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# TableLlama: insights

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# Problem

Loosely inspired by [\[Oren23\]](#), we want to assess the ability of [TableLlama](#) to correctly answer CEA questions when:

- Rows and columns are shuffled
- The header is missing (replaced with “col0”, “col1”, ..., “colN”)
- The mention is masked (mention references inside the prompt are replaced with “[MASK]”)
- The table context is reduced (1 row, 3 rows, 5 rows and 11 rows + header)
  - If C is the context-size, then we take the (C-1)/2 rows above and below the row containing the mention to be linked, wrapping around if the selected row is the first or the last one
- Table structure is removed ([TAB] col: | x | y | z | row: 1 | a | b | c | → [TAB] x y z a b c)

## Example prompt (from TURL-2K dataset)

**input:** [TLE] The Wikipedia page is about 2005 NPSL Season. The Wikipedia section is about New Franchises. [TAB] col: | team name | metro area | location | previous affiliation | row 1: | Detroit Arsenal | Detroit area | Berkley, MI | expansion | [SEP] row 2: | Grand Rapids Alliance | Grand Rapids area | Grand Rapids, MI | expansion | [SEP] row 3: | Milwaukee Bavarians | Milwaukee area | Milwaukee, WI | expansion | [SEP] row 4: | Minnesota Blast | Minneapolis area | Burnsville, MN | expansion | [SEP] row 5: | Princeton 56ers | Madison area | Madison, WI | expansion | [SEP] row 6: | San Diego Pumitas | San Diego area | San Diego, CA | expansion | [SEP] row 7: | San Jose Frogs | San Jose area | San Jose, CA | expansion | [SEP] row 8: | St. Paul Twin Stars | St. Paul area | St. Paul, MN | expansion |

**question:** The selected entity mention in the table cell is: Grand Rapids, MI. The column name for 'Grand Rapids, MI' is location. The referent entity candidates are: <Grand Rapids [DESCRIPTION] city in Itasca County, Minnesota, United States [TYPE] None>, <Grand Rapids [DESCRIPTION] city in and county seat of Kent County, Michigan, United States [TYPE] None>. What is the correct referent entity for the entity mention 'Grand Rapids, MI'?

**output:** <Grand Rapids [DESCRIPTION] city in and county seat of Kent County, Michigan, United States [TYPE] None>

## Example prompt - No header

**input:** [TLE] The Wikipedia page is about 2005 NPSL Season. The Wikipedia section is about New Franchises. [TAB] col: | **col0** | **col1** | **col2** | **col3** | row 1: | Detroit Arsenal | Detroit area | Berkley, MI | expansion | [SEP] row 2: | Grand Rapids Alliance | Grand Rapids area | Grand Rapids, MI | expansion | [SEP] row 3: | Milwaukee Bavarians | Milwaukee area | Milwaukee, WI | expansion | [SEP] row 4: | Minnesota Blast | Minneapolis area | Burnsville, MN | expansion | [SEP] row 5: | Princeton 56ers | Madison area | Madison, WI | expansion | [SEP] row 6: | San Diego Pumitas | San Diego area | San Diego, CA | expansion | [SEP] row 7: | San Jose Frogs | San Jose area | San Jose, CA | expansion | [SEP] row 8: | St. Paul Twin Stars | St. Paul area | St. Paul, MN | expansion |

**question:** The selected entity mention in the table cell is: Grand Rapids, MI. The column name for 'Grand Rapids, MI' is **col2**. The referent entity candidates are: <Grand Rapids [DESCRIPTION] city in Itasca County, Minnesota, United States [TYPE] None>, <Grand Rapids [DESCRIPTION] city in and county seat of Kent County, Michigan, United States [TYPE] None>. What is the correct referent entity for the entity mention 'Grand Rapids, MI'?

**output:** <Grand Rapids [DESCRIPTION] city in and county seat of Kent County, Michigan, United States [TYPE] None>

## Example prompt - No header + Masked

**input:** [TLE] The Wikipedia page is about 2005 NPSL Season. The Wikipedia section is about New Franchises. [TAB] col: | **col0** | **col1** | **col2** | **col3** | row 1: | Detroit Arsenal | Detroit area | Berkley, MI | expansion | [SEP] row 2: | Grand Rapids Alliance | Grand Rapids area | **[MASK]** | expansion | [SEP] row 3: | Milwaukee Bavarians | Milwaukee area | Milwaukee, WI | expansion | [SEP] row 4: | Minnesota Blast | Minneapolis area | Burnsville, MN | expansion | [SEP] row 5: | Princeton 56ers | Madison area | Madison, WI | expansion | [SEP] row 6: | San Diego Pumitas | San Diego area | San Diego, CA | expansion | [SEP] row 7: | San Jose Frogs | San Jose area | San Jose, CA | expansion | [SEP] row 8: | St. Paul Twin Stars | St. Paul area | St. Paul, MN | expansion |

**question:** The selected entity mention in the table cell is: **[MASK]**. The column name for '**[MASK]**' is **col2**. The referent entity candidates are: <Grand Rapids [DESCRIPTION] city in Itasca County, Minnesota, United States [TYPE] None>, <Grand Rapids [DESCRIPTION] city in and county seat of Kent County, Michigan, United States [TYPE] None>. What is the correct referent entity for the entity mention '**[MASK]**'?

**output:** <Grand Rapids [DESCRIPTION] city in and county seat of Kent County, Michigan, United States [TYPE] None>

## Example prompt - No header + Masked + Flatten

**input:** [TLE] The Wikipedia page is about 2005 NPSL Season. The Wikipedia section is about New Franchises. [TAB] **col0 col1 col2 col3** Detroit Arsenal Detroit area Berkley, MI expansion Grand Rapids Alliance Grand Rapids area [MASK] expansion Milwaukee Bavarians Milwaukee area Milwaukee, WI expansion Minnesota Blast Minneapolis area Burnsville, MN expansion Princeton 56ers Madison area Madison, WI expansion San Diego Pumitas San Diego area San Diego, CA expansion San Jose Frogs San Jose area San Jose, CA expansion St. Paul Twin Stars St. Paul area St. Paul, MN expansion

**question:** The selected entity mention in the table cell is: [MASK]. The column name for '[MASK]' is **col2**. The referent entity candidates are: <Grand Rapids [DESCRIPTION] city in Itasca County, Minnesota, United States [TYPE] None>, <Grand Rapids [DESCRIPTION] city in and county seat of Kent County, Michigan, United States [TYPE] None>. What is the correct referent entity for the entity mention '[MASK]'?

**output:** <Grand Rapids [DESCRIPTION] city in and county seat of Kent County, Michigan, United States [TYPE] None>

## Example prompt - No header + Masked + Reduced ctx

**input:** [TLE] The Wikipedia page is about 2005 NPSL Season. The Wikipedia section is about New Franchises. [TAB] col: | **col0** | **col1** | **col2** | **col3** | row 1: | St. Paul Twin Stars | St. Paul area | St. Paul, MN | expansion | [SEP] row 2: | Detroit Arsenal | Detroit area | Berkley, MI | expansion | [SEP] row 3: | Grand Rapids Alliance | Grand Rapids area | **[MASK]** | expansion | [SEP] row 4: | Milwaukee Bavarians | Milwaukee area | Milwaukee, WI | expansion | [SEP] row 5: | Minnesota Blast | Minneapolis area | Burnsville, MN | expansion |

**question:** The selected entity mention in the table cell is: **[MASK]**. The column name for '**[MASK]**' is **col2**. The referent entity candidates are: <Grand Rapids [DESCRIPTION] city in Itasca County, Minnesota, United States [TYPE] None>, <Grand Rapids [DESCRIPTION] city in and county seat of Kent County, Michigan, United States [TYPE] None>. What is the correct referent entity for the entity mention '**[MASK]**'?

**output:** <Grand Rapids [DESCRIPTION] city in and county seat of Kent County, Michigan, United States [TYPE] None>

# Datasets

- **TURL-1.7K:** starting with the TURL-2K dataset we
  - Downsampled it to contain only prompts with a number of tokens  $\leq 8192$  (**subsampled**)
    - 1788 examples
  - Have created all the datasets with the reduced ctx (**ctx-reduced**) from **subsampled**
    - 1731 examples (due to some table-parsing error)
  - Further downsampled **subsampled** to have the same cardinality of **ctx-reduced**
    - 1731 examples
- **HTR1-2023:** manually created a dataset from the HTR1-2023
  - Candidate retrieval with LamAPI (50 candidates)
  - Downsampled it to contain only prompts with a number of tokens  $\leq 8192$  (**subsampled**)
    - 1375 examples (out of 1405)



Dataset	Shuffled	Masked	Header	Context	Accuracy
HTR1	✗	✗	✗	1	0,7425
HTR1	✗	✓	✗	1	0,3193
HTR1	✗	✗	✗	3	0,7818
HTR1	✗	✓	✗	3	0,3927
HTR1	✗	✗	✗	5	0,7803
HTR1	✗	✓	✗	5	0,4124
HTR1	✗	✗	✗	11	0,7789
HTR1	✗	✓	✗	11	0,4022
<u>HTR1</u>	<u>✗</u>	<u>✗</u>	<u>✗</u>	<u>Full</u>	<u>0,784</u>
HTR1	✗	✓	✗	Full	0,4109
HTR1	✓	✗	✗	Full	0,7803
HTR1	✓	✓	✗	Full	0,392

Underlined are the results with the default downsampled dataset: no-mask, no-shuffle and w/-header

Dataset	Shuffled	Masked	Header	Context	Accuracy
TURL-1.7K	✗	✗	✓	1	0,9468
TURL-1.7K	✗	✓	✓	1	0,7926
TURL-1.7K	✗	✓	✗	1	0,6765
TURL-1.7K	✗	✗	✗	1	0,9076
TURL-1.7K	✗	✗	✓	3	0,9434
TURL-1.7K	✗	✓	✓	3	0,7787
TURL-1.7K	✗	✓	✗	3	0,6799
TURL-1.7K	✗	✗	✗	3	0,926
TURL-1.7K	✗	✗	✓	5	0,9463
TURL-1.7K	✗	✓	✓	5	0,7545
TURL-1.7K	✗	✓	✗	5	0,6649
TURL-1.7K	✗	✗	✗	5	0,9249
TURL-1.7K	✗	✗	✓	11	0,9428
TURL-1.7K	✗	✓	✓	11	0,7429
TURL-1.7K	✗	✓	✗	11	0,6534
TURL-1.7K	✗	✗	✗	11	0,9214
<u>TURL-1.7K</u>	<u>✗</u>	<u>✗</u>	<u>✓</u>	<u>Full</u>	<u>0,9405</u>
TURL-1.7K	✗	✓	✓	Full	0,7348
TURL-1.7K	✓	✗	✓	Full	0,9099
TURL-1.7K	✓	✓	✓	Full	0,647

## No-flatten

Dataset	Shuffled	Masked	Header	Context	Accuracy
HTR1	✗	✗	✗	1	0,7425
HTR1	✗	✓	✗	1	0,3193
HTR1	✗	✗	✗	3	0,7818
HTR1	✗	✓	✗	3	0,3927
HTR1	✗	✗	✗	5	0,7803
HTR1	✗	✓	✗	5	0,4124
HTR1	✗	✗	✗	11	0,7789
HTR1	✗	✓	✗	11	0,4022
<u>HTR1</u>	✗	✗	✗	<u>Full</u>	<u>0,7840</u>
HTR1	✗	✓	✗	Full	0,4109
HTR1	✓	✗	✗	Full	0,7803
HTR1	✓	✓	✗	Full	0,3920

## Flatten

Dataset	Shuffled	Masked	Header	Context	Accuracy
HTR1	✗	✗	✗	1	0,7447
HTR1	✗	✓	✗	1	0,2843
HTR1	✗	✗	✗	3	0,7629
HTR1	✗	✓	✗	3	0,3476
HTR1	✗	✗	✗	5	0,7731
HTR1	✗	✓	✗	5	0,3396
HTR1	✗	✗	✗	11	0,7658
HTR1	✗	✓	✗	11	0,3491
<u>HTR1</u>	✗	✗	✗	<u>Full</u>	<u>0,7614</u>
HTR1	✗	✓	✗	Full	0,3491
HTR1	✓	✗	✗	Full	0,7673
HTR1	✓	✓	✗	Full	0,3614

## No-flatten

Dataset	Shuffled	Masked	Header	Context	Accuracy
TURL-1.7K	✗	✗	✓	1	0,9468
TURL-1.7K	✗	✓	✓	1	0,7926
TURL-1.7K	✗	✓	✗	1	0,6765
TURL-1.7K	✗	✗	✗	1	0,9076
TURL-1.7K	✗	✗	✓	3	0,9434
TURL-1.7K	✗	✓	✓	3	0,7787
TURL-1.7K	✗	✓	✗	3	0,6799
TURL-1.7K	✗	✗	✗	3	0,9260
TURL-1.7K	✗	✗	✓	5	0,9463
TURL-1.7K	✗	✓	✓	5	0,7545
TURL-1.7K	✗	✓	✗	5	0,6649
TURL-1.7K	✗	✗	✗	5	0,9249
TURL-1.7K	✗	✗	✓	11	0,9428
TURL-1.7K	✗	✓	✓	11	0,7429
TURL-1.7K	✗	✓	✗	11	0,6534
TURL-1.7K	✗	✗	✗	11	0,9214
<u>TURL-1.7K</u>	✗	✗	✓	<u>Full</u>	<u>0,9405</u>
TURL-1.7K	✗	✓	✓	Full	0,7348
TURL-1.7K	✓	✗	✓	Full	0,9099
TURL-1.7K	✓	✓	✓	Full	0,6470

## Flatten

Dataset	Shuffled	Masked	Header	Context	Accuracy
TURL-1.7K	✗	✗	✓	1	0,9411
TURL-1.7K	✗	✓	✓	1	0,7516
TURL-1.7K	✗	✓	✗	1	0,6672
TURL-1.7K	✗	✗	✗	1	0,9110
TURL-1.7K	✗	✗	✓	3	0,9388
TURL-1.7K	✗	✓	✓	3	0,7412
TURL-1.7K	✗	✓	✗	3	0,6464
TURL-1.7K	✗	✗	✗	3	0,9157
TURL-1.7K	✗	✗	✓	5	0,9422
TURL-1.7K	✗	✓	✓	5	0,7337
TURL-1.7K	✗	✓	✗	5	0,6297
TURL-1.7K	✗	✗	✗	5	0,9081
TURL-1.7K	✗	✗	✓	11	0,9382
TURL-1.7K	✗	✓	✓	11	0,7099
TURL-1.7K	✗	✓	✗	11	0,6280
TURL-1.7K	✗	✗	✗	11	0,9110
<u>TURL-1.7K</u>	✗	✗	✓	<u>Full</u>	<u>0,9330</u>
TURL-1.7K	✗	✓	✓	Full	0,6967
TURL-1.7K	✓	✗	✓	Full	0,9122
TURL-1.7K	✓	✓	✓	Full	0,6031

# NIL experiments

Dataset has been created by replacing the correct candidate with <NIL [DESCRIPTION] Not in list [TYPE] None>

- TURL-1.7K - NIL: 0.3345
- HTR1 - NIL: 0.0611

Good performance on TURL-1.7K, but ...

- 526 candidates lists have length == 1, i.e.  $526/1731 \approx 30.39\%$
- 837 candidates lists have length  $\leq 5$ , i.e.  $837/1731 \approx 48.35\%$

The performances on HTR1-2023 are possibly driven by the fact that:

- 70 candidates lists have length == 1, i.e.  $70/1375 \approx 5.09\%$
- 157 candidates lists have length  $\leq 5$ , i.e.  $157/1375 \approx 11.42\%$

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## NIL experiments

Experiment with a further downsampled dataset where prompts with mentions with less than 10 candidates were removed:

- TURL-1.7K - NIL-reduced: 0.0064
- HTR1 - NIL-reduced: 0.0067

Which demonstrates that TableLlama is not able to understand NIL entities

## NIL examples

"input": "[TLE] The Wikipedia page is about USA Today All-USA high school football team (2000\u20132013). The Wikipedia section is about 2002 team. [TAB] col: | player | position | school | hometown | college | row 1: | Chris Leak | Quarterback | Independence High School | Charlotte, North Carolina | Florida | [SEP] row 2: | Reggie Bush | Running back | Helix High School | La Mesa, California | USC | [SEP] row 3: | Demetris Summers | Running back | Lexington High School | Lexington, South Carolina | South Carolina | [SEP] row 4: | Jorrie Adams | Offensive line | Jasper High School | Jasper, Texas | Texas A&M | [SEP] row 5: | Ofa Moheau | Offensive line | Trinity High School | Euless, Texas | BYU | [SEP] row 6: | Ryan Harris | Offensive line | Cretin-Derham Hall High School | Saint Paul, Minnesota | Notre Dame | [SEP] row 7: | Mike Jones | Offensive line | Richards High School | Oak Lawn, Illinois | Iowa | [SEP] row 8: | Greg Olsen | Tight end | Wayne Hills High School | Wayne, New Jersey | Miami (FL) | [SEP] row 9: | Sean Bailey | Wide receiver | Milton High School | Alpharetta, Georgia | Georgia | [SEP] row 10: | Steve Smith | Wide receiver | Taft High School | Woodland Hills, California | USC | [SEP] row 11: | Tom Zbikowski | Athlete | Buffalo Grove High School | Buffalo Grove, Illinois | Notre Dame | [SEP] row 12: | Chase Goggans | Placekicker | Coffee High School | Douglas, Georgia | Florida State |"

"question": "The selected entity mention in the table cell is: South Carolina. The column name for 'South Carolina' is college."

"gt": "<nil [desc] not in list [type] none>",

"output": "<south carolina state university [desc] public university in south carolina, usa [type] university>"

## NIL examples

"input": "[TLE] The Wikipedia page is about Basingstoke (UK Parliament constituency). The Wikipedia section is about Members of Parliament. [TAB] col: | election | election | member | party | row 1: | | 1885 | George Sclater-Booth | Conservative | [SEP] row 2: | | 1887 by-election | Arthur Frederick Jeffreys | Conservative | [SEP] row 3: | | 1906 | Arthur Salter | Conservative | [SEP] row 4: | | 1917 by-election | Auckland Campbell Geddes | Unionist | [SEP] row 5: | | 1920 by-election | Arthur Richard Holbrook | Coalition Conservative | [SEP] row 6: | | 1923 | Reginald Fletcher | Liberal | [SEP] row 7: | | 1924 | Arthur Richard Holbrook | Conservative | [SEP] row 8: | | 1929 | Viscount Lymington | Conservative | [SEP] row 9: | | 1934 by-election | Henry Maxence Cavendish Drummond Wolff | Conservative | [SEP] row 10: | | 1935 | Patrick Donner | Conservative | [SEP] row 11: | | 1955 | Denzil Freeth | Conservative | [SEP] row 12: | | 1964 | David Mitchell | Conservative | [SEP] row 13: | | 1983 | Andrew Hunter | Conservative | [SEP] row 14: | | 2002 | Andrew Hunter | Independent Conservative | [SEP] row 15: | | 2004 | Andrew Hunter | Democratic Unionist | [SEP] row 16: | | 2005 | Maria Miller | Conservative |"

"question": "The selected entity mention in the table cell is: Conservative. The column name for 'Conservative' is party."

"gt": "<nil [desc] not in list [type] none>",

"output": "<conservative party [desc] political party in romania founded in 1991 [type] politicalparty>"

## NIL examples

"input": "[TLE] The Wikipedia page is about J/80. The Wikipedia section is about World championships. [TAB] col: | year | location | entries | winning boat | country | skipper | row 1: | 2013 | Marseille , France | 117 | New territoriess | POR | Hugo Rocha | [SEP] row 2: | 2012 | Dartmouth , UK | 76 | Nilfisk | ESP | Jos\u00e9 van der Ploeg | [SEP] row 3: | 2011 | Copenhagen , Denmark | 67 | Nextel Engineering | ESP | Ignacio Camino | [SEP] row 4: | 2010 | Newport , USA | 61 | ECC Viviendas | ESP | Jose Maria Torcida | [SEP] row 5: | 2009 | Santander , Spain | 134 | Princesa Yaiza | ESP | Rayco Tabares | [SEP] row 6: | 2008 | Kiel , Baltic Sea | 64 | Nextel Engineering | ESP | Ignacio Camino | [SEP] row 7: | 2007 | La Trinit\u00e9 sur Mer , France | 125 | ECC Viviendas | ESP | Jose Maria Torcida | [SEP] row 8: | 2006 | Corpus Christi, TX , USA | 34 | L'Glide | USA | Glenn Darden | [SEP] row 9: | 2005 | Falmouth , UK | 52 | Volvo | GBR | Ruairidh Scott | [SEP] row 10: | 2004 | Royal Swedish Yacht Club, Stockholm | 56 | Out of Space | SWE | Peder Arvefors | [SEP] row 11: | 2003 | Ft. Worth , Texas , USA | 49 | Synergy | USA | Jay Lutz | [SEP] row 12: | 2002 | La Rochelle , France | 46 | TENDRISSE | FRA | Pascal Abignoli |"

"question": "The selected entity mention in the table cell is: USA. The column name for 'USA' is country

"gt": "<nil [desc] not in list [type] none>"

"output": "<usa [desc] wikimedia disambiguation page [type] none>"



## NIL examples

**"input":** "[TLE] The Wikipedia page is about Roger Stern. The Wikipedia section is about External links. [TAB] col: | precededby len wein | the incredible hulk writer 1978\u20131980 | succeededby steven grant | row 1: | Precededby Roger McKenzie | Captain America writer 1980\u20131981 (with John Byrne in early 1980) | Succeededby J.M. DeMatteis | [SEP] row 2: | Precededby Dennis O'Neil | The Amazing Spider-Man writer 1982\u20131984 | Succeededby Tom DeFalco | [SEP] row 3: | Precededby Steven Grant | The Avengers writer 1983\u20131987 | Succeededby Ralph Macchio | [SEP] row 4: | Precededby John Byrne | Fantastic Four writer 1986\u20131987 | Succeededby Steve Englehart | [SEP] row 5: | Precededby John Byrne | Superman writer 1988\u20131989 | Succeededby Jerry Ordway | [SEP] row 6: | Precededby John Byrne | Action Comics writer 1988\u20131994 | Succeededby David Michelinie | [SEP] row 7: | Precededby Tom McCraw and Tom Peyer | Legionnaires writer with Tom McCraw 1996\u20131999 | Succeededby Dan Abnett and Andy Lanning | [SEP] row 8: | Precededby Kurt Busiek | Iron Man writer 1998\u20132000 (with Kurt Busiek ) | Succeededby Joe Quesada |",

**"question":** "The selected entity mention in the table cell is: Fantastic Four. The column name for 'Fantastic Four' is the incredible hulk writer 1978\u20131980

**"gt":** "<nil [desc] not in list [type] none>",

**"output":** "<fantastic four [desc] marvel comics featuring the super heros titled the fantastic four [type] comic>"

## Discussion

- A 5-context table is enough to maintain high performance (even without header)
  - TURL-1.7K: 0.9463 vs 0.9405 (5-ctx vs full-ctx resp.)
  - HTR1-2023: 0.7803 vs 0.7840 (5-ctx vs full-ctx resp.)
  - Is this due to the fact that the model has seen the full table during the fine-tuning?
- Masking drops performances (especially when combined with no-header)
  - TURL-1.7K: 0.7348 vs 0.9405 (masked vs not-masked resp.)
  - HTR1-2023: 0.4109 vs 0.7840 (masked vs not-masked resp.)
- Shuffling rows and cols affects more TURL-1.7K than HTR1-2023
  - TURL-1.7K: 0.9099 vs 0.9405 (shuffled vs not-shuffled resp.)
  - HTR1-2023: 0.7803 vs 0.7840 (shuffled vs not-shuffled resp.)
  - Is this a sign of data overfitting?
- Decreasing the table-ctx increases the performance on TURL-1.7K
  - Is this a sign of overfitting?

## Discussion

- Table structure influences the most when the mention is masked
  - TURL-1.7K: 0.9330 vs 0.9405 (full-ctx-flatten vs full-ctx resp.)
  - TURL-1.7K: 0.6967 vs 0.7348 (full-ctx-masked flatten vs full-ctx masked resp.)
  - HTR1-2023: 0.7614 vs 0.7840 (full-ctx-flatten vs full-ctx resp.)
  - HTR1-2323: 0.3491 vs 0.4109 (full-ctx-masked flatten vs full-ctx masked resp.)
- NIL cannot be recognized
  - If the semantic of a candidate resembles the mention's label, then TableLlama chooses that candidate
- Has already observed, header influences the performances, especially when the table-ctx is reduced

## Next steps

- ~~Add experiments where table structure is missing~~
  - ~~[TAB] col: | x | y | z | [SEP] row 1: | a | b | c | → [TAB] x y z a b c~~
  - ~~Does the table structure have an impact on the overall performance?~~
- Add experiments for TURL-1.7K with candidates retrieved with LamAPI
- Check for seen/unseen candidates and mentions
- Efficiency
  - Is there a way to re-use the kv-cache for the same table?
    - Yes, everything except the question can be reused
- Ask TableLlama if it has some knowledge regarding the table structure as TableQA
  - Give me the row/col/row-col index of the mention X?
  - What is the col name of the mention X?
- Multi-Modality: text + image
  - Can multi-modality improve the performances?

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## Next steps

- ~~Test NIL on TableLlama~~
  - ~~Replace correct candidate with NIL candidate~~

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Thank you for your

$$\text{Attention}(Q,K,V) = \text{softmax}\left(\frac{QK^T}{\sqrt{d_k}}\right)V$$