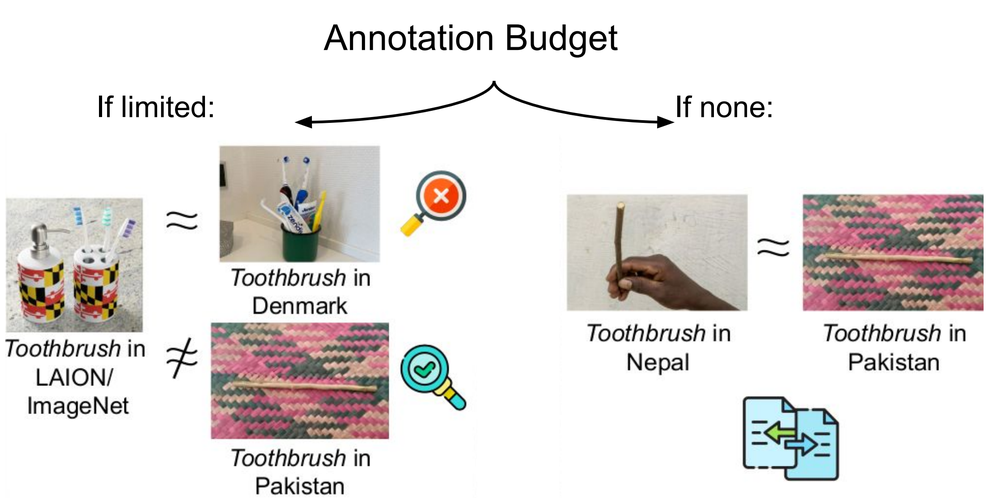
Annotations on a 💰 Leveraging Geo-Data Similarity to Balance Model Performance and Annotation Cost

Oana Ignat*, Longju Bai, Joan Nwatu, Rada Mihalcea

Contact: oignat@umich.edu

Motivation

- Vision-language models **work poorly on data from underrepresented countries**.
- Due to the **diverse appearance** of topics across countries.
- Collecting diverse global data is **expensive** (~1$/ img).



Contributions

How to reduce the annotation budget by finding the most effective data to annotate?

1. We identify which **countries and topics are less represented in training data of vision-language models**.
2. We identify the groups of **countries that are visually similar** and show they can be used to **supplement training data effectively**.
3. Our work creates **opportunities for affordable and geo-diverse data collection**, encouraging contributions to **creating inclusive datasets and models**.

Dataset

Low-Resource:
- Diverse countries
- Crowd-sourced data
- **Dollar Street & GeoDE**

High-Resource:
- Mostly Western data
- Web-crawled
- **ImageNet & LAION**

Cooking pot in low-resource data (top) vs. in high-resource data (bottom)

# unique topics	94
# unique countries	52
# unique (topic, country) pairs	1,501
# images in low-resource data	80,801
# images in high-resource data	103,006
average # images per (topic, country)	53.8
median # images per (topic, country)	30

Table 1. Data Statistics

github.com/MichiganNLP/visual_diversity_budget

Research Questions

RQ1: Which countries are less represented in vision-language models?

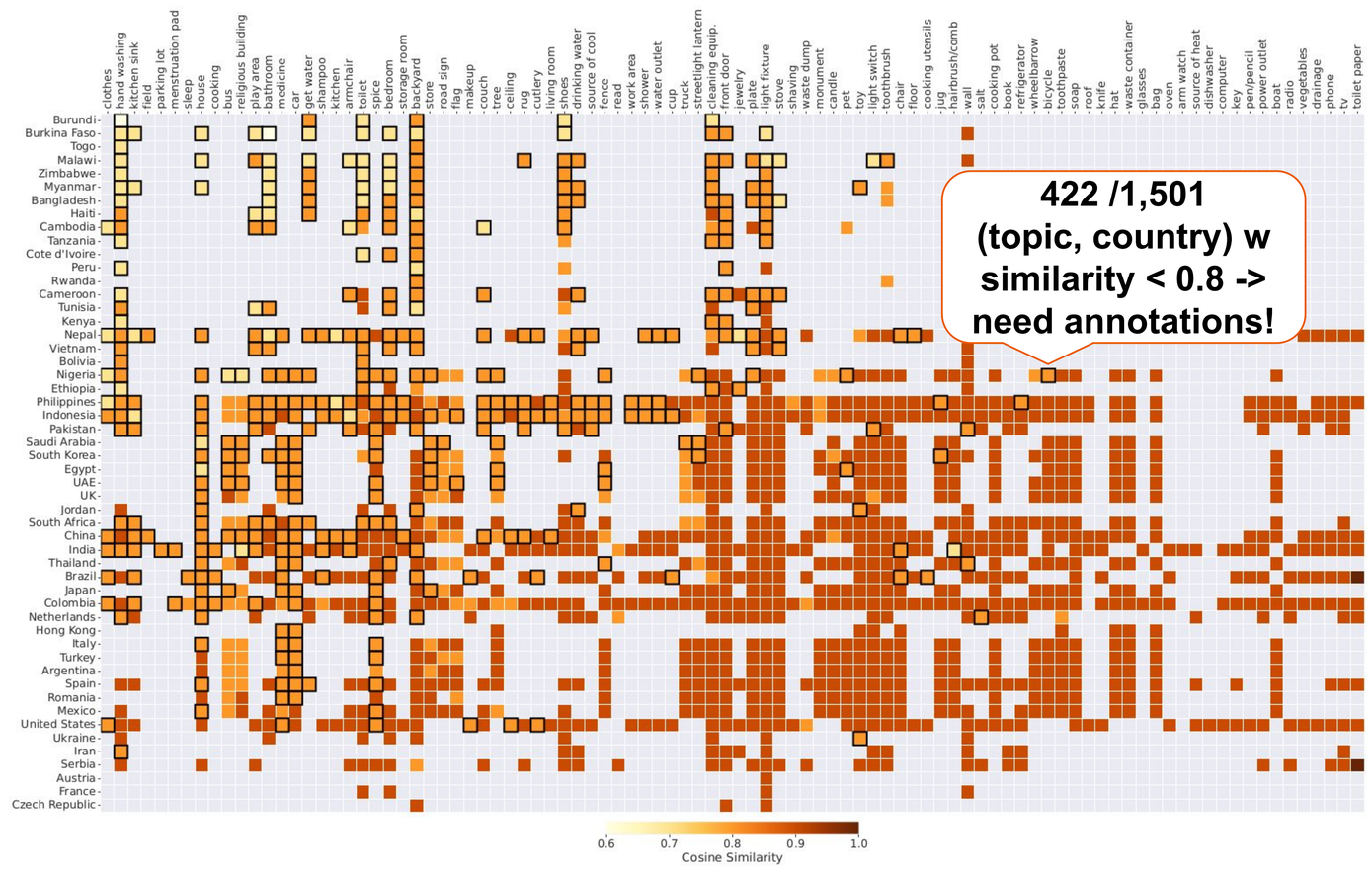
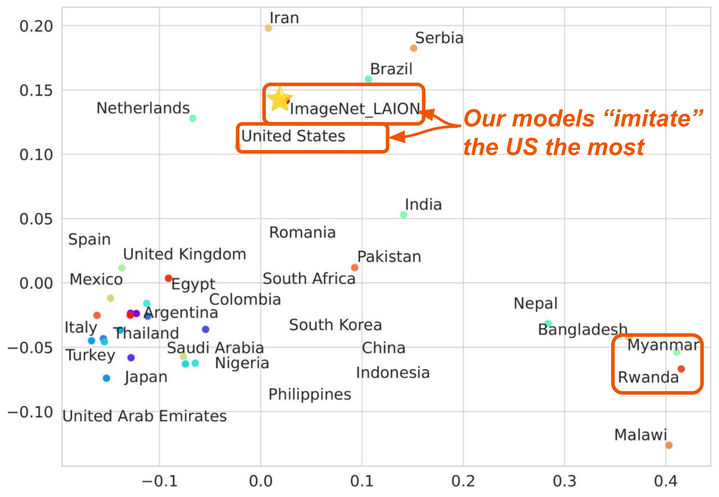


Fig. Visual Similarity Heatmap between Low-Resource and High-Resource (topic, country) pairs.

RQ2: How can we leverage cross-country data similarity to improve the representation of vision-language models?



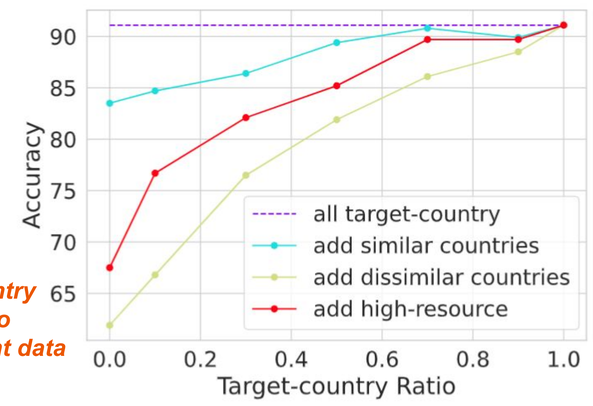


Fig. PCA for *toothbrush* for all countries that contain this topic in the low-resource data and in the high-resource data.

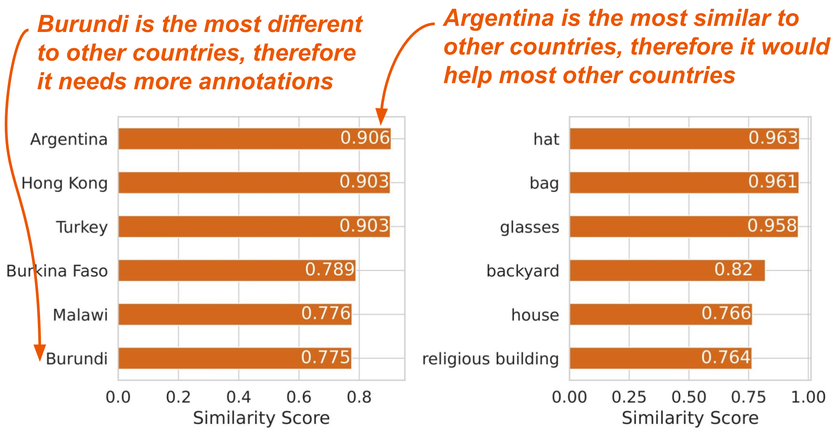
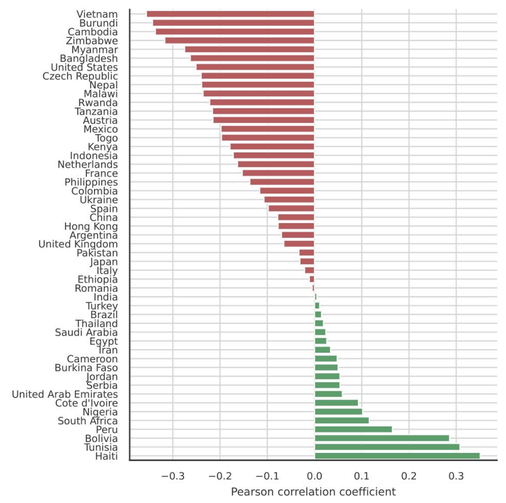


Fig. Top 3 and last 3 countries (left) and topics (right) sorted by average similarity score



Main Takeaways

- **Focus annotations on unrepresented data** for a global performance.
- **Most countries < 10 img/ topic** -> annotate those first!
- **Leverage cross-country data similarity** to supplement unrepresented countries.
- **Geo distance not correlate w country sim.** -> need more info (history, income, …).