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## Introduction

Several popular large-scale computer vision datasets, e.g., ImageNet and COCO, are either fully or partly scraped from Flickr. Thus, biases inherent to Flickr influence the performance of models for visual tasks as diverse as object classification, pose estimation, instance segmentation, image captioning, and beyond.

We, therefore, investigated the limitations of standard Flickr image data collection methods in low- and middle-income countries.

We analyzed human-centric image geo-diversity on a massive scale using geotagged Flickr images associated with each African nation.

We report African geotagged image distribution according to fine-grained intra-national wealth estimates. We compare the quantity and content of available data in Africa to population-matched nations in Europe.

Our findings also show an “othering” phenomenon as evidenced by a substantial number of images from Africa being taken by non-local photographers.

## Data Collection

Using the FlickrAPI, we scraped geotagged images and associated metadata from Flickr between dates 2004-02-10 and 2022-02-10 (18 years) by querying by country name and the country name + “people” for all 54 countries in Africa and 4 European countries.

We utilize the normalized by nation relative wealth index data collected from Low- and Middle-Income Countries by Facebook’s Data for Good project. Using k-nearest neighbour, we computed the nearest RWI-labeled geographic location of each image and excluded geotagged images beyond 300km to the nearest RWI-labelled location.

European Countries			
Country	population	#geotagged	%geotagged
Switzerland	8.75M	129,517	24.170699
Finland	5.55M	119,901	22.941545
Slovenia	2.11M	86,630	23.313706
Cyprus	918.10k	77,826	20.948900
African Countries			
Country	population	#geotagged	%geotagged
Sierra Leone	8.30M	7,303	13.902532
CAF	5.60M	2,954	14.843475
Lesotho	2.10M	5,121	11.831708
Djibouti	976.11k	5,179	14.374532

## Geotagged Images and RWI Distribution

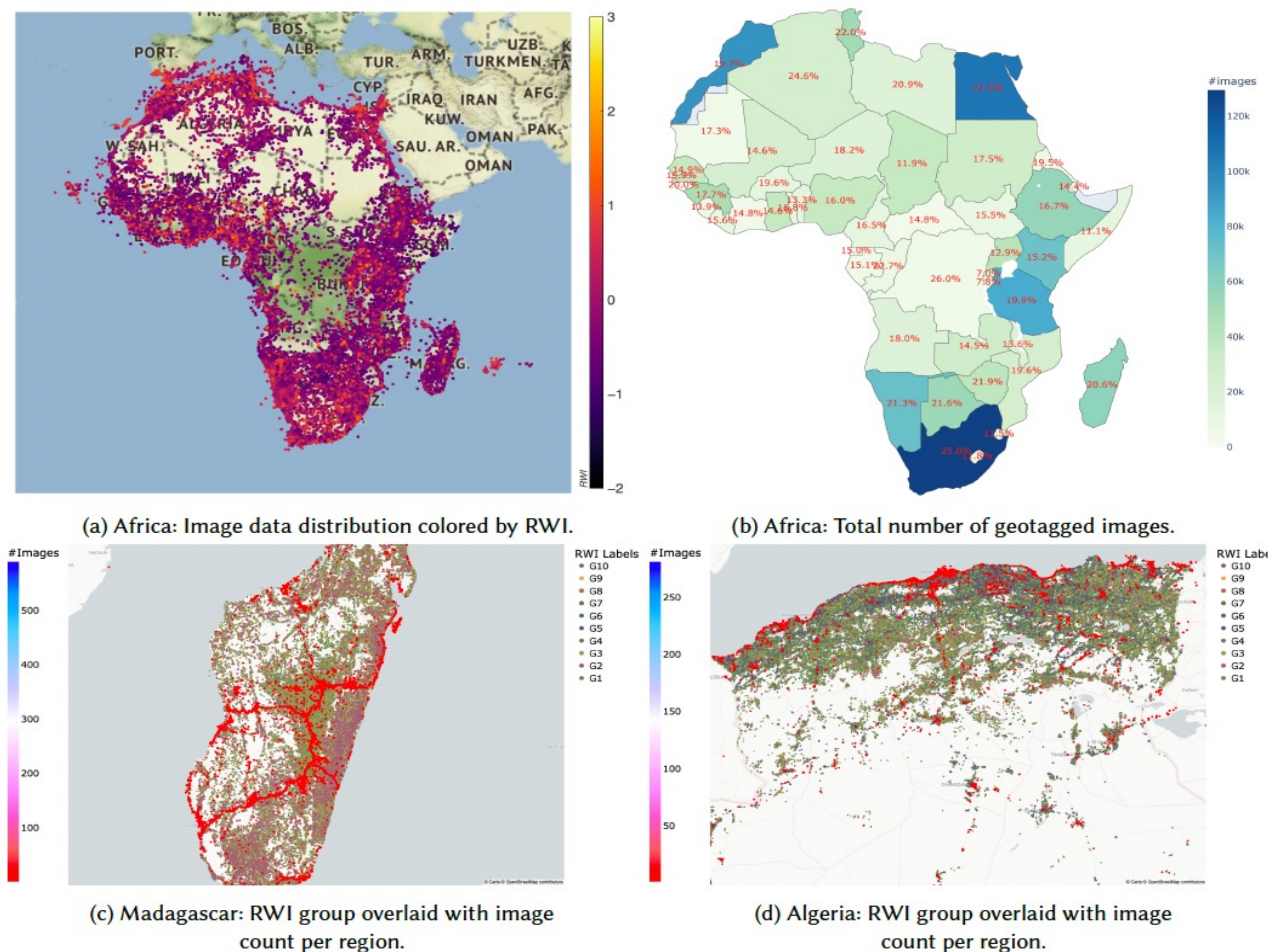


Fig. 1. A collection of maps displaying relative wealth index (RWI) and geolocation of Flickr Africa images via country name query. Tolerance distances from geotag to nearest RWI-labeled point are: ((a, b) dist:  $\leq 300km$ ; (c, d)  $\leq 10km$ ). (b) Nations are colored according to total number of geotagged images and the percentage values (rounded to one decimal place) are the percentage of geotagged images with respect to all images scraped by nation. South Africa had the highest number of geotagged images and Sao Tome and Principe had the smallest number of geotagged images, while Cape Verde had the highest percentage of geotagged images and Rwanda had the lowest percentage of geotagged images. ((c, d) Here, RWI groups are equally binned into G1-G10 by nation, with G1 having the lowest RWI values.

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## Our Findings

There are **very few geotagged images from Africa**, most from **middle RWI regions**, and drastically fewer than European nations of comparable size e.g., **Switzerland has 18x as many geotagged images as Sierra Leone**.

The #geotagged images **positively increased** with **population size** (correlation: 0.412 & 0.538), **internet usage** (0.474 & 0.385), and **GDP** (0.599 & 0.748). Official language was not found to have a meaningful correlation to the #geotagged images.

The most frequent tags were the **name of the place** where the image was taken, including “Africa”. The least frequent tags were usually those in foreign languages or tags containing typos or consisting of multiple concatenated words.

Most images were licensed as **“All Rights Reserved”** (80.46%, 81.99%), indicating the Flickr default setting when images are uploaded.

For the geotagged images, we randomly selected for the crowdsourcing task, African images were far more likely to be taken by foreigners whereas the opposite trend was observed for high-GDP European nations. In addition, in general, European and African images **did not contain people** and were captured in **outdoor, public, and natural settings**. A majority were **real photographs** (as opposed to synthetically-generated images, or pictures of pictures) and did not contain content considered to be offensive by annotators.

## Conclusion

Our findings exposed new limitations of current large-scale image data collection methodologies and unique data challenges to Africa, including the lack of data crucial to specific domains (e.g., representative household object data since few images are within indoor/private scenes).

Looking forward, we encourage new scholarship centering novel methods for sourcing geodiverse datasets and measuring new forms of geodiversity specific to Africa, such as analyses of tribal diversity as opposed to the more commonly studied diversity by race/ethnicity.

We openly provide our large-scale dataset to enable future researchers to utilize and augment Flickr Africa for model evaluations across a wide domain of computer vision tasks.