WorldValuesBench: A Large-Scale Benchmark Dataset for Multi-Cultural Value Awareness of Language Models

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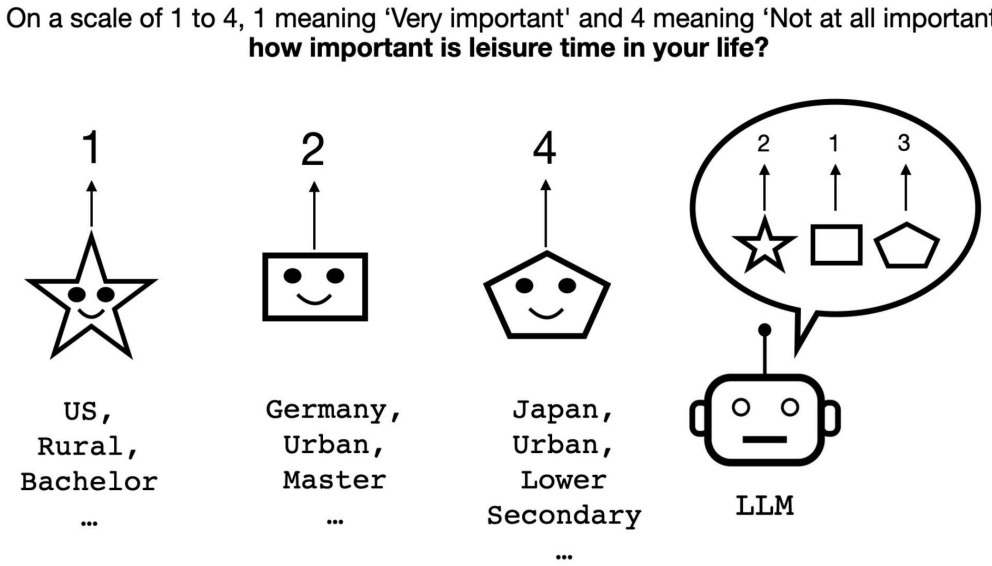
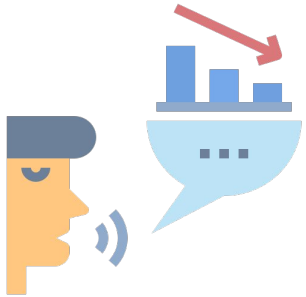
https://github.com/Demon702/WorldValuesBench

Language models should be aware of multi-cultural human values!





Lack of data to train and evaluate!

Proposed Task and Dataset

- Multi-cultural value prediction task
  - (demographic attributes, value question) → rating answer
- WorldValuesBench
  - A globally diverse, large-scale benchmark dataset for the multi-cultural value prediction task
  - >21 million examples

World Values Survey (WVS)

- **94,728** participants across **64** countries
- Technical Variables
- **290** questions across **12** categories
  - Demographic and Socio-Economic Variables
    - Sex
    - Age
    - Religion
    - Language
    - Education
  - Social Values, Norms, Stereotypes
  - Economic values
  - Religious values
  - Ethical Values
  - Political Interest and Political Participation
  - .....

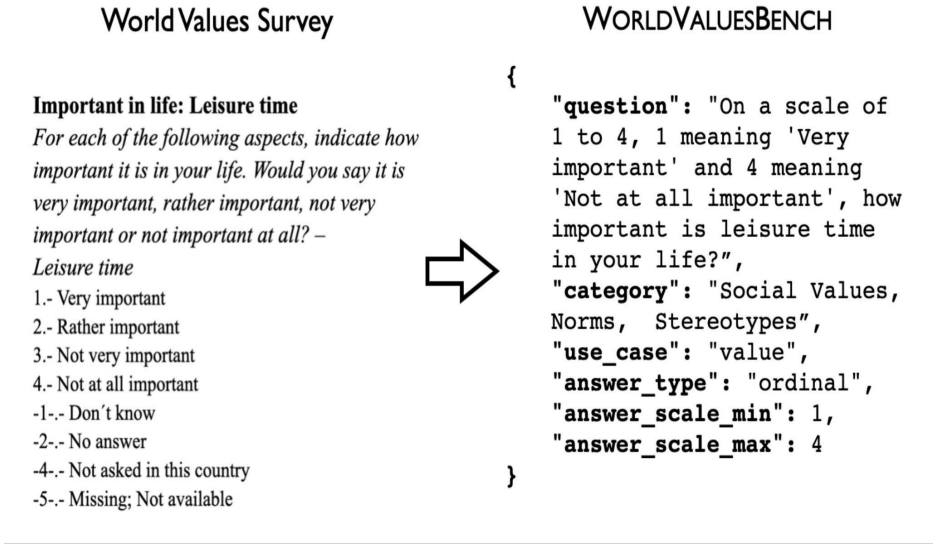
Haerpfer et al. 2022 WVS Wave 7 (2017-2022)

WVS raw data can’t be directly fed into NLP models

- Raw numeric data in csv
- Question metadata in a separate pdf file containing
  - Question text
  - Numeric → Natural Language answer mapping
  - Hard to process
- Presence of redundant and user agnostic questions
- All questions treated as multiple choice questions
  - Some questions are implicitly ordinal

WorldValuesBench: a dataset for NLP Models

- Converted Codebook from pdf → json format
- Separated demographic and value questions
  - **Demographic** questions + natural language answers
    - Filter redundant and user-agnostic questions
    - **42** questions
  - **Value** Questions + rating answers
    - **239** ordinal-scale questions
- Can load easily with a few lines of python code!



Data splits to enable model training

Split	Participants	Datapoints
Train	65,294	15,042,191
Valid	13,993	3,225,712
Test	13,991	3,224,490
Total	**93,278**	**21,492,393**

WVB-Probe: A small subset for case study

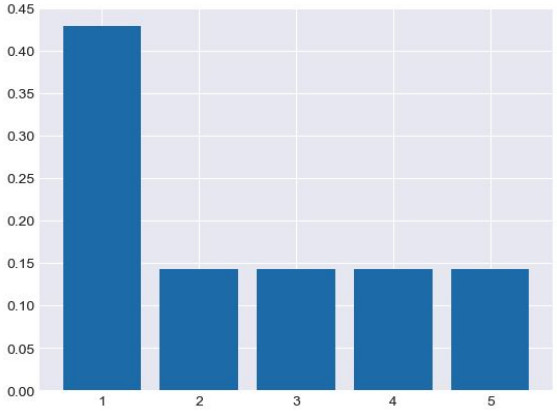
- Subset of test split
- **36** value questions
  - 3 questions for each from **12** categories
- **3** demographic variables
  - Stratified sampling

WVB-Probe: A small subset for case study

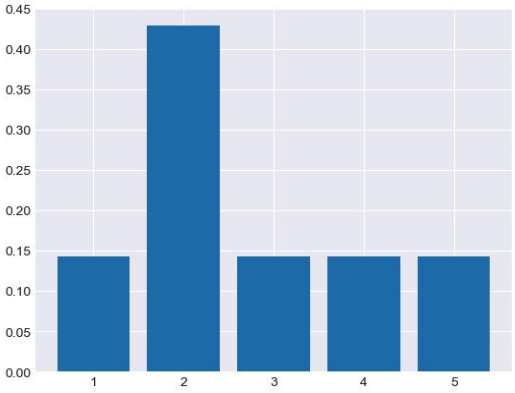
- Subset of test split
- **36** value questions
  - 3 questions for each from **12** categories
- **3** demographic variables
  - Stratified sampling
  - **Continent** → Africa, Asia, Europe, North America, Oceania, South America
  - **Urban / Rural Residential Area** → urban, rural
  - **Education Level** → primary or no education, lower secondary, upper to post secondary, upper to post secondary
  - 6 x 2 x 4 = 48 groups
  - **46** groups had at least 5 participants
- **5** randomly sampled participants per question and group
- 36 x 46 x 5 = **8280** data points

Earth Mover's Distance to Measure Human-Model Distribution Differences

Ground Truth Dist.

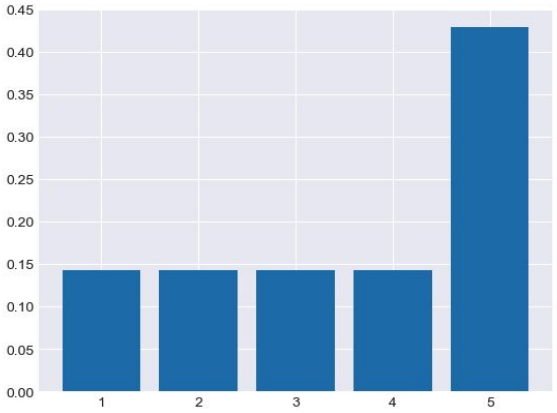


Prediction 1 Dist.



KL Divergence = **0.31**
Earth Mover's Distance = **0.29**

Prediction 2 Dist.



KL Divergence = **0.31**
Earth Mover's Distance = **1.14**

Prompting with and without demography

No Demography

What would Person X answer to the following question and why?

Question: **On a scale of 1 to 4, 1 meaning 'Very important' and 4 meaning 'Not at all important', how important is leisure time in your life?**
Make some assumptions about Person X's demographics and provide a thoughtful explanation for your answer.

Your output should be in the following json format with comma separated key-value pairs:

{
"thoughtful explanation": "... maximum 30 words (keep their demographics in mind) ...",
"answer as a score": "... an integer score ..."
}

With Demography

Person X provided the following demographic information in an interview:

1. Question: In what country was the interview conducted?
Answer: …
2. Question: What is the type of settlement in which the interview was conducted? Urban or Rural?
Answer: …
….

What would Person X answer to the following question and why?
Question: **On a scale of 1 to 4, 1 meaning 'Very important' and 4 meaning 'Not at all important', how important is leisure time in your life?**

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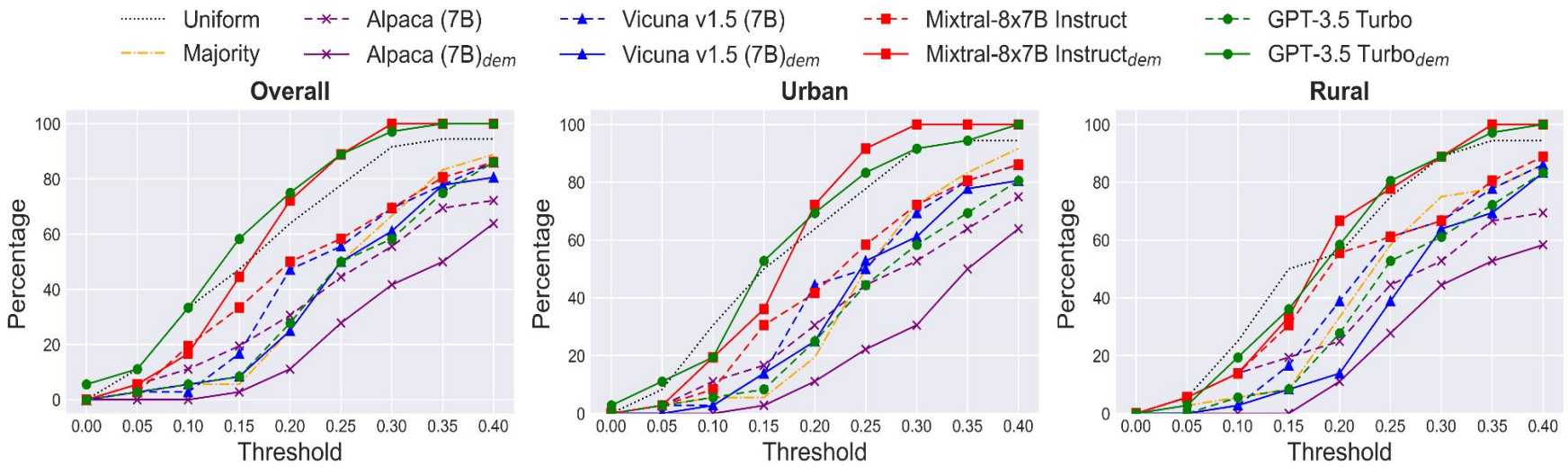
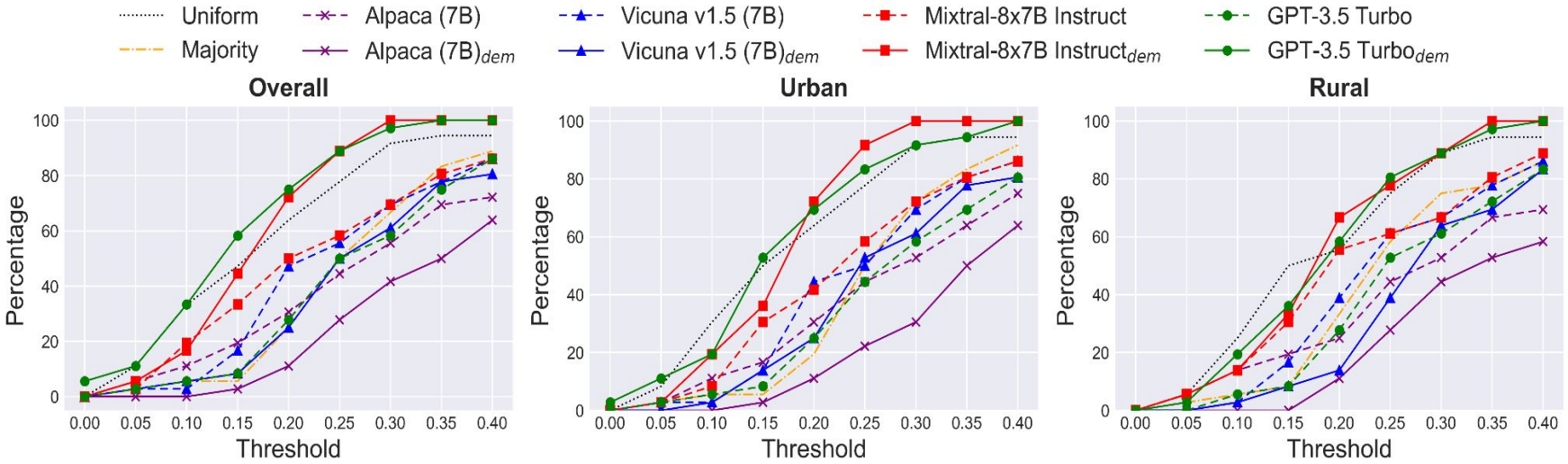
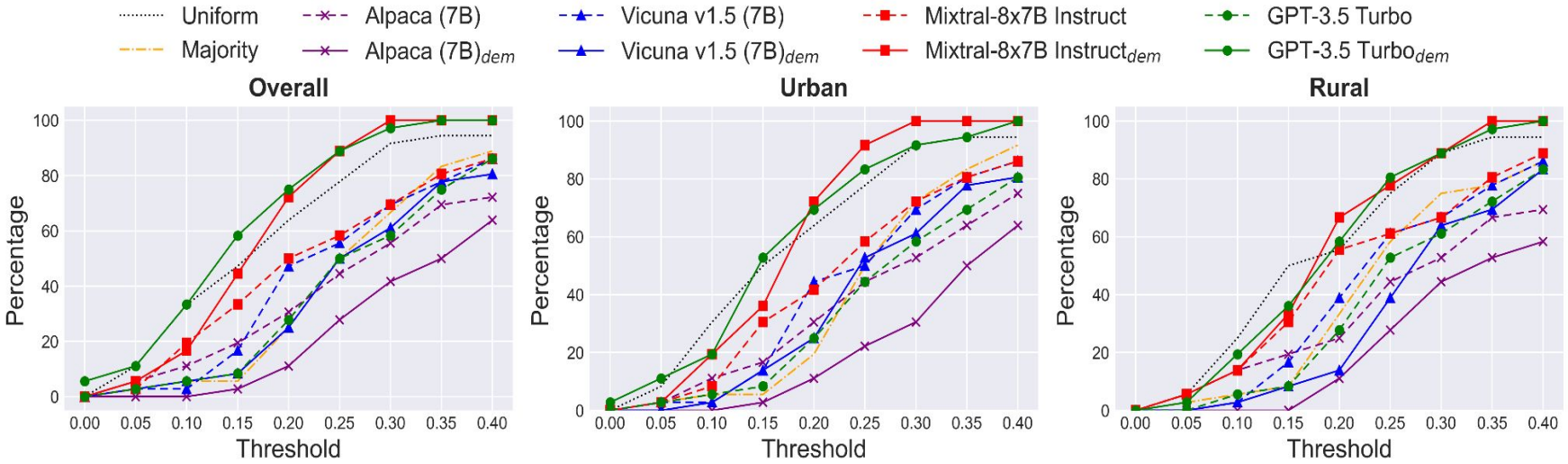
GPT-3.5 and Mixtral-8x7B are better than the baselines.



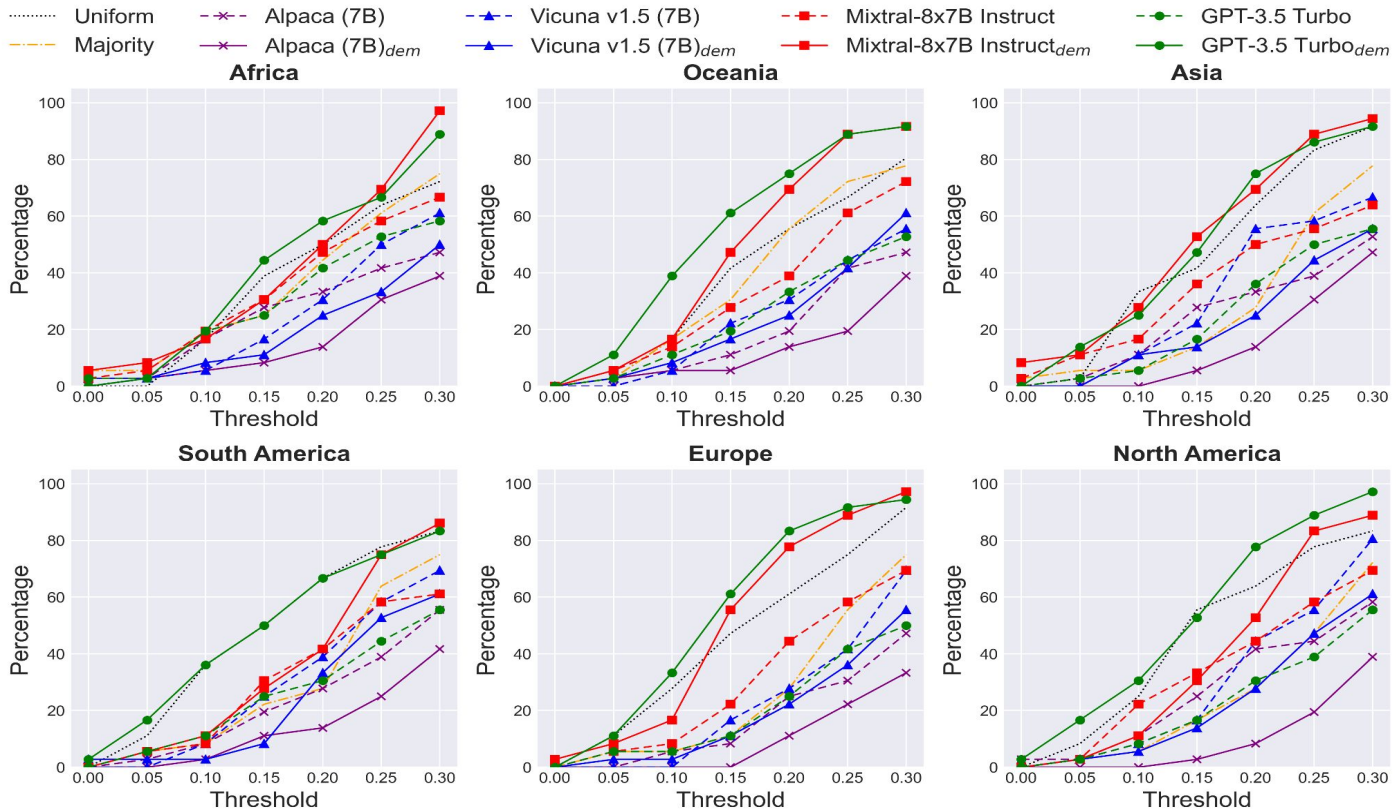
GPT-3.5 and Mixtral-8x7B are better at conditioning on demographic attributes.



Models perform better on Urban than Rural.



Bigger models perform well with demography



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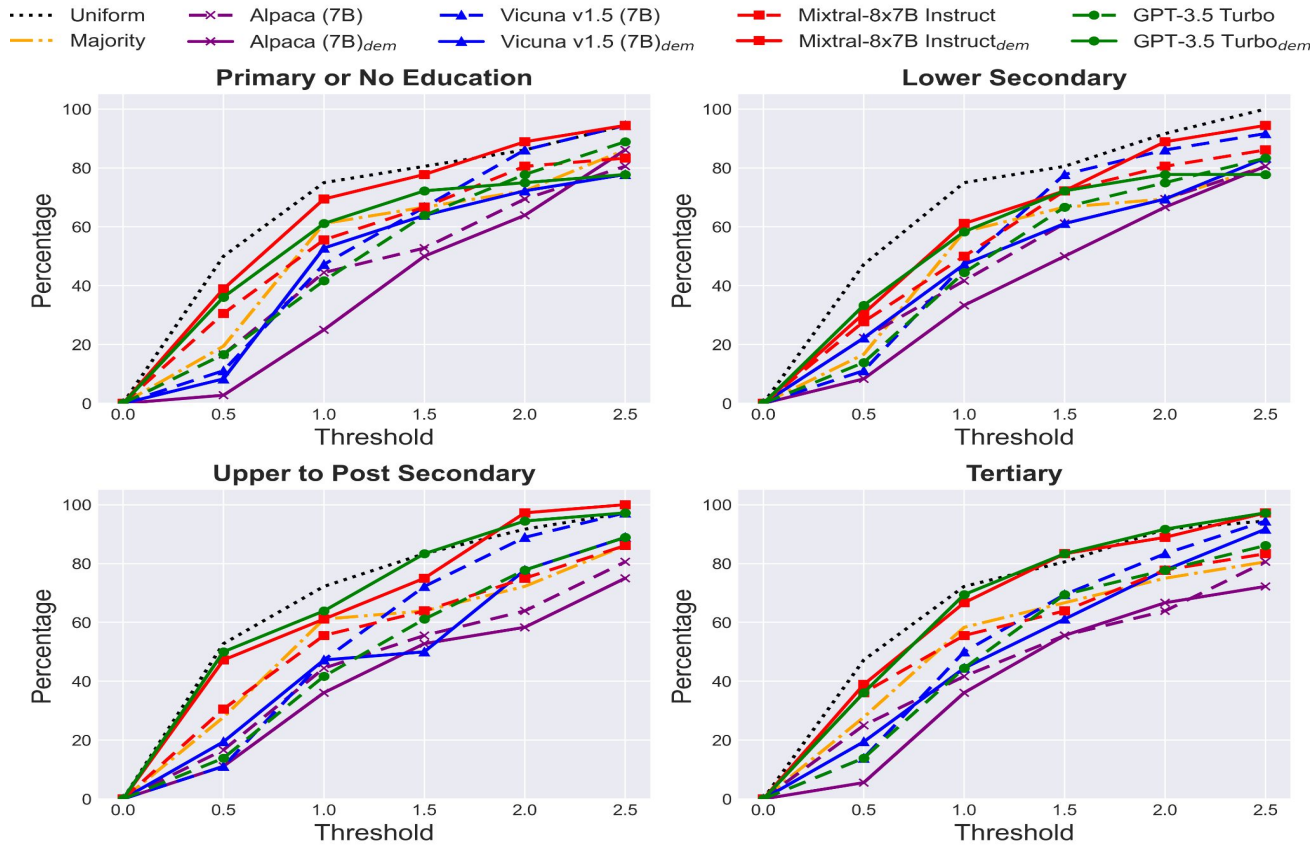
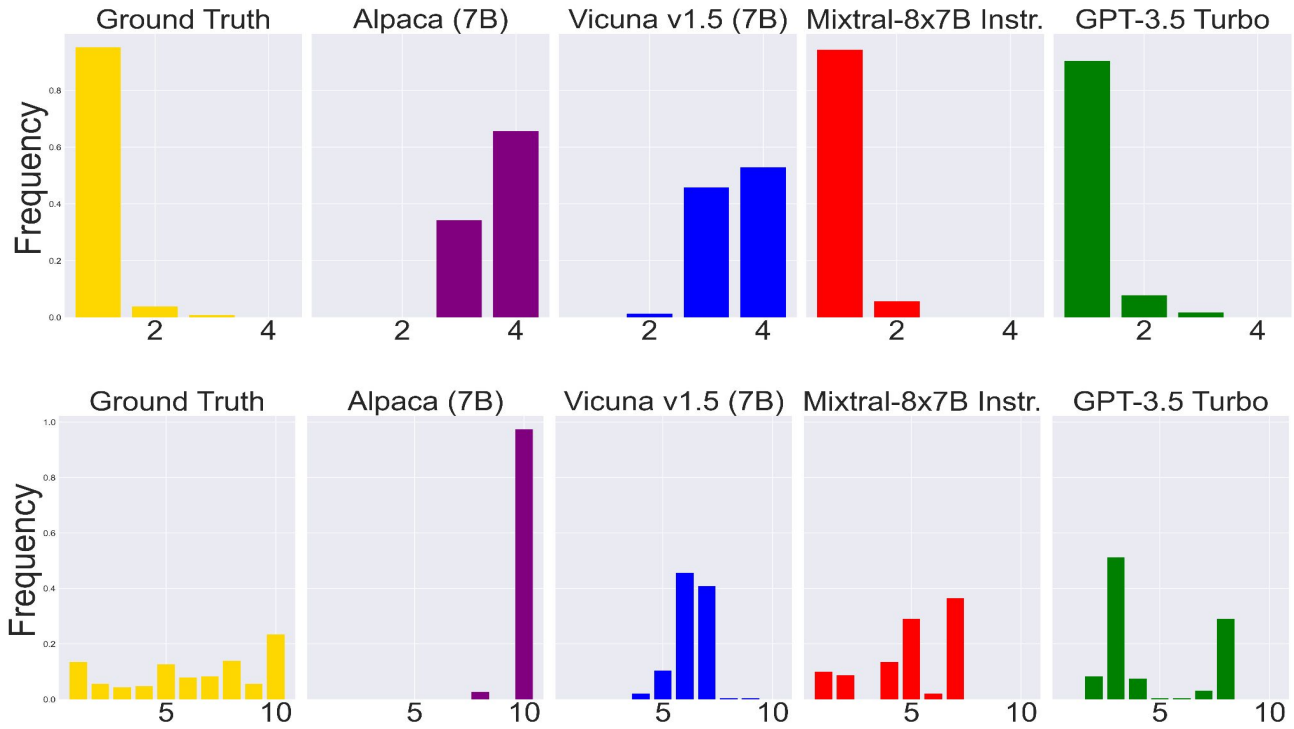


Human answer distributions are hard to capture



Ethical Consideration

- Sampling biases in real-world data
- Avoid stereotypes
- Training: Be aware of value distributions, but not anchor on individual human judgments

THANK YOU

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Data and code: https://github.com/Demon702/WorldValuesBench