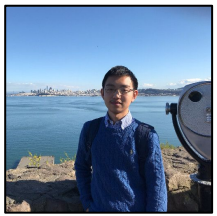
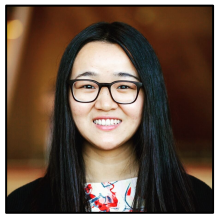
Can Large Language Models *Transform* Computational Social Science?

Caleb Ziems[†*], William Held[✦*], Omar Shaikh[†*], Jiaao Chen[✦*], Zhehao Zhang[‡*], Diyi Yang[†]





* All heavily contributed to the implementation of this work

Stanford NLP

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Social and Language Technologies
SALT

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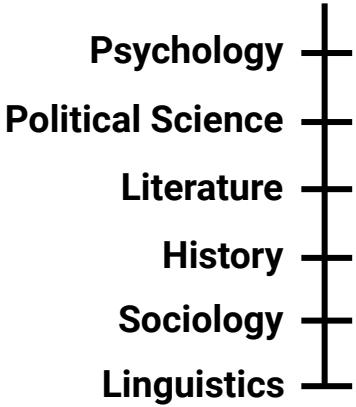
RQ: Are LLMs useful tools in the **Computational Social Scientist's** toolkit?



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(Supervised) **Text Classification**

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1. **Viability**
2. **Model-Selection**
3. **Domain-Utility**
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politeness recognition humor recognition emotion recognition empathy classification	**Psychology**
stance detection ideology detection	**Political Science**
agent framing relationship dynamics	**Literature**
event extraction	**History**
power relations identification social role detection	**Sociology**
dialect feature identification	**Linguistics**

Research Questions

RQ: Are LLMs useful **tools** in the **Computational Social Scientist's** toolkit?

politeness recognition	**Psychology**	**Stanford Politeness Corpus** (Danescu-Niculescu-Mizil et al., 2013)
humor recognition		**r/Jokes + Pun of the Day** (Weller and Seppi 2019)
emotion recognition		**CARER** (Saravia et al. 2018)
empathy classification		**EPITOME** (Sharma et al., 2020)
stance detection	**Political Science**	**SemEval-2016 Stance Dataset** (Mohammad et al., 2016)
ideology detection		**Ideological Books Corpus** (Gross et al., 2013)
agent framing	**Literature**	**Article Bias Corpus** (Baly et al. 2020)
relationship dynamics		**WikiEvents** (Li et al., 2021)
event extraction	**History**	**Hippocorpus** (Sap et al., 2020)
power relations identification	**Sociology**	**Wikipedia Talk Pages** (Danescu-Niculescu-Mizil et al. 2012)
social role detection		**CMU Movie Corpus** (Bamman et al. 2013)
dialect feature identification	**Linguistics**	**Indian English Minimal Pairs** (Demszky et al. 2019)

RQ1: Zero-Shot Classification Performance

RQ1: Viability. Can LLMs augment the human annotation pipeline?

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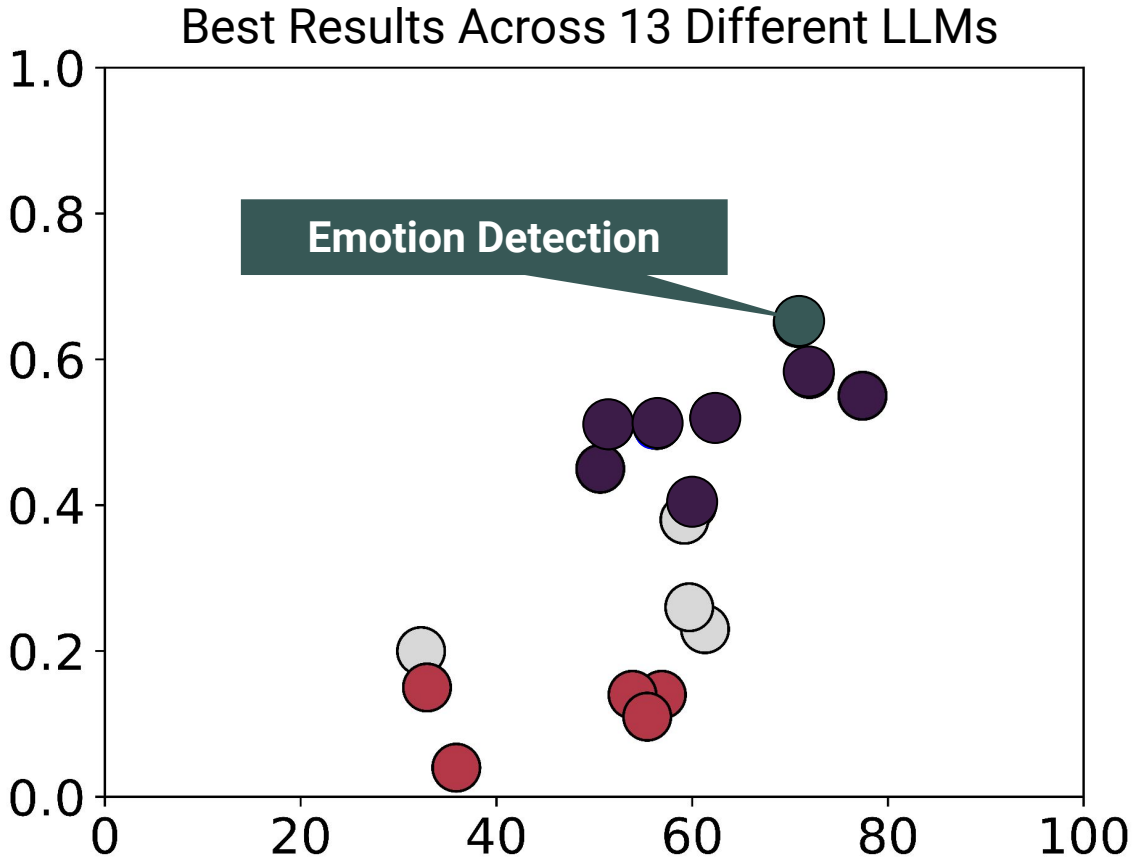

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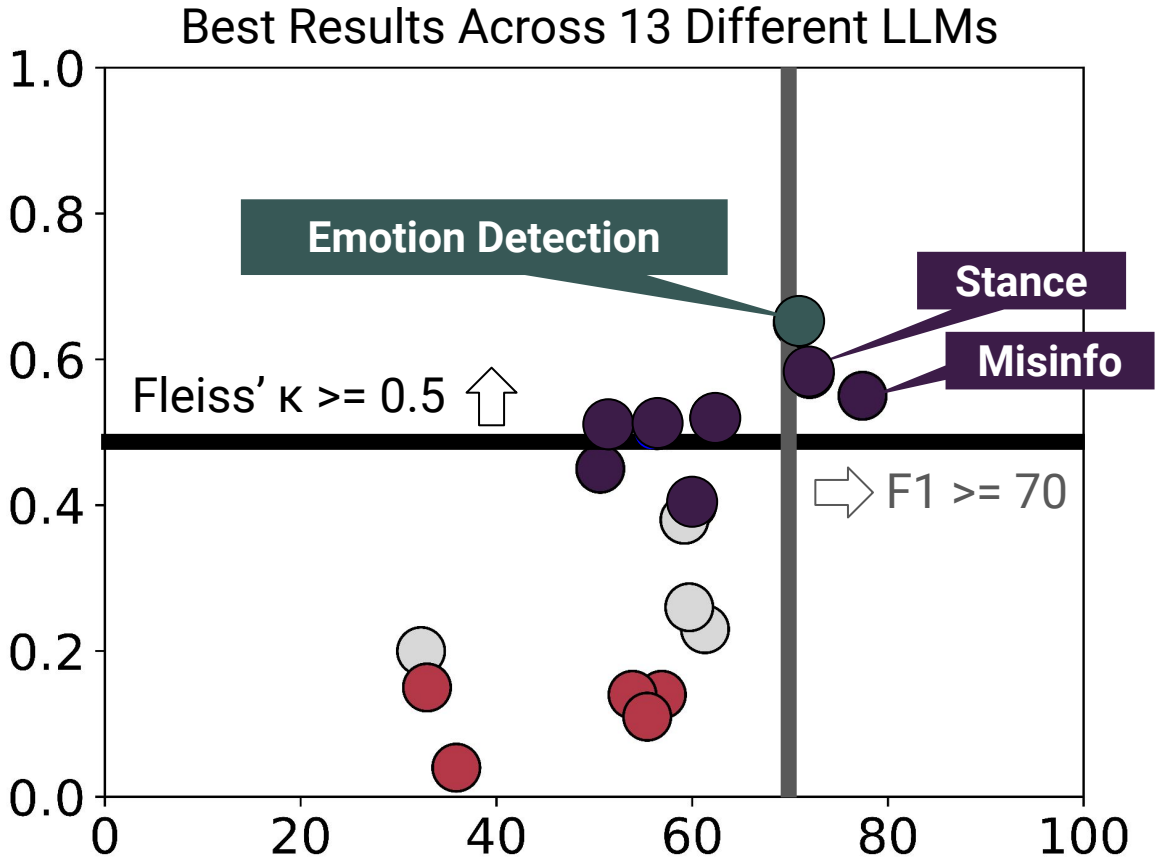

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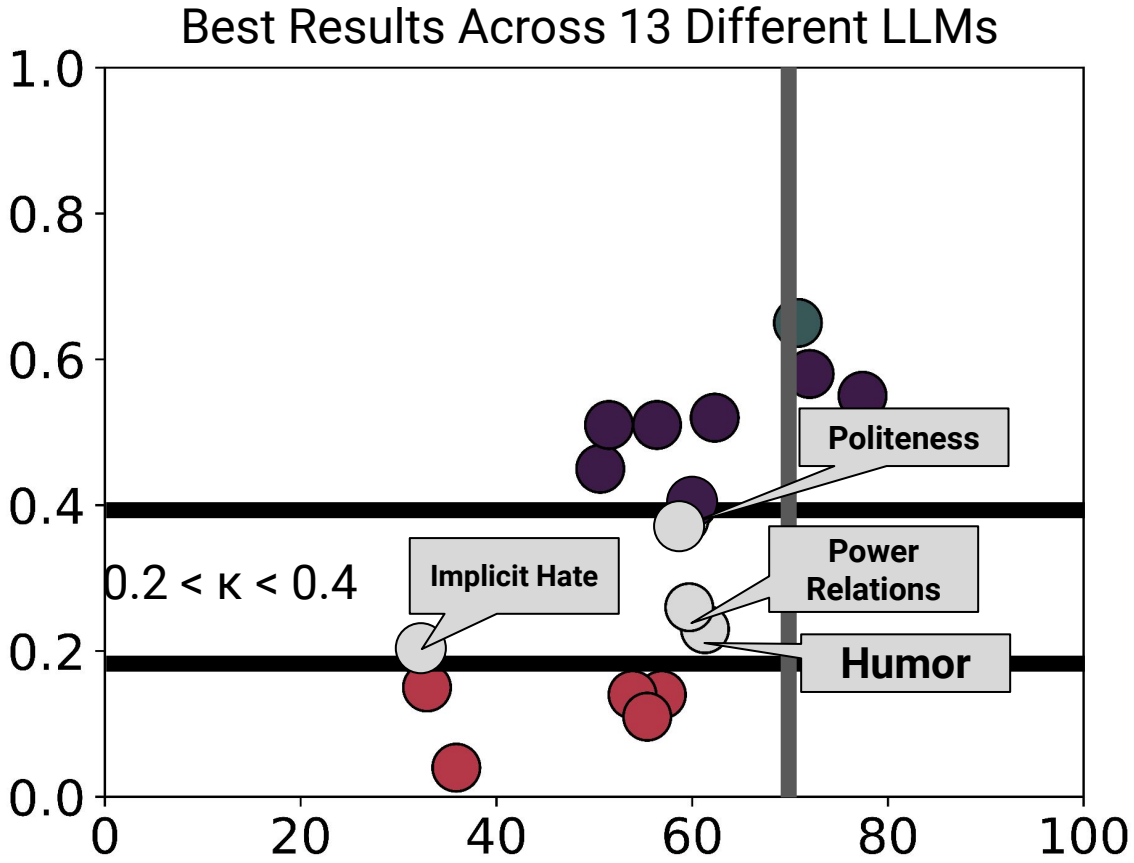

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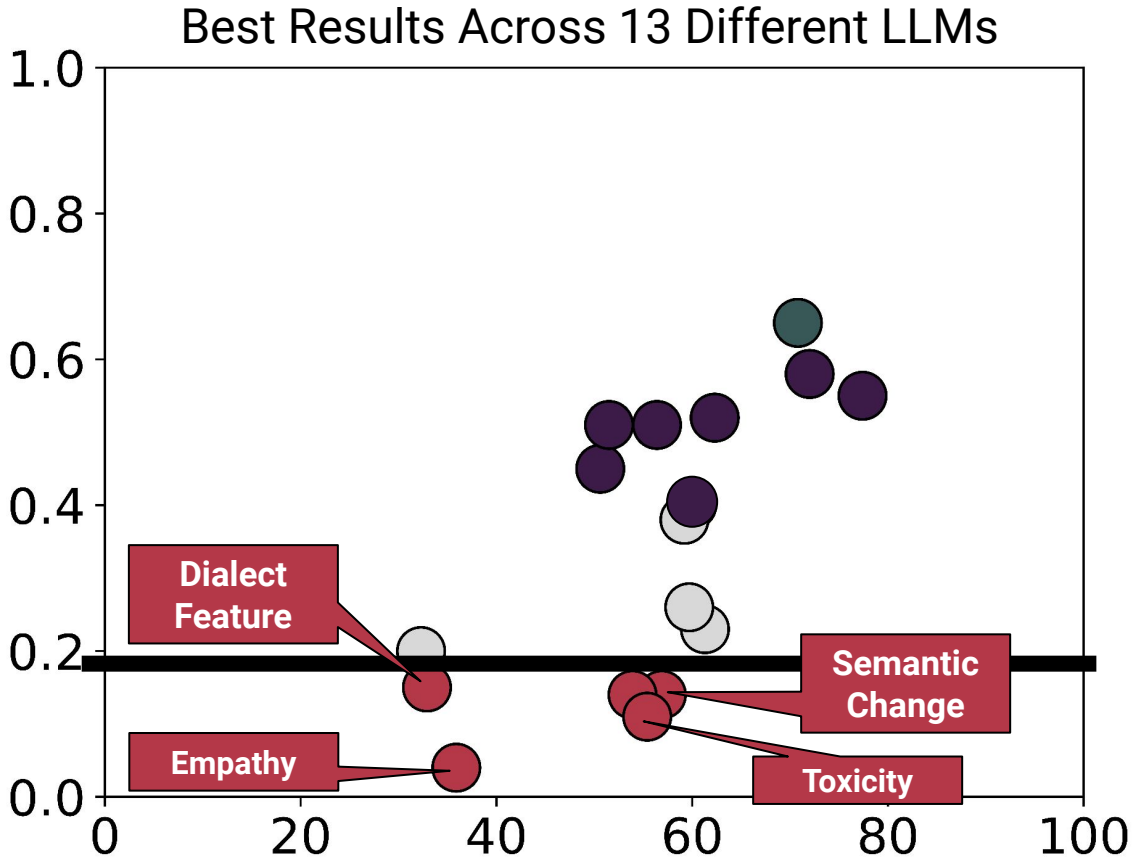

RQ2: CSS Performance Follows Scaling Laws

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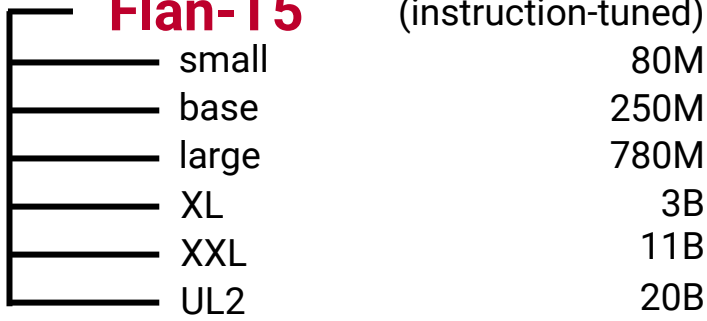

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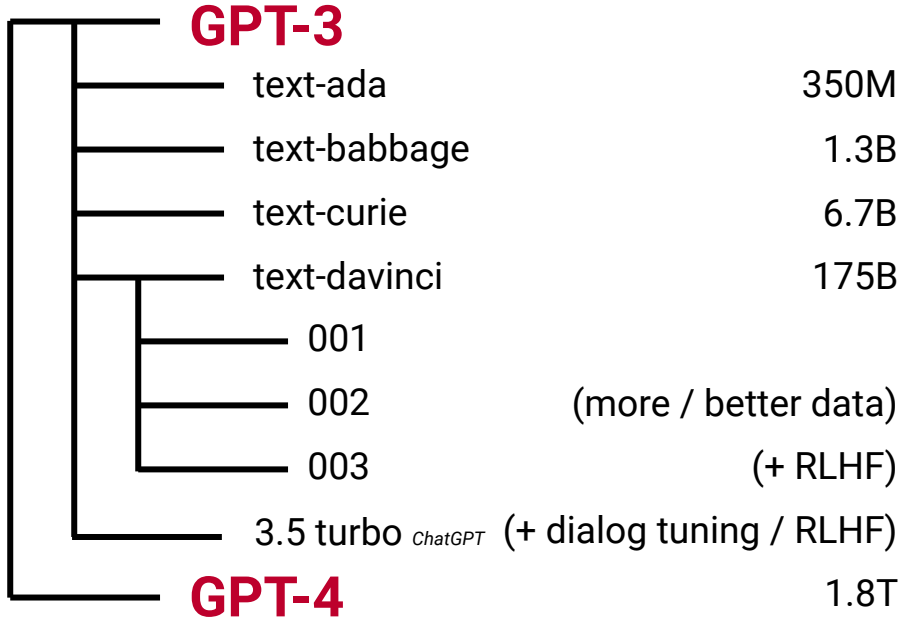

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↪ **Findings:** Performance ***scales with*** model size

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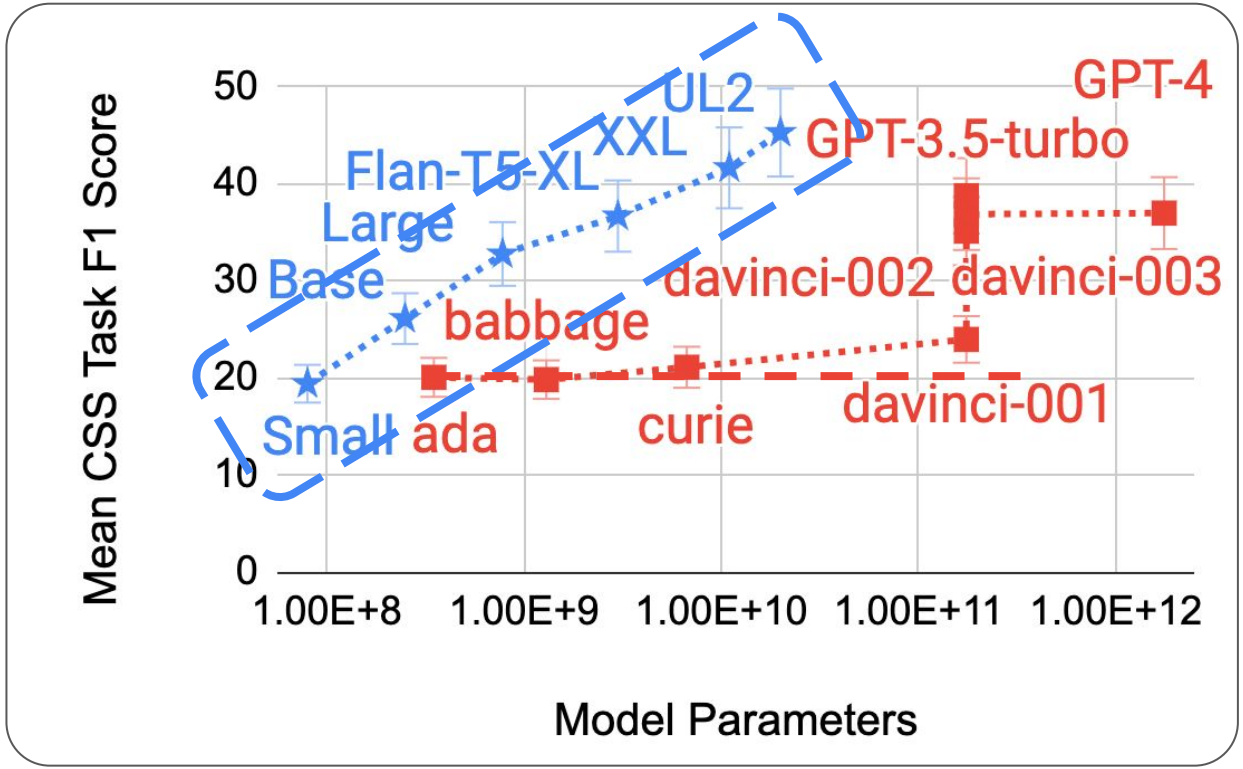

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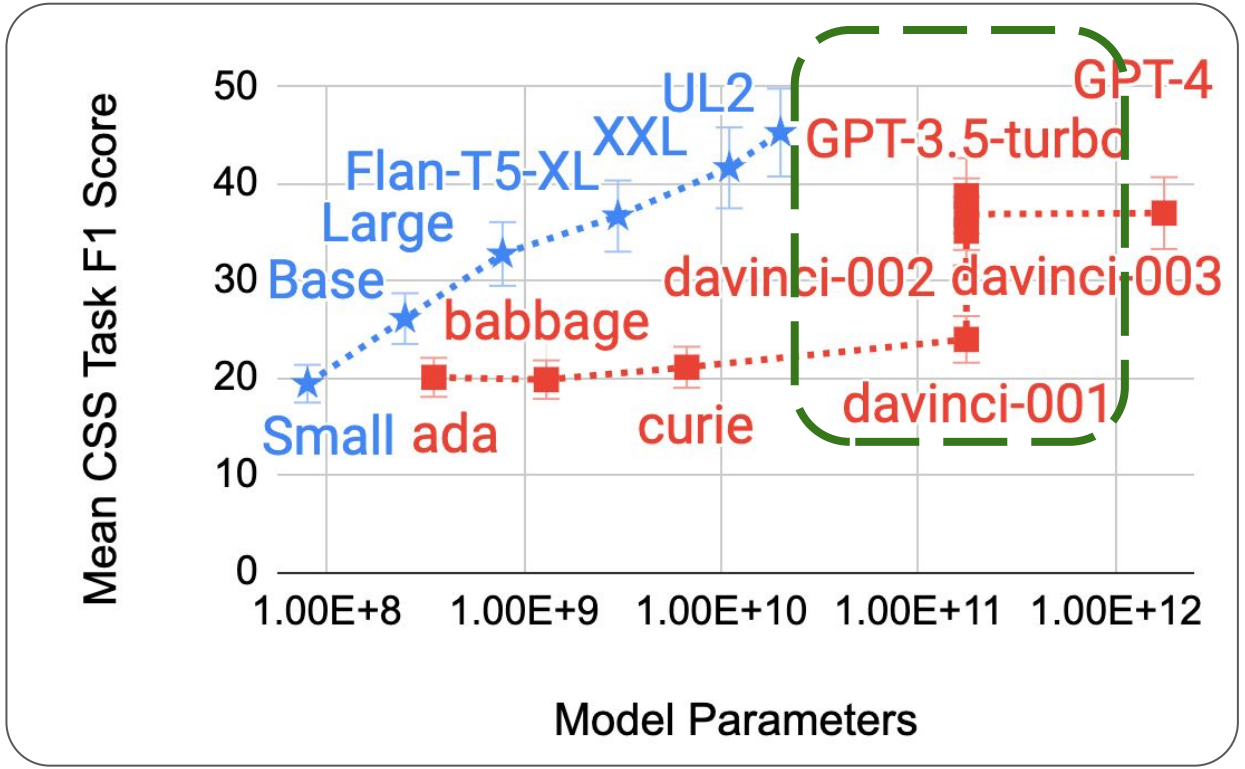


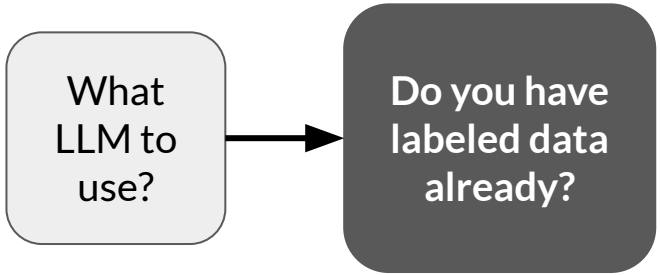
RQ2: Scaling Laws – Benefits of Open Source

Recommendation:

What LLM to use?

RQ2: Scaling Laws – Benefits of Open Source

Recommendation:



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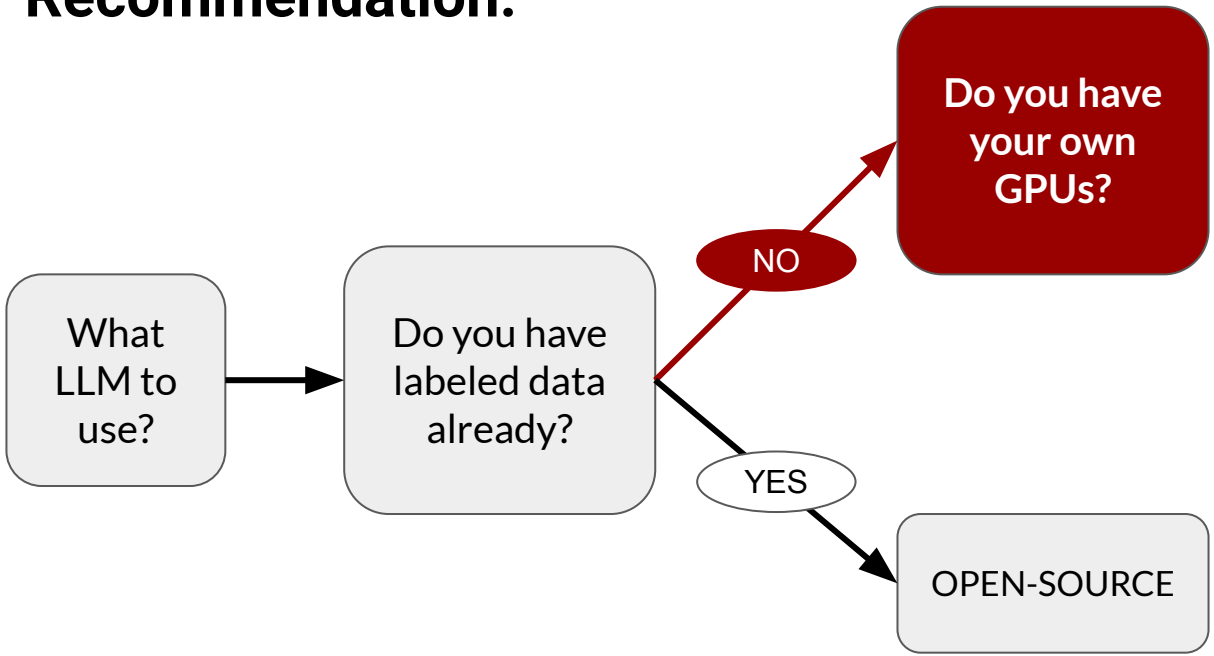

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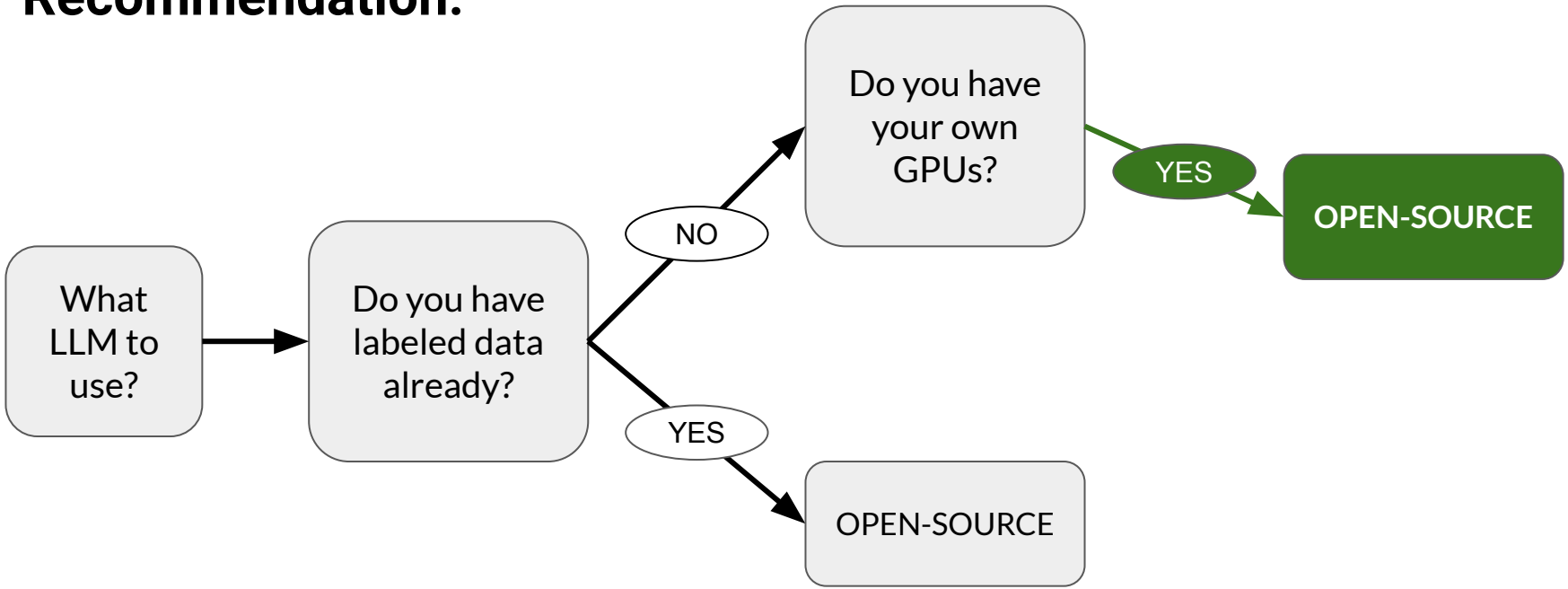

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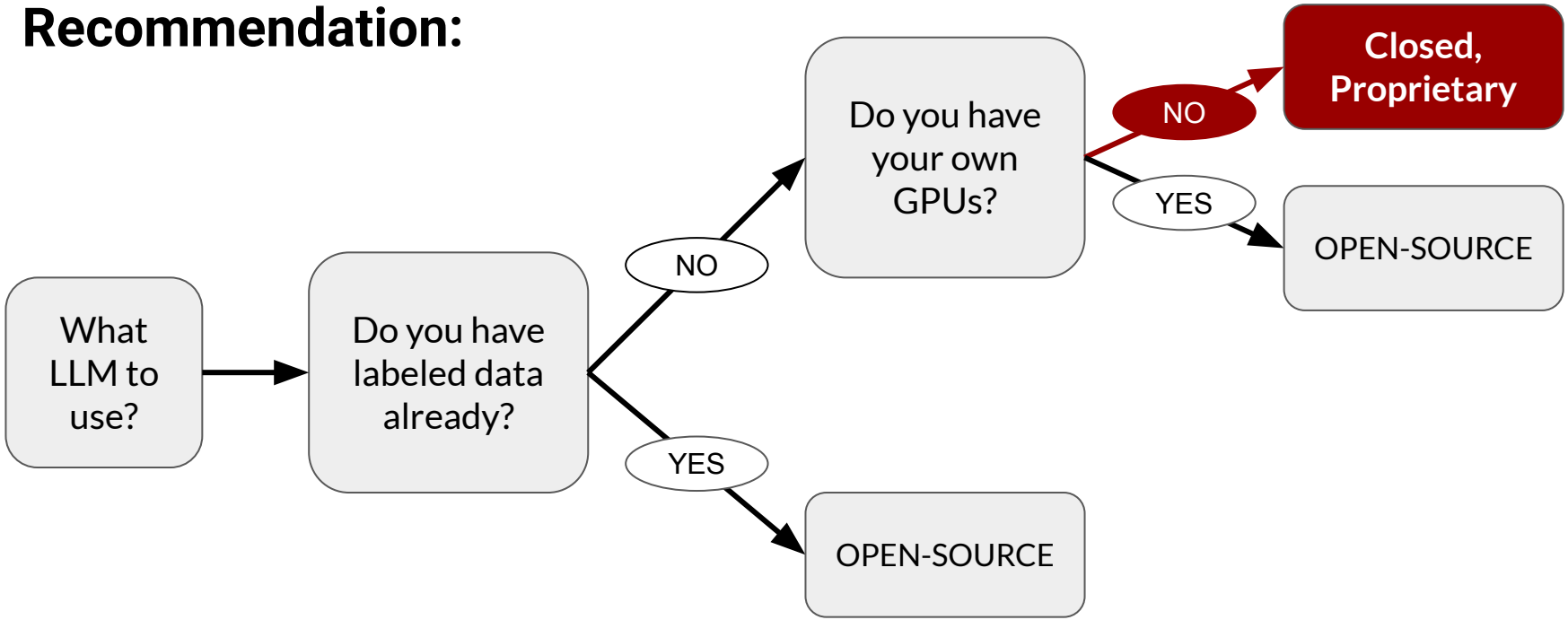

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RQ3: Domain-Utility. Are LLMs better adapted for some subfields than others?

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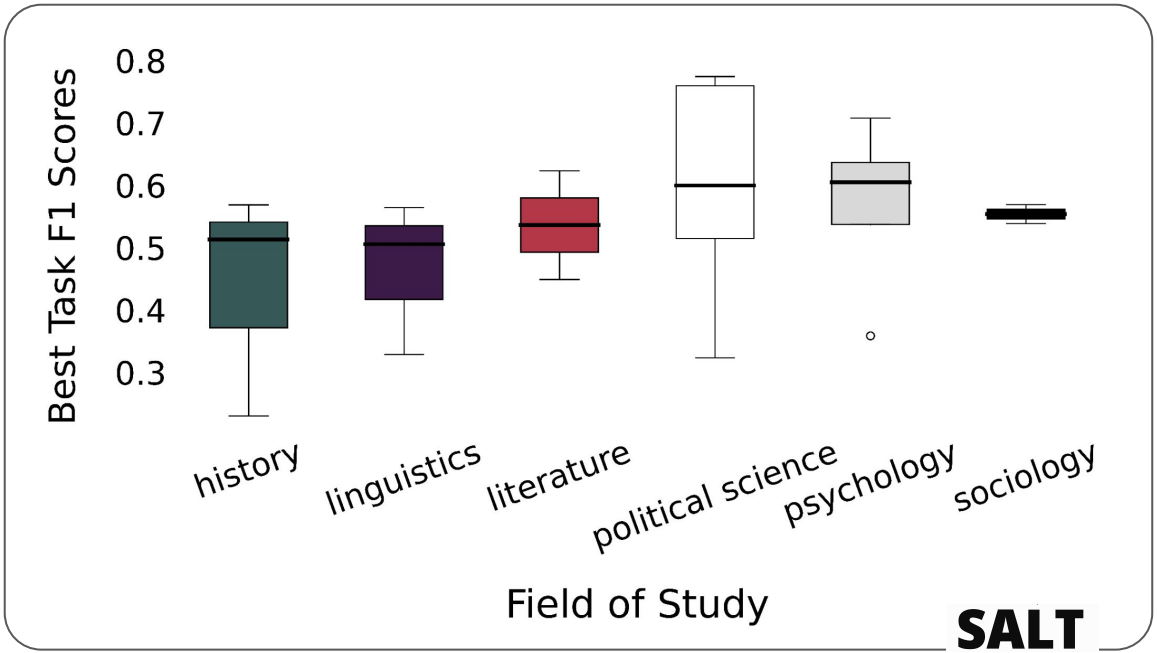

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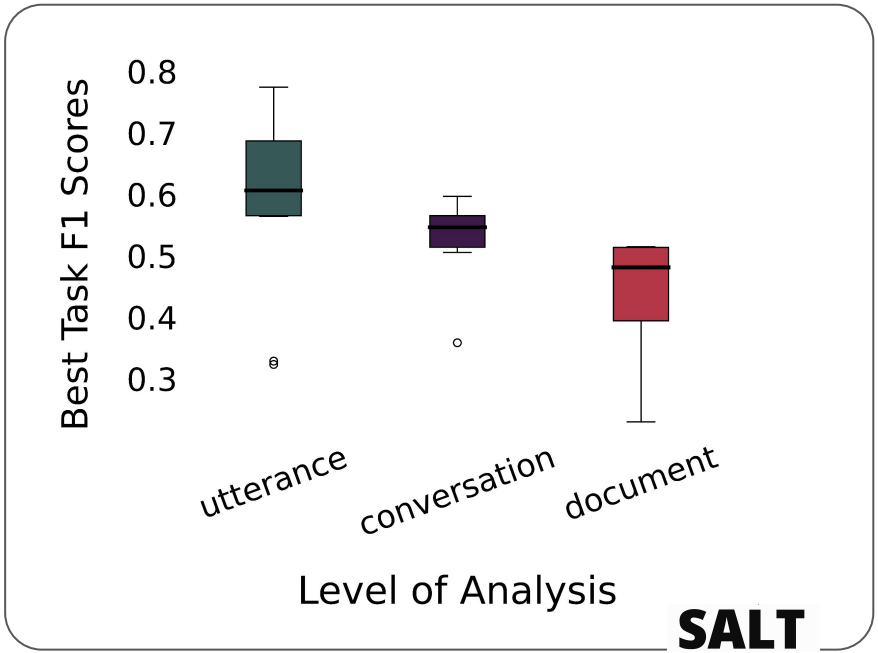
but rather by the ***complexity*** of the ***input***



RQ3: Performance Depends on Task-Complexity

Recommendations:

- Validate on a small sample
- Weigh benefits with risks
- Move beyond Western studies

RQ4: High-Quality Generation Results

RQ4: Functionality. Are prompted LLMs useful for generatively implementing theories and explaining social scientific constructs with text?

*emotion-specific **summarization***

CovidET (Zhan et al., 2022)

figurative language explanation

FLUTE (Chakrabarty et al., 2022)

implied misinformation explanation

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hate speech explanation

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↪ **Findings:** zero-shot GPT-4 produces ***helpful and informative generations*** in all five evaluation tasks

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↪ **Findings:** zero-shot GPT-4 produces ***helpful and informative generations*** in all five evaluation tasks

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Expert	**CDC Comm. Specialist**	**Public Policy Grad Student**	**Grammarly Writing Expert**	**Journalism Degree**	**Psychology Degree**

RQ4: High-Quality Generation Results

RQ4: Functionality.

↪ **Findings:** zero-shot GPT-4 ***beats reference*** levels of:

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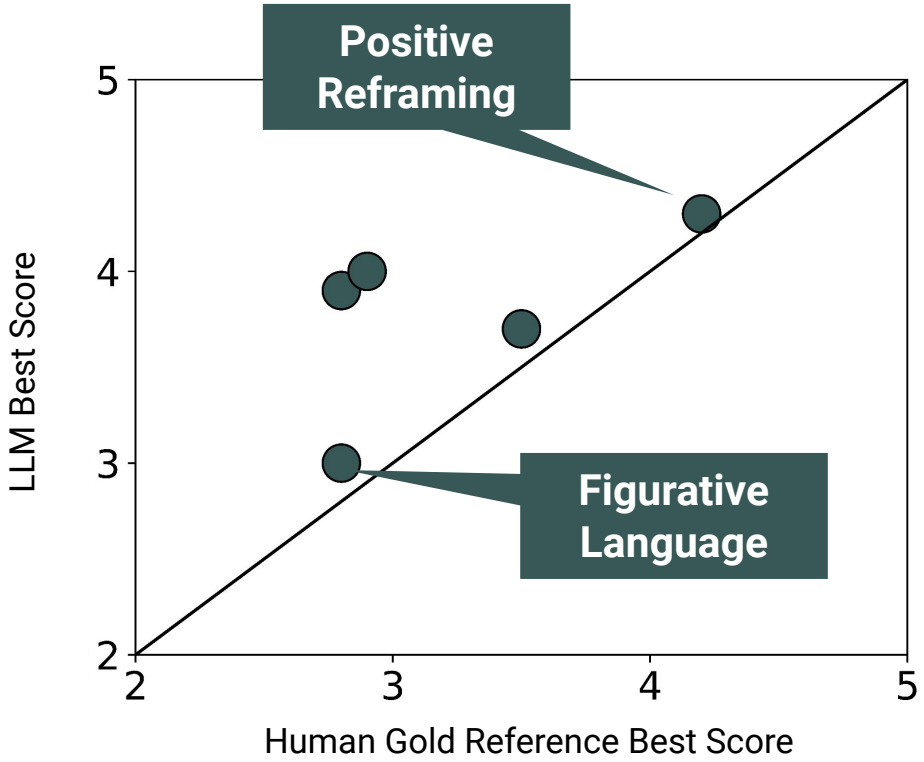

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RQ4: Functionality.

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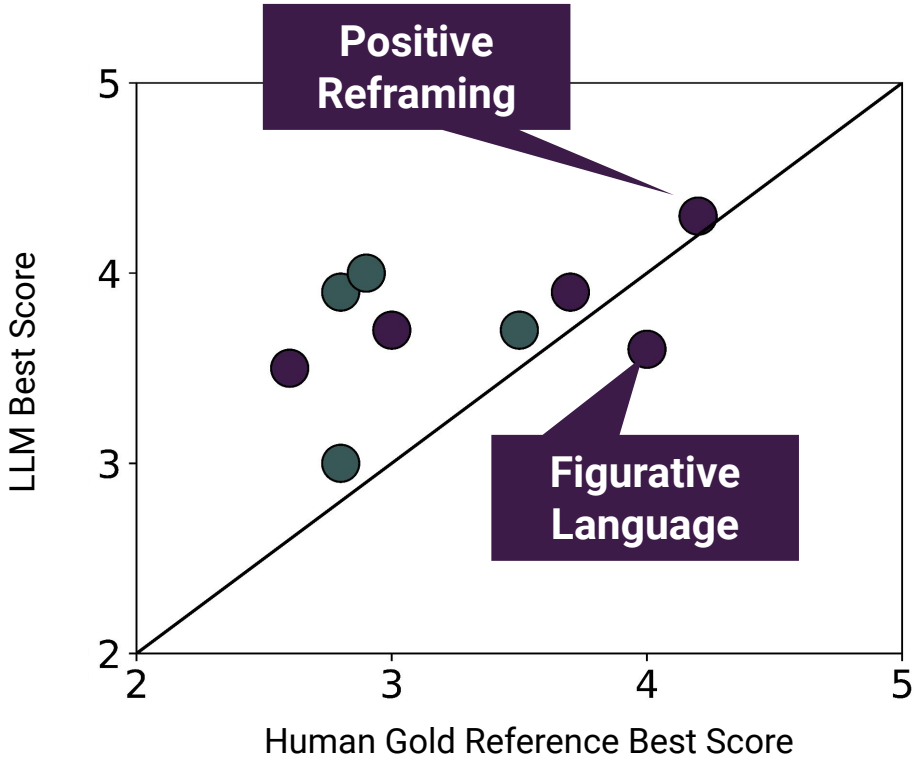
- ***Faithfulness***
- ***Relevance***



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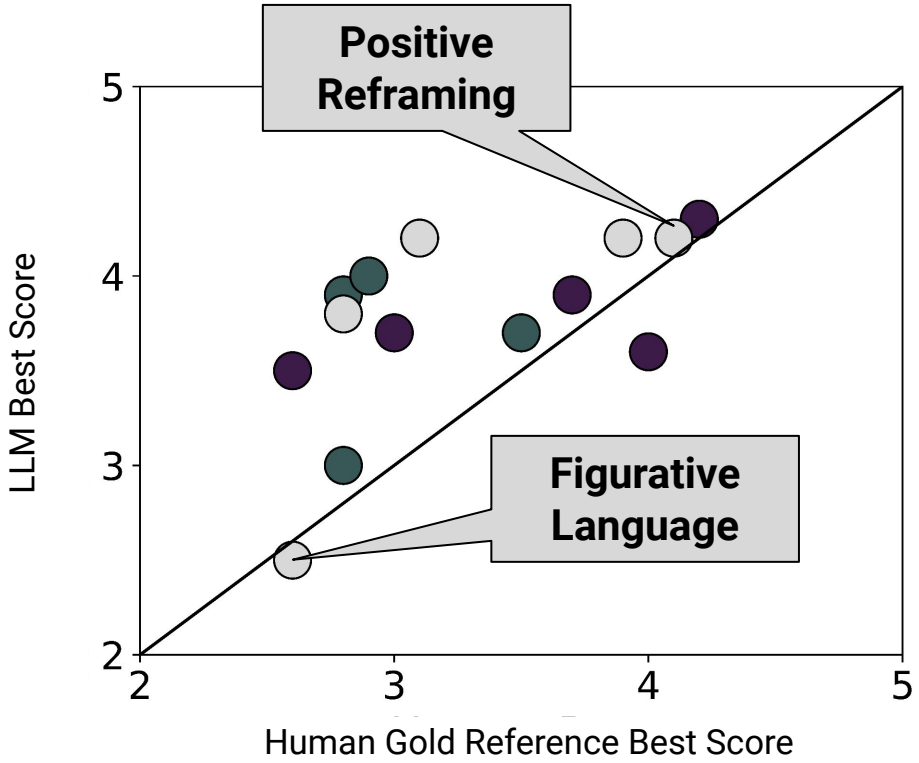

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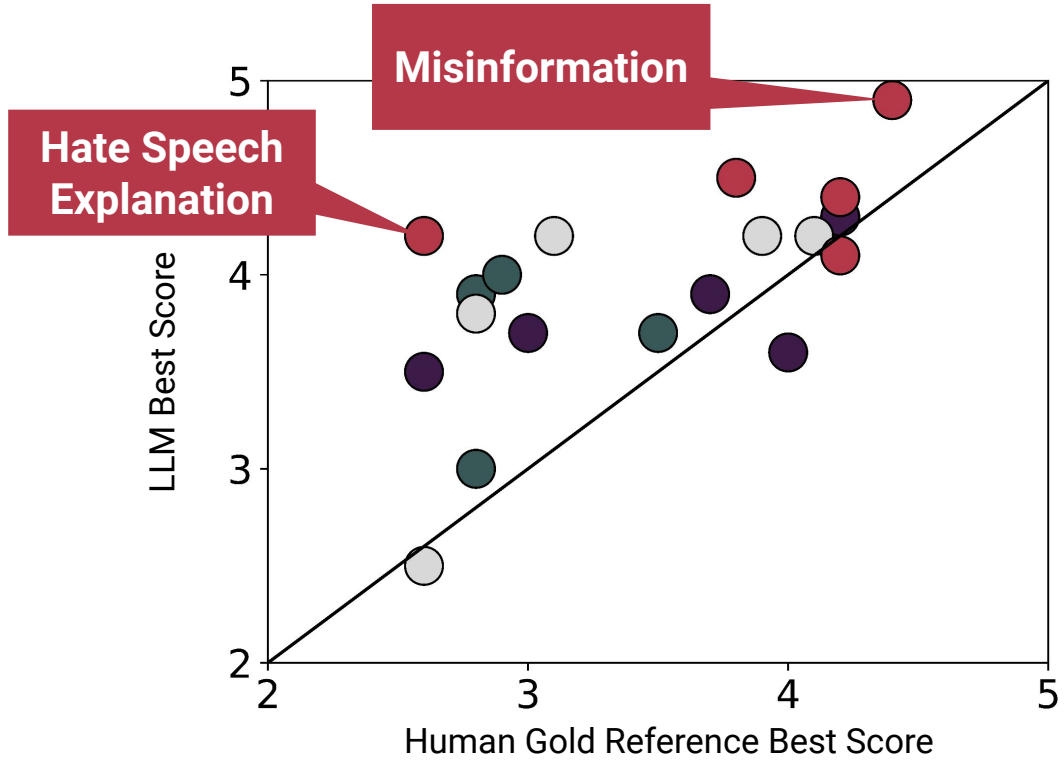

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Discussion

CSS Challenges for LLMs:

1. Subtle expert taxonomies
2. Size of the target label space
3. Structural parsing
4. Temporal grounding

Discussion

Recommendations:

1. Integrate LLMs in the loop to transform large-scale data labeling
2. Consider open-source LLMs for classification
3. Reinvest in expert annotation

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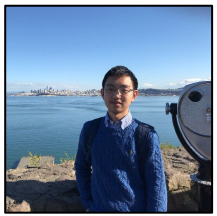

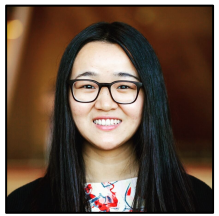

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White House Ousts Top Climate Change Official

Which of the following describes the above news headline?

A: Misinformation
B: Trustworthy

Constraint: Answer with only the option above that is most accurate and nothing else.

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