

# TEQUILA: Temporal Question Answering Over Knowledge Bases

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**TEQUILA enables any standalone KB-QA system to answer temporal questions!!!**

Which clubs did Neymar play for before he joined PSG?



## MOTIVATION

- ★ Knowledge-based question answering (KB-QA) answers questions over large KBs (e.g., YAGO, Wikidata)
- ★ State-of-the-art KB-QA cannot handle **complex** questions
- ★ Important class of complexity: **Temporal** information needs

## STAGES

- ★ **Detect** a temporal question (HeidelTime + dictionaries)
- ★ **Decompose** and rewrite (Shallow NLP + intuitions)
- ★ **Answer** sub-questions (KB-QA + similarity lookups)
- ★ **Reason** on temporal intervals (signals + constraints)

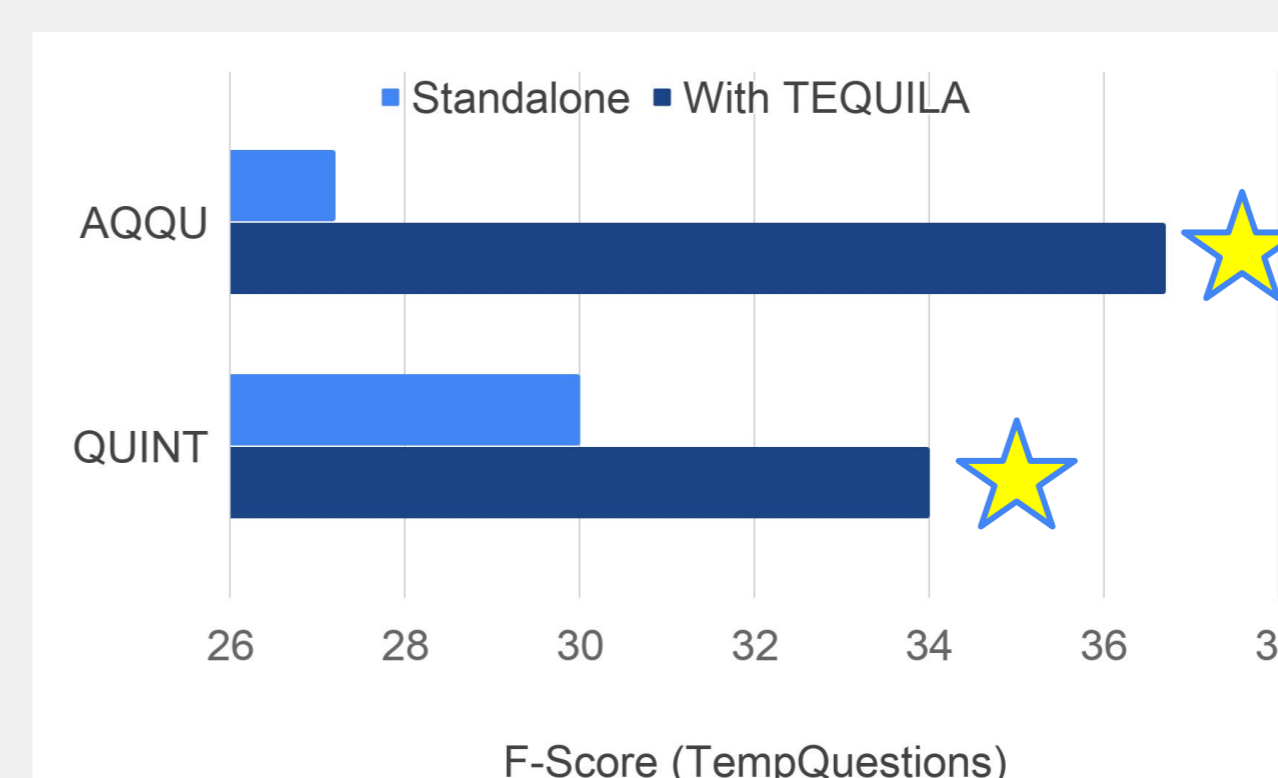
## DECOMPOSITION INTUITIONS

- ★ **Signal** separates non-temporal and temporal sub-questions
- ★ Each sub-question needs **entity and relation** to be answerable by KB-QA system
- ★ If temporal sub-question **lacks** entity or relation, it is **borrowed** from the non-temporal part
- ★ KB-QA systems **robust** to **ungrammatical** constructs

## REASONING

Relation	Signals	Constraint
BEFORE	"before", ...	$END_{ANS} \leq BEGIN_{CONS}$
AFTER	"after", ...	$BEGIN_{ANS} \geq END_{CONS}$
OVERLAP	"during", ...	$BEGIN_{ANS} \leq END_{CONS} \leq END_{ANS}$

## RESULTS



- ★ **TempQuestions** (Jia et al. 2017)
- ★ **ComplexQuestions** (Bao et al. 2016)
- ★ **Improves precision**



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Demo: <https://gate.d5.mpi-inf.mpg.de/tequila/>