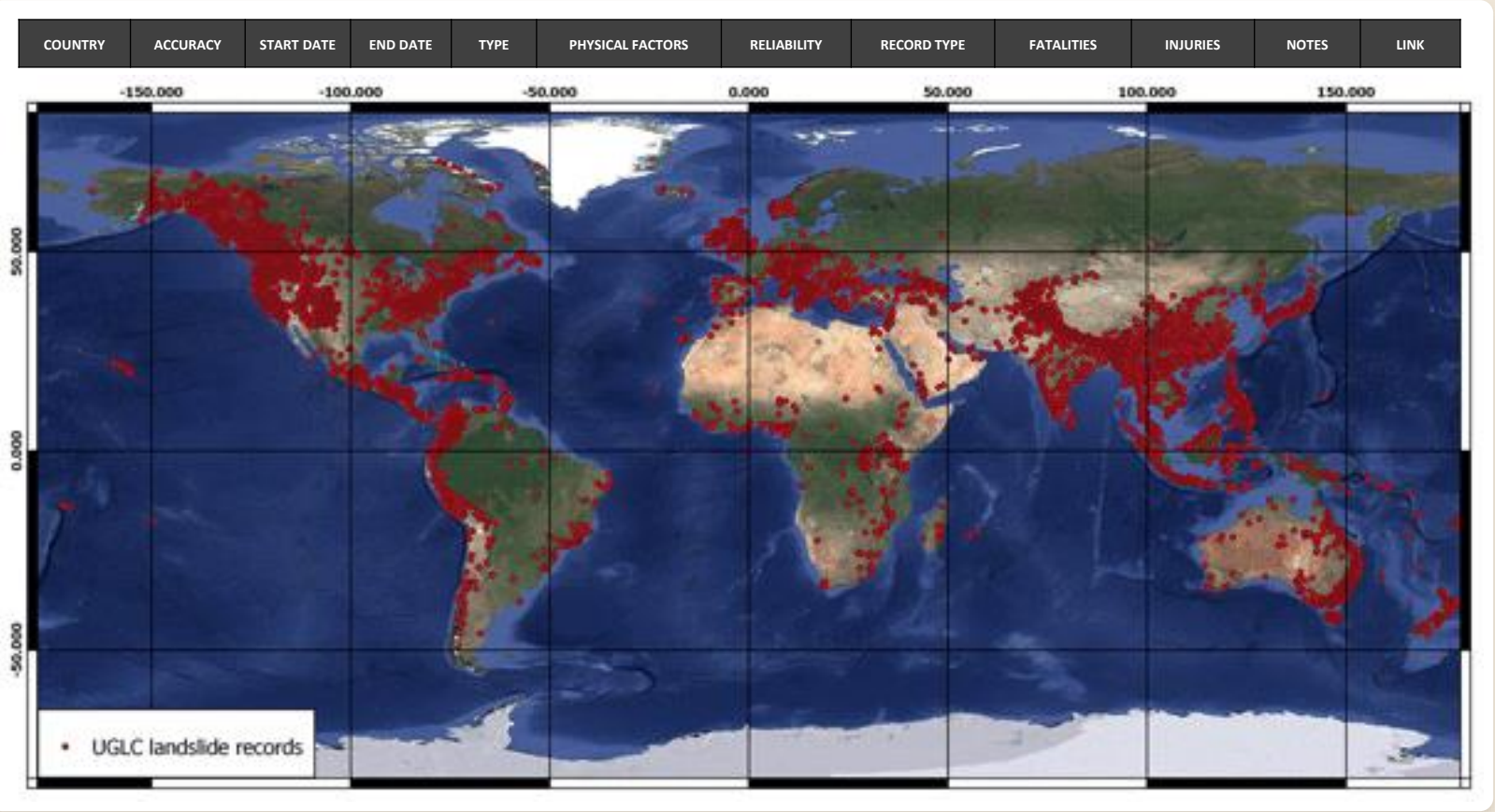


Unified Global Landslide Catalogue UGLC:

Harmonized Data Foundation for AI-Driven Landslide Susceptibility and Hazard Modeling at Multiple Scales

Geographic coverage, density and data quality as key for scalable AI/ML landslide risk modeling

UGLC is today the largest open-source landslide catalogue in the world



~1.06M
point records

~0.9M
polygons

≈ 2 million landslides points and polygons documented, standardized and harmonized into a single, GIS friendly and AI-ready open dataset

COMPARISON

NASA GLC / COOLR

most established open global catalogue to date

~49K
manually curated reports since 2007

UGLC is more the 1 order of magnitude larger, a step change in scale, not just quantity

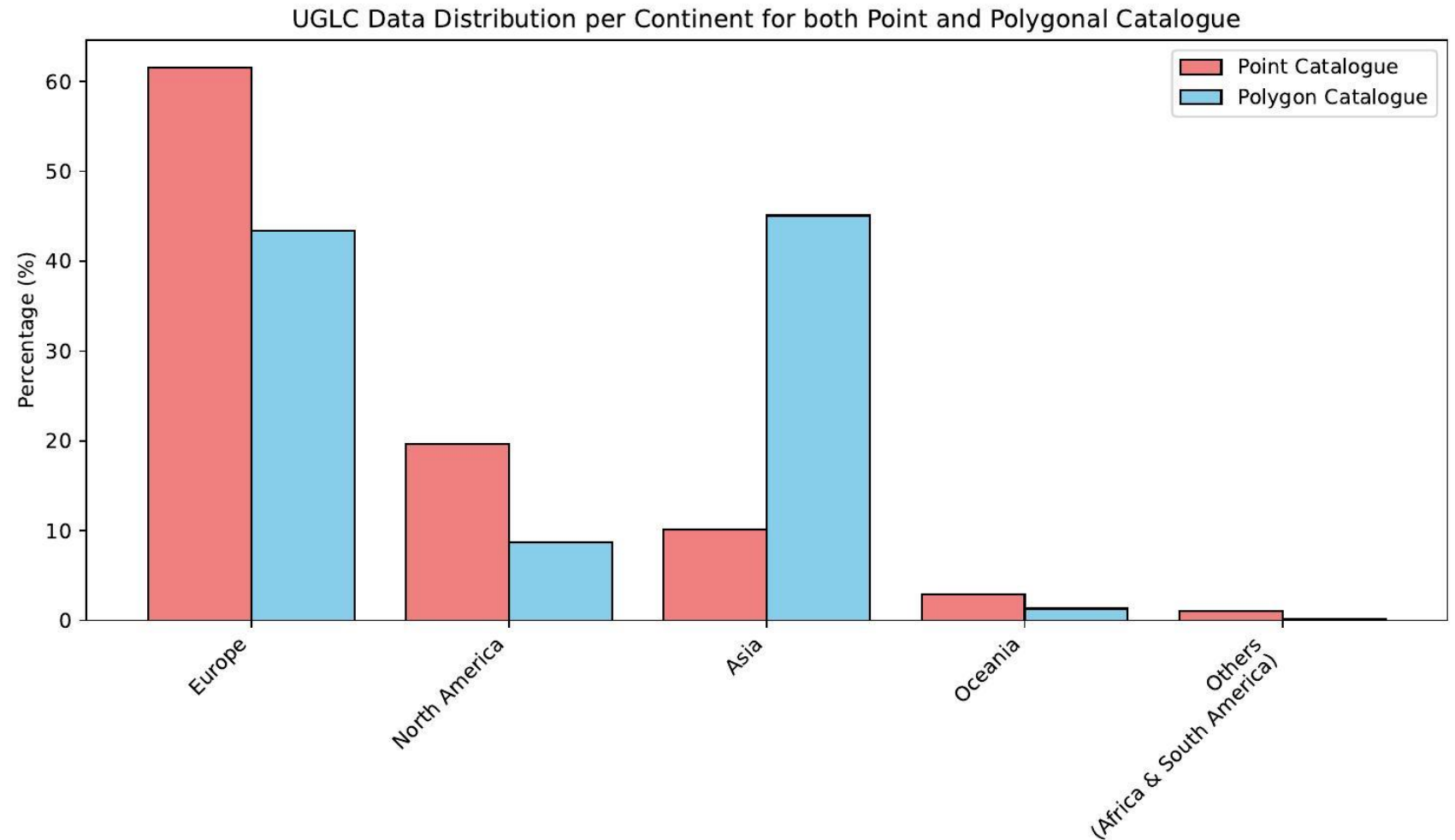
WHERE THE DATA IS

Geographic distribution is far from uniform

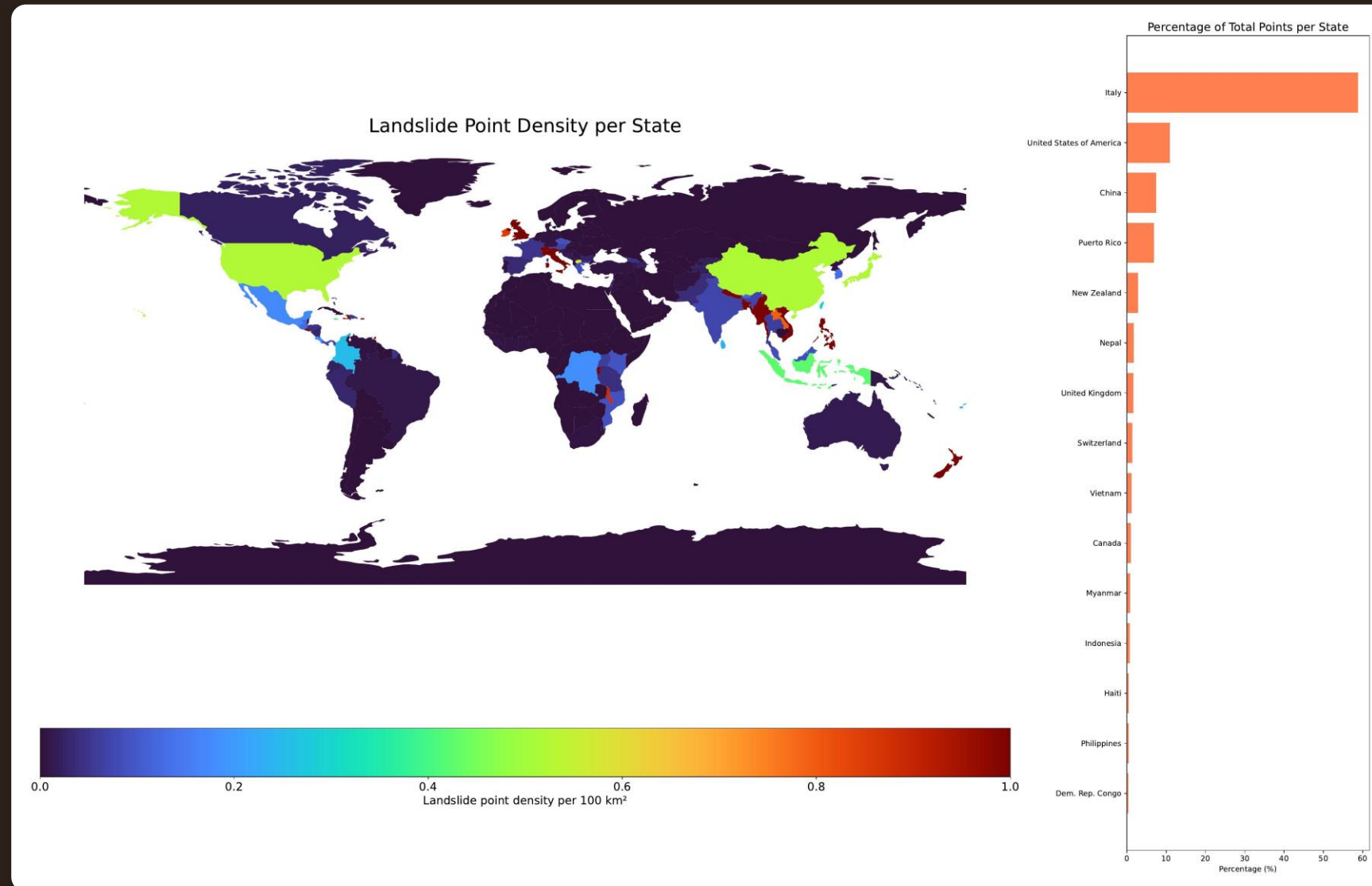
READING

- Europe and Asia together account for over 80% of the data
- Point dataset is widely better scattered than the polygonal one, which tends to be concentrated in specific areas
- Africa and South America combined: about 2%

A global model trained like this mostly learns the European and Asian context.



Several countries concentrate most of the data



STATS

- Italy alone accounts for over 50% of all point records
- Beside Italy data predominance, many other countries like Philippines, USA, Vietnam, China, UK and New Zealand follow, are strongly represented
- Data shortcomings for some large regions (several Northern African Countries, South American countries and Russia)

NOTE:
UGLC mirrors where national inventories exist, not where landslides actually happen.

To model such a complex and heterogeneous phenomena balanced data are needed, not just more data

1

Geographic coverage

That could represent diverse climates, geological assets and land uses, not only where mapping is easiest

2

Comparable density

Preventing several data-rich countries from dominating what models could learn

3

Consistent quality

Coherent and traceable mapping criteria and accuracy across sources, so regions can be fairly compared

A catalogue that is huge but imbalanced trains models that work well where data is abundant, failing elsewhere, often exactly where risk assessment is crucial.

Built to serve multi-scale AI/ML susceptibility, hazard & risk modeling

End users / stakeholders

- EO & disaster risk management community
- AI/ML modelers working at regional-to-global scale
- Geologists and Geotechnical engineers, for site-scale hazard screening and rapid consultation of historical landslide occurrences

Requirement addressed

- A single, harmonized, analysis-ready global landslide training dataset
- Consistent quality criteria standardized across sources for fair regional comparison
- A shared ontology resolving differences in mapping conventions, attribute schemas and classification criteria between source inventories

HAVE A LOOK

UGLC is online!



GITHUB REPOSITORY

(Codebase and documentation)



ZENODO REPOSITORY

(Data Repository)



*UGLC it's completely open access and easily accessible.
With the full codebase and documentation accessible on
GitHub repository and deeply explained on the paper
published on ESSD Copernicus journal.*

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Earth System
Science
Data

Unified Global Landslide Catalogue (UGLC): a single, standardised global-scale landslide dataset

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Abstract. Landslides are a serious threat to all communities due to their potential for property damage and loss of life. Triggered by different natural, climatic and anthropogenic factors, landslides are complex phenomena and difficult to identify, monitor, and manage (<https://doi.org/10.1016/j.geomorph.2015.03.016>, Kirschbaum et al., 2015). Accurate and comprehensive data are essential in the mitigation of landslide risk, where both the likelihood and impact of landslides on communities must be quantified. Robust datasets allow for the development of dependable prevention strategies such as land use planning and early warning systems. These proactive measures play a crucial role in landslide risk mitigation (<https://doi.org/10.1007/s11069-023-05848-8>, Gomez et al., 2020).

This study presents a single global scale standardised landslide catalogue, the Unified Global Landslide Catalogue (UGLC), which is intended as an harmonised landslide information framework designed to support data discovery, comparative analyses, and large-scale descriptive investigations relevant to risk-related studies. UGLC integrates multiple open data landslide datasets and reports spatiotemporal data with trigger factors for landslides. Landslide occurrence data are collected from extensive field surveys, GPS data, GIS techniques, satellite imagery, and historical records sourced from government agencies, universities, and researchers.

UGLC contains more than 1 million landslide events as point and polygonal data, from the period spanning circa 1700 to 2023. The catalogue is standardised across 18 field attributes, and systematically grouped into seven main categories: (1) UGLC Reference – a unique event identifier; (2) Source Reference that enables back-tracing to the original data source; (3) and (4) Spatial Accuracy and Temporal Accuracy – precisely describe the geographic location and temporal resolution of recorded events, respectively; (5) Geological Information, including triggering factors; (6) Reliability, which assigns a trustworthiness value to the data; and (7) Notes and Information containing supplementary details such as source links, authorship, scientific publications, and other relevant metadata.

UGLC is intended as a robust catalogue of standardised landslide information worldwide. The aim is to provide a reliable and user-friendly source for the characterisation of landslide occurrence. Uniquely, it presents a comprehensive range of data for global analysis and thus compensates for the shortcomings of small-scale heterogeneous datasets. UGLC will facilitate a deeper understanding of landslide phenomena in

Published by Copernicus Publications.

Closing the gaps together, and putting the data to work

- UGLC v2: new data + new file formats (GIS-ready, KML/Google Earth), not just ML/AI-ready;
- Coming next, a free, browser-based WebGIS portal to explore the catalogue;
- Built for community contribution, open to aggregating further disclosed inventories over time;
- Already at work, a global susceptibility model (under submission) and a dynamic hazard model in development with Planetek Italia

UGLC itself is fully open and open to community contributions. Our call to this community:
help us close the remaining gaps and reuse the data! It's free and built to be useful to everyone working on landslide

THANK YOU

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UGLC: Mancino et al., 2025 — Earth System Science Data

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