal intent.

Recency

Prioritizing the most-up-to-date information for trending topics or evolving facts.

History

Retrieving authentic accounts from the time, preserved in archives (e.g., “1960s Cold War”).

Periodicity

Identifying recurring patterns (e.g., “Olympics”, “Tax season”) in search queries.

Ricardo Campos, Gaël Dias, Alípio M. Jorge, and Adam Jatowt. **Survey of Temporal Information Retrieval and Related Applications**. ACM Comput. Surv. 47, 2, Article 15, 2014

What is Temporal QA?

Temporal Question Answering (TQA) answers questions whose interpretation, evidence, or correct answers depend on time.

- Unlike Temporal IR, which retrieves temporally relevant documents, TQA must take into consideration or reason over temporal information to generate or verify answers.

Temporal Intent: Detecting to what time period a question refers to.

Matching & grounding: Finding temporally relevant content to formulate answers and/or making references linking to it.

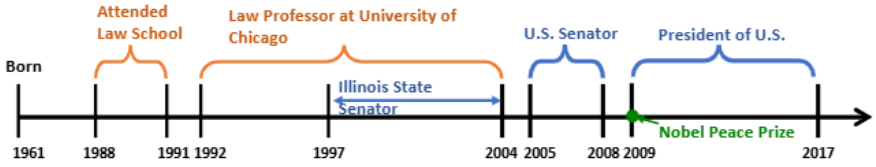
Reasoning: Ordering events, inferring relations, aggregating data across time, etc.

Example 1: Explicit Reasoning

Q: At what age did Obama win the Nobel Peace Prize?

This requires identifying and grounding two anchors:

- **Anchor 1:** Birth Year (1961)
- **Anchor 2:** Prize Year (2009)



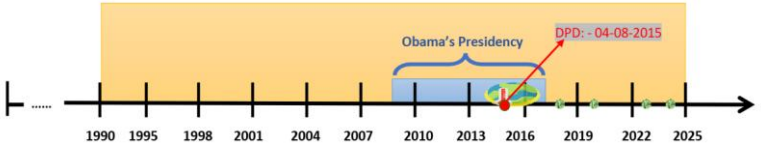
Calculation: 2009 - 1961 = 48 YEARS OLD

Example 2: Context Sensitivity

Q: **What does President Obama's climate policy tell us about how the U.S. viewed climate change during his late years of service?**

This requires **historically grounded reasoning** and anchoring the question in its historical context:

- Must anchor "late years" to presidency timeline (2009-2017).
- Requires access to **contemporaneous** documents (diachronic collection).
- Typically should ignore retrospective analyses from after 2017 to capture original intent.



Challenges in Temporal IR & QA

Why is temporal information access difficult?

Temporal Ambiguity	Temporal expressions or temporal intent require contextual interpretation.	"recent", "last year", "next Monday", "Who was the President of Virginia?"
Knowledge Volatility	Facts evolve over time.	✓ CEOs change ✓ Rankings change ✓ Policies change ✓ Events unfold
Temporal Uncertainty	The exact temporal information is unknown, approximate, or conflicting.	• Approximate dates (e.g. "around 1850") • Conflicting sources • Incomplete timelines
Long-Horizon Reasoning	Reasoning across long time spans is difficult (due to context shift, etc).	 *Requires tracking many events and relations.*
Implicit Temporal Intent	Many questions hide their timeframe; it must be inferred from context.	"latest earnings", "current leader", "Paris Olympics"
Retrieval Misalignment	Event time, publication time, and query time often differ, making retrieval difficult.	• Article published in **2025** about **WWII** • News published **today** describing an event to occur next **week** • Missing publication dates

Temporal information access requires handling **ambiguity**, **uncertainty**, **evolving knowledge**, and **complex temporal reasoning**.