

Table 10 Challenges in the state of the art for QA systems over KBs

Challenge	Survey, years covered	Short description	Task
Identify Question types	[17], 2004–07, [52], 2005–12	Includes wh-questions, requests (<i>give me</i>), nominal or definitions, topicalized entities, how questions with adjective or quantifications (<i>how big/many</i>)	Question Analysis
Lexical gap, Vocabulary gap	[54] 2004–11, [52], 2005–12, [36], 2004–11, [37], 2011–12, [46], 2011–15	Query and databases may not be expressed using the same vocabulary (synonymy) or at the same level of abstraction. It requires to bridge the gap between the vocabulary in the user query and the KB vocabulary	Mapping
Multilingual QA	[16] QALD-3, [71] QALD-4, [46], 2011–15	Mediates between a user expressing an information need in her own language and the semantic data	Question Analysis, Mapping
Light expression Vagueness Lexical ambiguity	[17], 2004–07, [54], 2004–11, [52], 2005–12, [37], 2004–11, [46], 2011–15	Queries with words that can be interpreted through different ontological entities or semantically weak constructions. Relations that are expressed implicitly with the use of verbs such as <i>be/have</i> or light prepositions that can convey different meanings	Disambiguation
Semantic gap Conceptual complexity	[52], 2005–12, [36], 2004–11, [37], 2011–12	Queries that are not necessarily structured in the knowledge base in the same way than in the question.	Query construction
Spatial and temporal prepositions	[17], 2004–07, [52], 2005–12, [46], 2011–15	Requires to capture the domain-independent meaning of spatial (<i>in, next, thorough</i>) and temporal (<i>after, during</i>) prepositions	–
Adjective modifiers and superlatives	[17], 2004–07, [54], 2004–11, [52], 2005–12, [46], 2011–15	Superlative modifiers and attribute selectors (<i>how+adj</i>) require mapping each adjective to a KB predicate (e.g. <i>area/ population</i> for <i>smallest</i>), as well as keeping the polarity for superlatives (order by ASC/DESC)	Disambiguation, Query construction