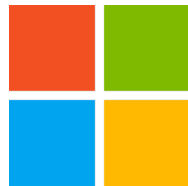


# Multi-Field Adaptive Retrieval

Millicent Li, Tongfei Chen, Benjamin Van Durme, Patrick Xia



Microsoft

# Motivation

Documents naturally have structure, but plenty of existing retrieval datasets do not.

## Ronald Reagan

Article Talk

From Wikipedia, the free encyclopedia

*"Reagan" redirects here. For other uses, see [Ronald Reagan \(disambiguation\)](#) and [Reagan \(disambiguation\)](#).*

**Ronald Wilson Reagan**<sup>[1]</sup> (February 6, 1911 – June 5, 2004) was an American politician and actor who served as the 40th *president of the United States* from 1981 to 1989. He was a member of the *Republican Party* and became an important figure in the American conservative movement. His presidency is known as the *Reagan era*.

Born in Illinois, Reagan graduated from *Eureka College* in 1932 and was hired the next year as a sports broadcaster in Iowa. In 1937, he moved to California where he became a well-known film actor. During his acting career, Reagan was president of the *Screen Actors Guild* twice, from 1947 to 1952 and from 1959 to 1960. In the 1950s, he hosted *General Electric Theater* and worked as a motivational speaker for *General Electric*. Reagan's "A Time for Choosing" speech during the 1964 presidential election launched his rise as a leading conservative figure. After being elected *governor of California* in 1966, he raised state taxes, turned the state budget deficit into a surplus and implemented harsh crackdowns on university protests. Following his loss to Gerald Ford in the 1976 *Republican Party* presidential primaries, Reagan won the *Republican Party's* nomination and then a landslide victory over President *Jimmy Carter* in the 1980 presidential election.

In his first term as president, Reagan began implementing "*Reaganomics*", which involved economic deregulation and cuts in both taxes and government spending during a period of stagflation. On the world stage, he escalated the arms race, increased military spending, transitioned *Cold War* policy away from the policies of *détente* with the Soviet Union, and ordered the 1983 invasion of Grenada. He also survived an assassination attempt, fought public-sector labor unions, expanded the war on drugs, and was slow to respond to the AIDS epidemic. In the 1984 presidential election, he defeated former vice president *Walter Mondale* in another landslide victory. Foreign affairs dominated Reagan's second term, including the 1986 bombing of Libya, the secret and illegal sale of arms to Iran to fund the *Contras*, and engaging in negotiations with Soviet leader *Mikhail Gorbachev*, which culminated in the *Intermediate-Range Nuclear Forces Treaty*.

Reagan left the presidency in 1989 with the American economy having seen a significant reduction of inflation, the unemployment rate having fallen, and the U.S. having entered its then-longest peacetime expansion. At the same time, the national debt had nearly tripled since 1981 as a result of his tax cuts and increased military spending, despite cuts to domestic discretionary spending. Reagan's foreign policies also contributed to the end of the Cold War.<sup>[2]</sup> Though he planned an active post-presidency, it was hindered after he was diagnosed with *Alzheimer's disease* in 1994, and his physical and mental capacities gradually deteriorated, leading to his death in 2004. His tenure constituted a *realignment* toward conservative policies in the United States, and he is often considered an icon of American conservatism. *Historical rankings of U.S. presidents* have typically placed Reagan in the upper tier, and his *post-presidential approval ratings* by the general public are usually high.<sup>[3]</sup>



Official portrait, 1981

**40th President of the United States**

**In office**

January 20, 1981 – January 20, 1989

**Vice President** George H. W. Bush

**Preceded by** Jimmy Carter

**Succeeded by** George H. W. Bush

**33rd Governor of California**

**In office**

January 2, 1967 – January 6, 1975<sup>[1]</sup>

**Lieutenant** Robert Finch (1967–1969)<sup>[2]</sup>  
Edwin Paetzle (1969–1974)<sup>[3]</sup>  
Jim L. Harner (1974–1975)<sup>[4]</sup>

**Preceded by** Pat Brown

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**President of the Screen Actors Guild**

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**Preceded by** Howard Keel

**Succeeded by** George Chandler

**In office**

March 10, 1947 – November 10, 1952

**Preceded by** Robert Montgomery

**Succeeded by** Walter Pidgeon

**Personal details**

**Born**

Ronald Wilson Reagan  
February 6, 1911  
Tampico, Illinois, U.S.

**Died**

June 5, 2004 (aged 93)  
Los Angeles, California, U.S.

Example from MS MARCO<sup>1</sup>

```
{ "is_selected": [ 0, 1, 0, 0, 0, 0, 0 ], "passage_text": [ "In his younger years, Ronald Reagan was a member of the Democratic Party and campaigned for Democratic candidates; however, his views grew more conservative over time, and in the early 1960s he officially became a Republican. In November 1984, Ronald Reagan was reelected in a landslide, defeating Walter Mondale and his running mate Geraldine Ferraro (1935-), the first female vice-presidential candidate from a major U.S. political party.", "From Wikipedia, the free encyclopedia. A Reagan Democrat is a traditionally Democratic voter in the United States, especially a white working-class Northerner, who defected from their party to support Republican President Ronald Reagan in either or both the 1980 and 1984 elections. During the 1980 election a dramatic number of voters in the U.S., disillusioned with the economic 'malaise' of the 1970s and the presidency of Jimmy Carter (even more than, four years earlier, Liberal Republican Gerald Ford), supported former California governor (and former Democrat) Ronald Reagan.", "Ronald Reagan began his political life in the Democratic Party, but as he became more and more conservative, he ultimately changed to the Republican Party in the early 1960s. Yes, he switched parties in 1962. He said that he did not desert was ronald reagan a democrat
```

What do we do if we have documents **with** structure?

<sup>1</sup>Bajaj et al. 2016; MS MARCO: A Human Generated MACHINE Reading COmprehension Dataset

# Potential Solution

The simple solution is to use existing retrieval systems that encode directly a **single** document.

- But then we lose out on the inherent structure of the document, which can be a useful signal.

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**Died**  
June 5, 2004 (aged 93)  
Los Angeles, California, U.S.

# Introducing mFAR: Multi-Field Adaptive Retrieval

Our method enables:

Retrieval across multiple “fields.”

{

```
  "title": "Beating the King's Indian  
and Benoni Defense...",  
  
  "brand": "The House of Staunton",  
  
  "reviews": [{reviewerID: 1234, ...}, ...]
```

```
  "description": "...",
```

```
  "...": "...",
```

}

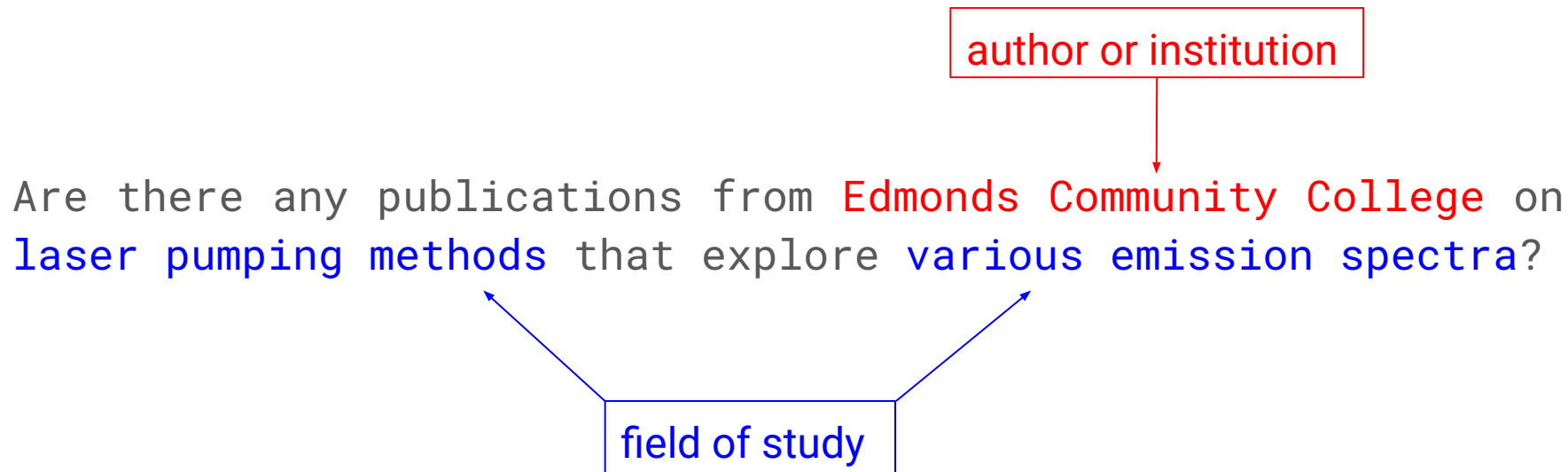
Hybrid retrieval: combines the power of lexical (word-level) and dense (semantic) scorers.

Question: What is the product about?

Lexical: **“Beating the King’s Indian and Benoni Defense”**

Dense: **“Chess strategy guide”**

# mFAR: Query Conditioning



# mFAR models

We include four baselines and train several types of mFAR models:

Baselines:

- BM25
- Contriever
- $\text{mFAR}_{\text{lexical}}$
- $\text{mFAR}_{\text{dense}}$

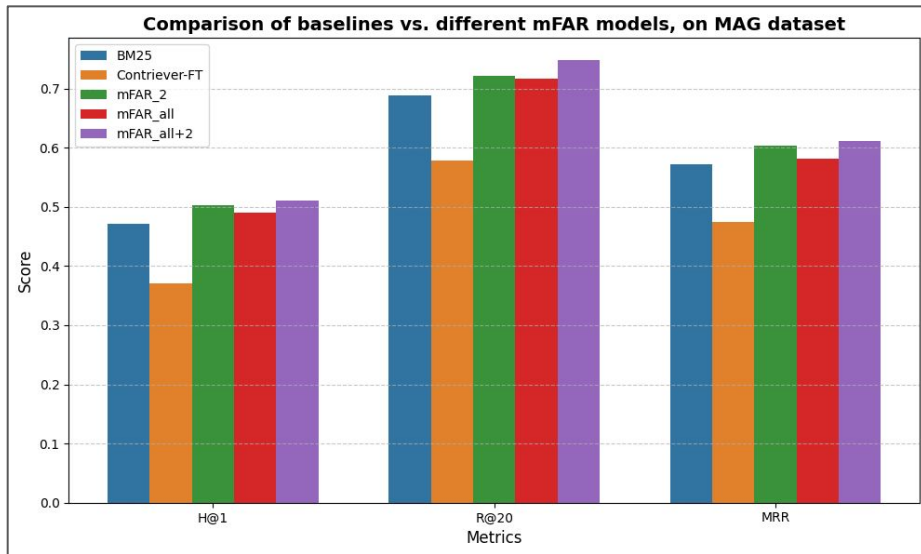
Models:

- $\text{mFAR}_2$
- $\text{mFAR}_{\text{all}}$
- $\text{mFAR}_{\text{all}+2}$

# Datasets and Evaluation

We evaluate our model on STaRK<sup>1</sup>, with various combinations of mFAR, on typical retrieval metrics.

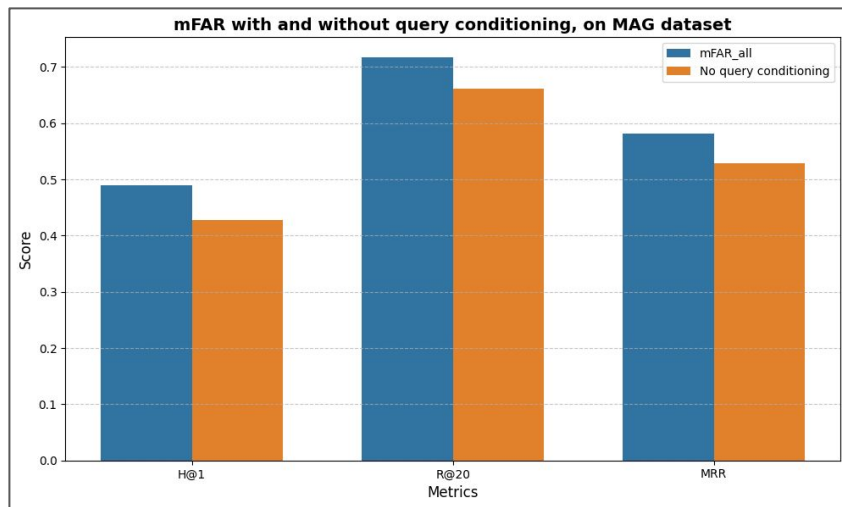
STaRK contains 3 datasets: Amazon, MAG (academic papers), and Prime (biosciences).



<sup>1</sup>Wu et al. 2024; STaRK: Benchmarking LLM Retrieval on Textual and Relational Knowledge Bases

# Is Query Conditioning Necessary?

We find that vast majority of performance gains do come from query conditioning; without query conditioning, multiple fields and multiple scorers alone do not amount to much performance gain.



More specific analyses included in the paper!



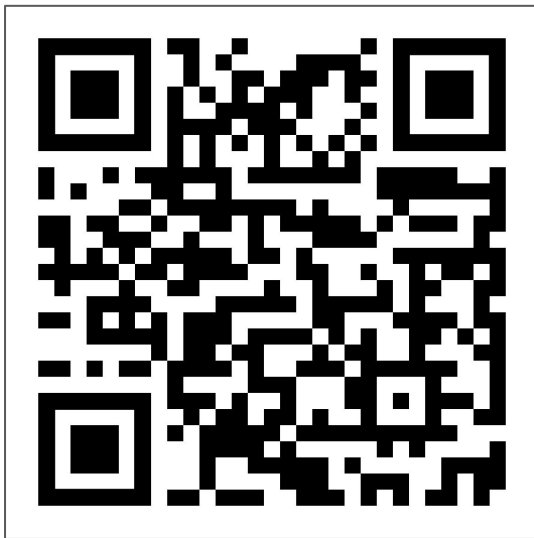
# Takeaways

We find that:

- A simple BM25 baseline/Contriever baseline is not enough
- Hybrid retrieval outpaces models that are only dense or only sparse
- The flexibility of adding multiple fields improves performance, but it is not trivially simple to add them

# Thank you!

Paper Link



Code

