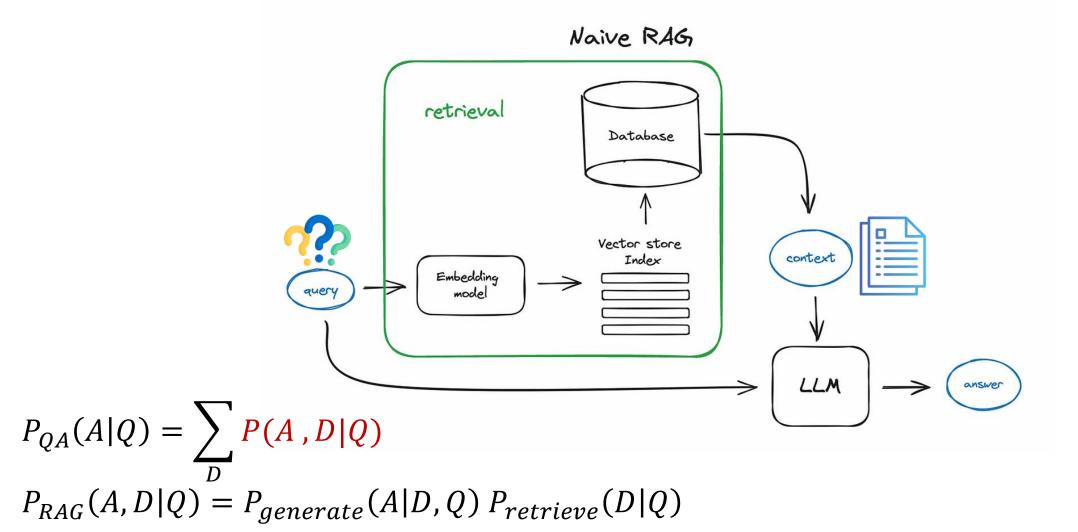
ReSCORE: Label-free Iterative Retriever Training for Multi-hop Question Answering with Relevance-Consistency Supervision

Dosung Lee, Wonjun Oh, Boyoung Kim, Minyoung Kim, Joonsuk Park, Paul Hongsuck Seo Korea University, NAVER AI Lab, NAVER Cloud, University of Richmond {dslee1219, owj0421, bykimby, omniverse186, phseo}@korea.ac.kr, park@joonsuk.org



Retrieval Augmented Generation





Multi-hop Question Answering & Challenges

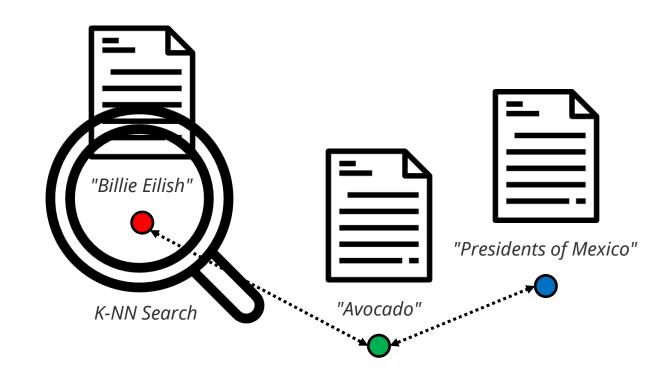
Single-hop





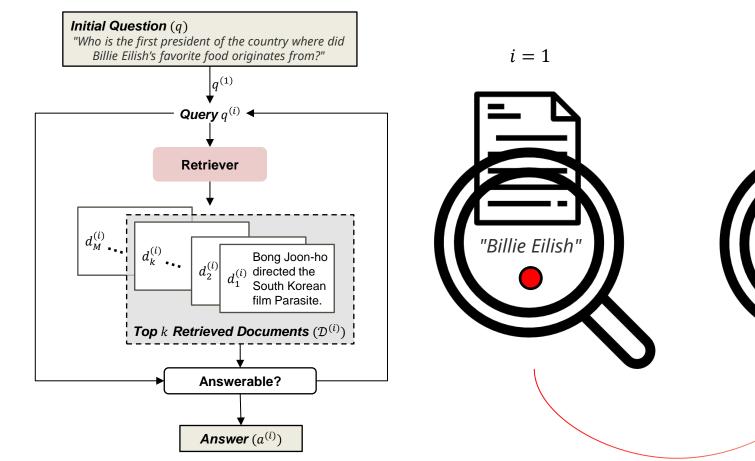
Multi-hop

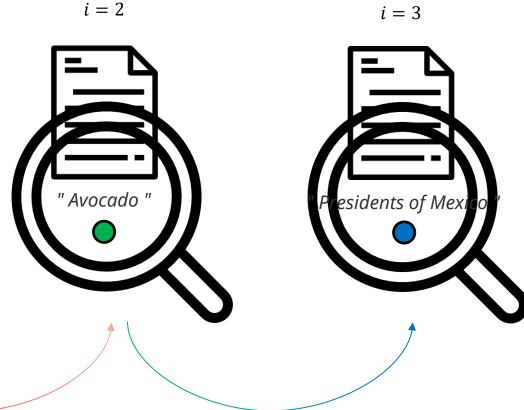
"Who is the first president of the country where did Billie Eilish's favorite food originates from?"





Iterative RAG Inference Framework





"Billie Eilish's favorite food is Avocado" "Avocado originated from Mexico"



Challenges of Labeling MHQA & Label-free Training



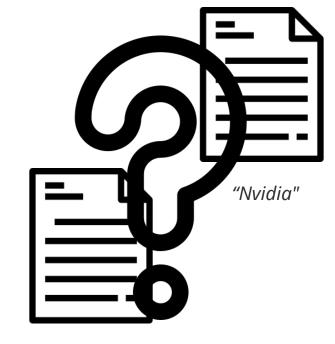
"Who is the first president of the country where did Billie Eilish's favorite food originates from?"



"Billie Eilish"



"Elon Musk"



"South Korea"



" Presidents of Mexico "



" Avocado"



"Paris"

Relevance-Consistency Supervision

$$P_{QA}(A|Q) = \sum_{D} P(A, D|Q)$$

 $P_{RAG}(A, D|Q) = P_{generate}(A|D, Q) P_{retrieve}(D|Q)$

 $P_{Retriever}(D|Q) \propto P_{LLM}(A,Q|D)$

 $P_{LLM}(A, Q|D) = P_{Consistency}(A|D, Q) P_{Relevance}(Q|D)$



"Who is the first president of the country where did Billie Eilish's favorite food originates from?"



"Presidents of Mexico"

 $P_{Consistency}(A|D,Q)$



"Billie Eilish"

 $P_{Relevance}(Q|D)$



ReSCORE Training

