



Department of Mathematical Modeling and Machine Learning (DM³L)

Climplicit: Climatic Implicit Embeddings for Global Ecological Tasks

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- + Essential to ecology
- Large storage requirements
- Learn features from scratch





- + Powerful representations
- Large compute requirements
- Technical know-how

Pretrain geolocation representations for ecological applications





See Section 2.3 & Appendix E



See Section 2.3 & Appendix E



See Section 2.2 & Appendix B





See Section 3 & Appendix D



Table 1: Comparison of probing on diverse pretrained geolocation representations with representations trained from scratch (**FS**). Mean and standard deviation of ten runs. **Best**. Second best.

	Model	Biomes (% F1 \uparrow)	SDM (% Acc \uparrow)	Plant traits (% $\mathbb{R}^2 \uparrow$)
Training from scratch on location & CHELSA	$\begin{array}{c} \mathrm{FS\ Loc} \\ \mathrm{FS\ CH} \\ \mathrm{FS\ Loc} + \mathrm{CH} \end{array}$	$\begin{array}{r} 73.89 \pm 2.42 \\ 71.82 \pm 1.94 \\ \textbf{79.60} \pm \textbf{1.66} \end{array}$	$\begin{array}{c} 2.01 \pm 0.37 \\ 2.49 \pm 0.10 \\ 2.51 \pm 0.11 \end{array}$	$\begin{array}{c} 42.19 \pm 0.04 \\ 60.04 \pm 0.26 \\ \underline{64.78 \pm 0.35} \end{array}$
ĺ	SATCLIP	68.33 ± 0.39	1.27 ± 0.07	61.55 ± 0.13
Other	TAXABIND	59.33 ± 0.09	3.09 ± 0.01	56.95 ± 0.01
pretrained	SINR	63.11 ± 0.25	1.71 ± 0.03	63.54 ± 0.11
geolocation encoders	CSP	58.63 ± 0.41	1.61 ± 0.07	49.65 ± 0.27
	GEOCLIP	62.68 ± 0.07	$\textbf{3.51} \pm \textbf{0.004}$	57.86 ± 0.05
Climplicit	CLIMPLICIT (Ours)	$\underline{78.42\pm0.27}$	$\underline{3.22\pm0.03}$	$\textbf{70.04} \pm \textbf{0.11}$

Biomes

Results

Tropical & Subtropical Moist Broadleaf Forests Tropical & Subtropical Dry Broadleaf Forests Tropical & Subtropical Coniferous Forests Temperate Broadleaf & Mixed Forests Temperate Conifer Forests Boreal Forests/Taiga 🔲 Tropical & Subtropical Grasslands, Savannas & Shrublands Temperate Grasslands, Savannas & Shrublands Flooded Grasslands & Savannas Montane Grasslands & Shrublands Tundra Mediterranean Forests, Woodlands & Scrub **Deserts & Xeric Shrublands** Mangroves Ocean Lake Rock and Ice







Climplicit

Groundtruth







FS Location + CHELSA

Climplicit







Climplicit









Climplicit

GeoCLIP⁷





Climplicit ...

- ... provides an implicit representation of CHELSA
- ... reduces storage requirements by 99,9%
- ... can be run on a laptop
- ... is competitive with training from scratch and other geospatial representations

Project page:



ecovision-uzh.github.io/climplicit

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