University of BRISTOL

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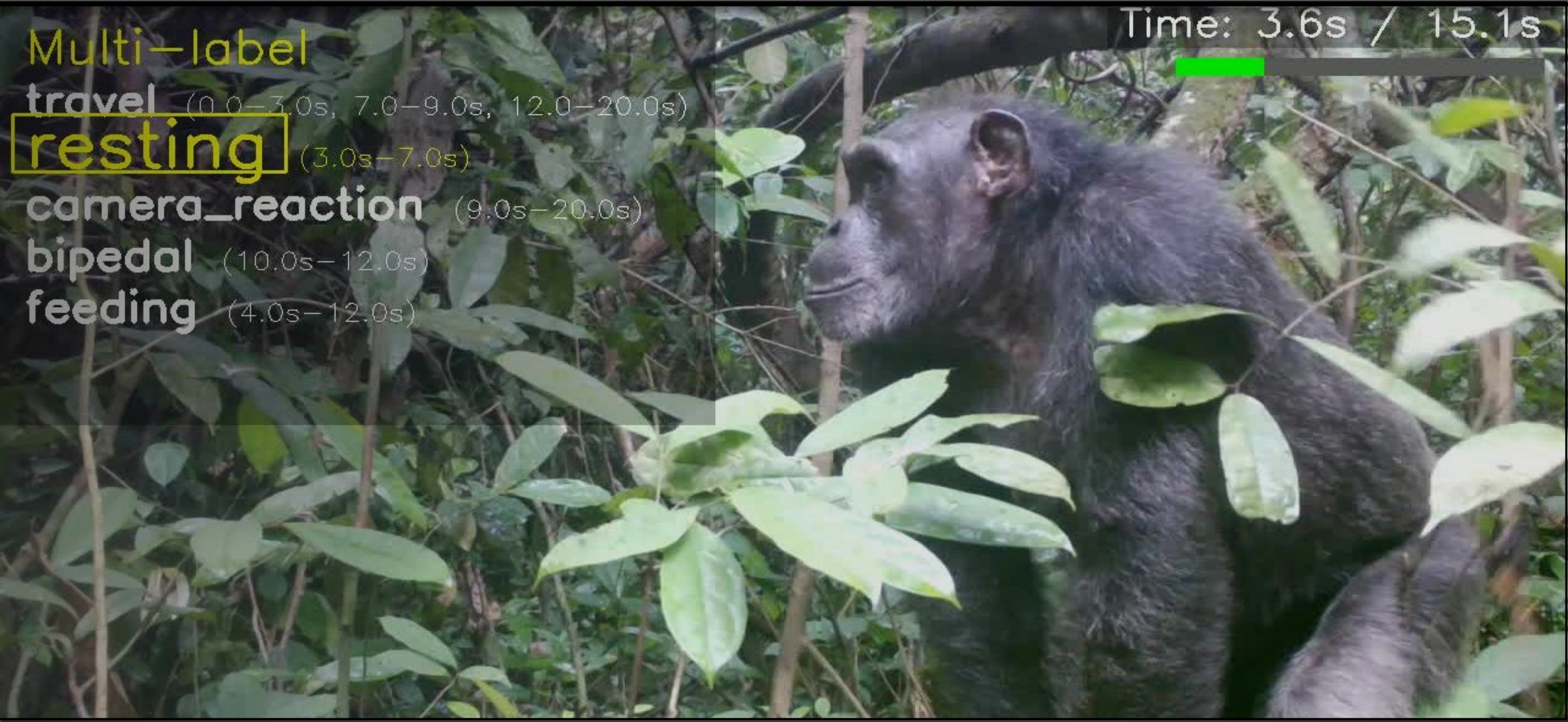
The PanAf-FGBG Dataset

Understanding the Impact of Backgrounds in Wildlife Behaviour Recognition

paper | data | code

Otto Brookes, Maksim Kukushkin, Majid Mirmehdi, Colleen Stephens, Paula Dieguez, Thurston C. Hicks, Sorrel Jones, Kevin Lee, Maureen McCarthy, Amelia Meier, Emmanuelle Normand, Erin Wessling, Roman Wittig, Kevin Langergraber, Klaus Zuberbühler, Lukas Boesch, Thomas Schmid, Mimi Arandjelovic, Hjalmar Kühl, Tilo Burghardt

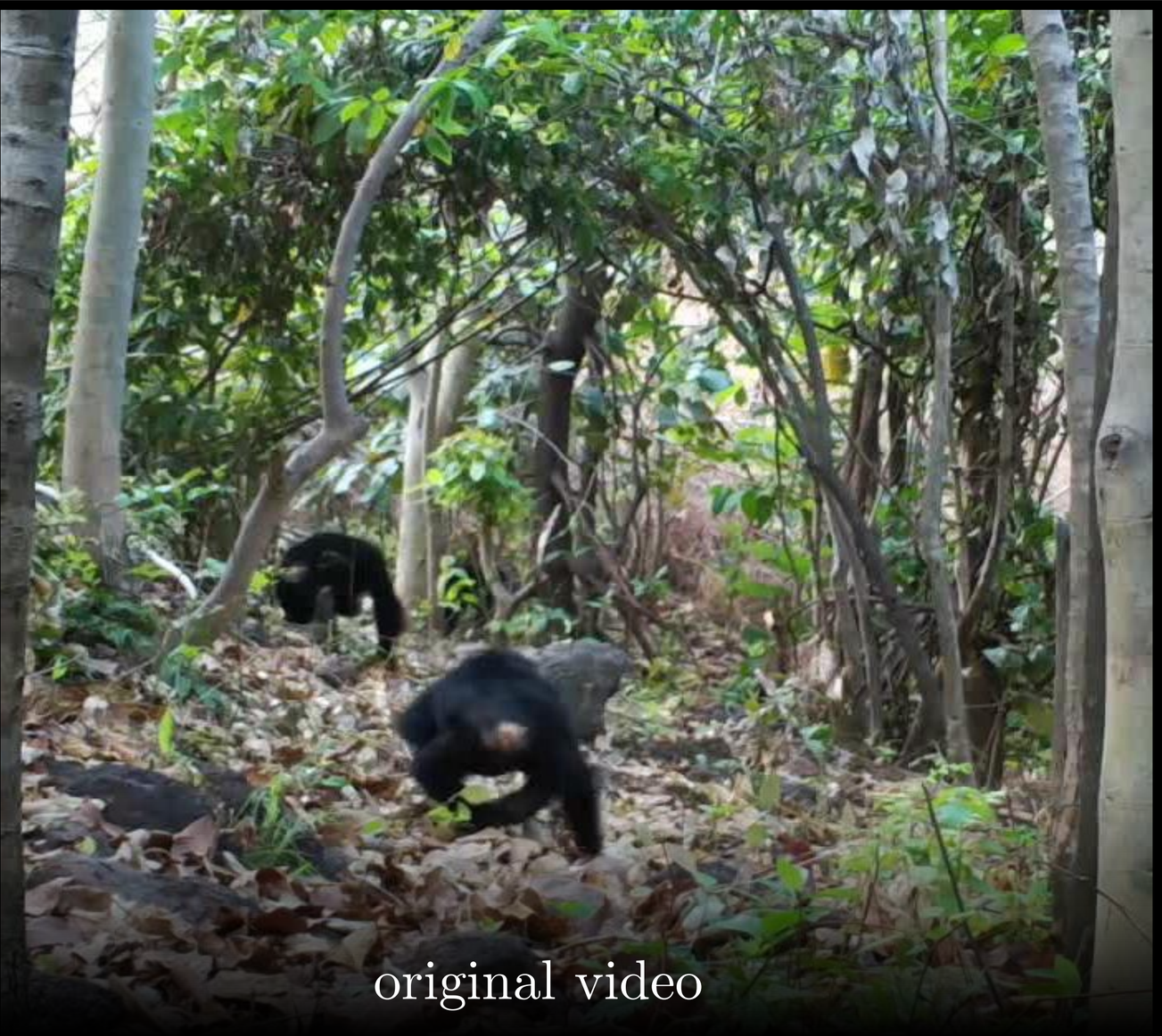
Wild Chimpanzee Behaviour Recognition

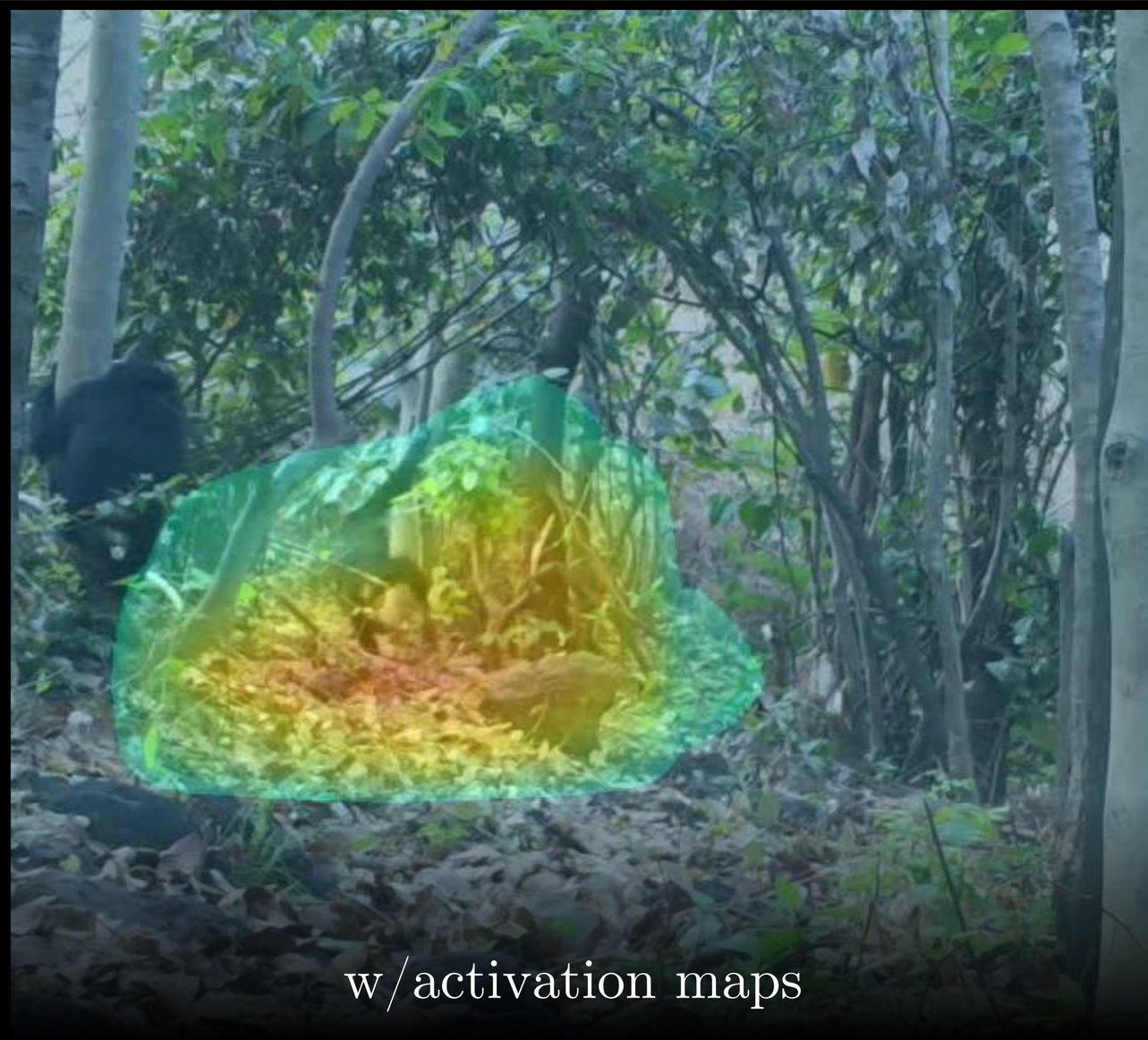


Known Backgrounds = Better Performance

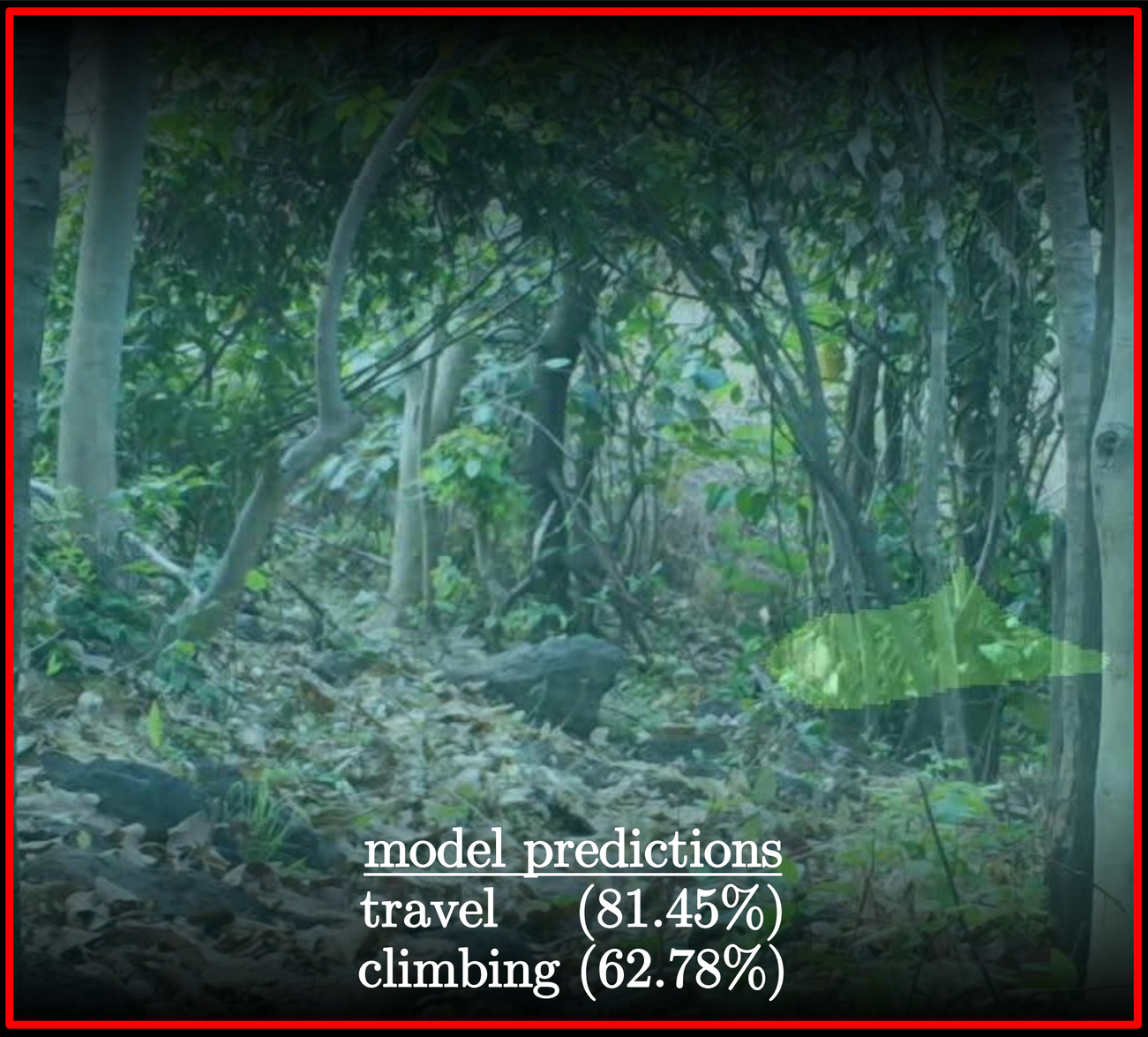
Example: A test video of travel and climbing

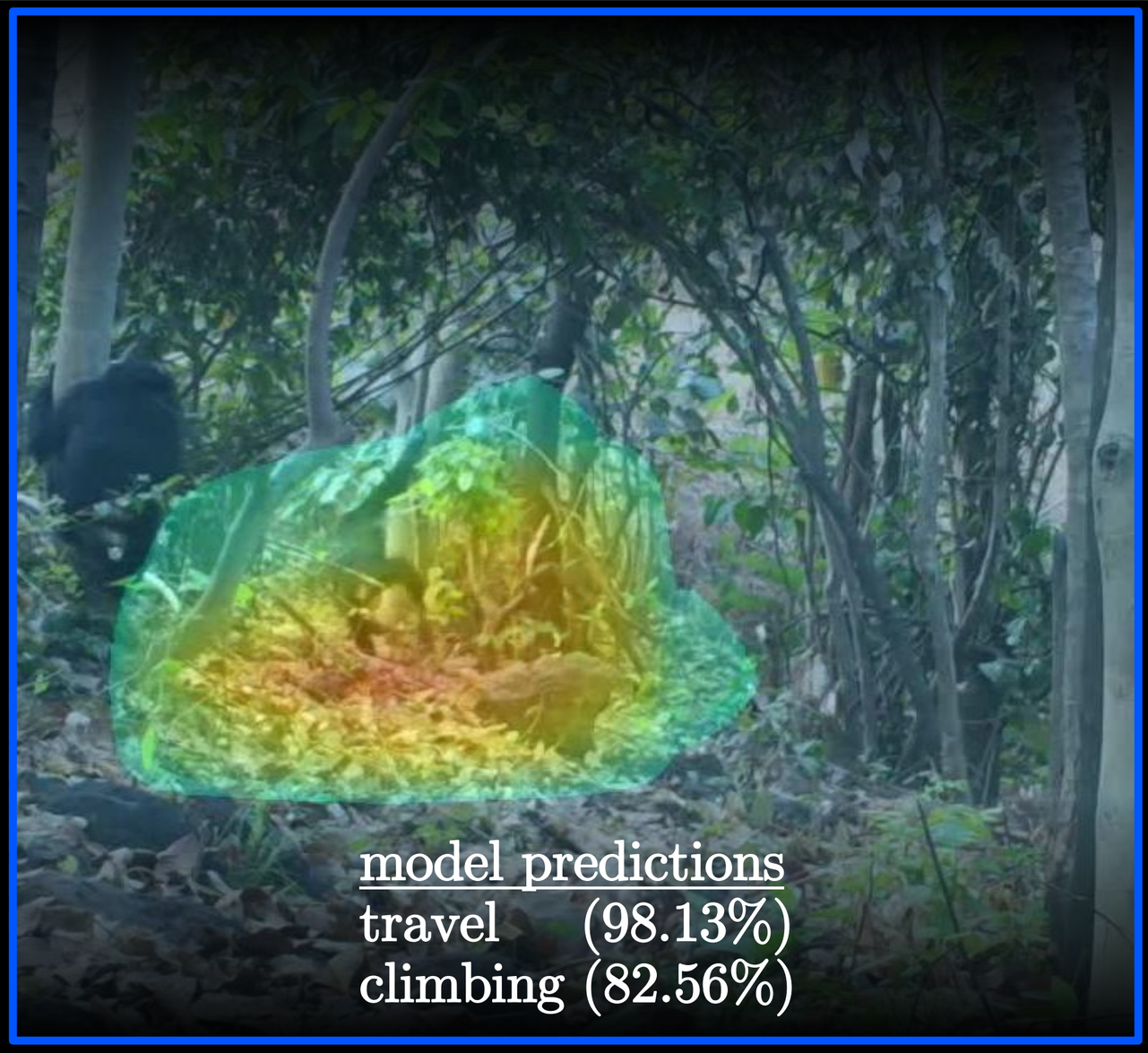
Focused on the background, not the chimp!





Backgrounds alone predict behaviours quite well...





Background and behaviour information are correlated

mountain trail location implies ‘typical’ behaviours

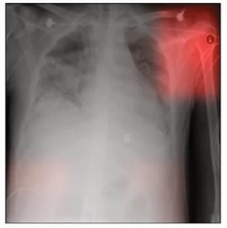
Well-studied for human action, not animal behaviour

Shortcut Learning

Recognize pneumonia

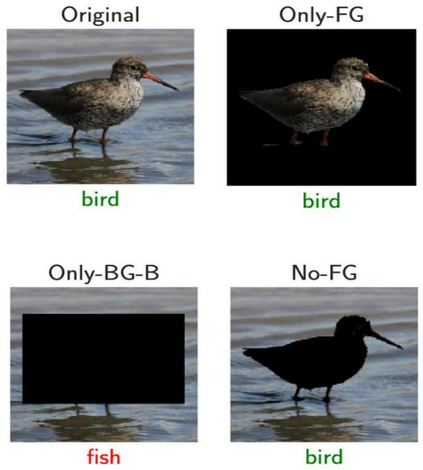
Fails on scans from new hospitals

Looks at hospital token, not lung



[Geirhos *et al.*, 2020]

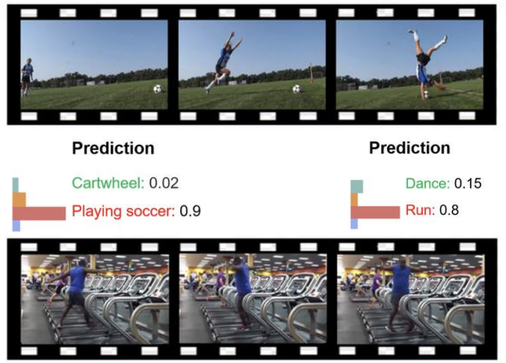
Background: Noise or Signal?



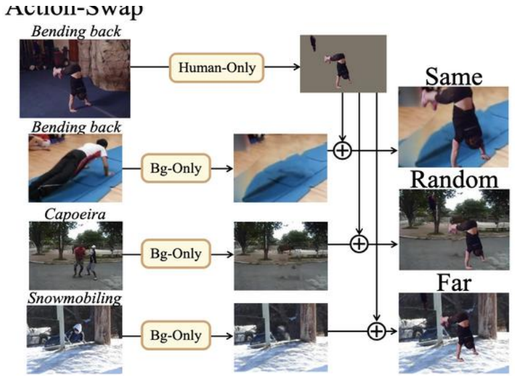
[Xiao *et al.*, 2021]

Backgrounds in human action recognition

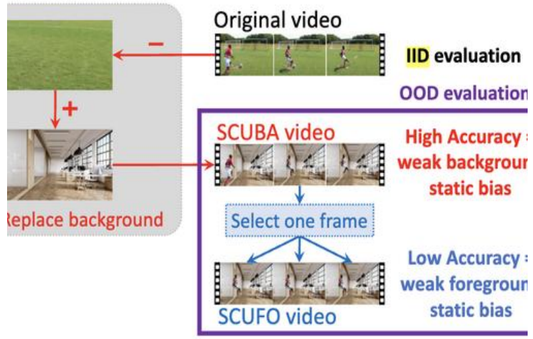
[Choi *et al.* 2019]



[Wang & Gao et al. 2021]

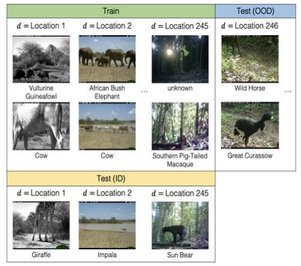


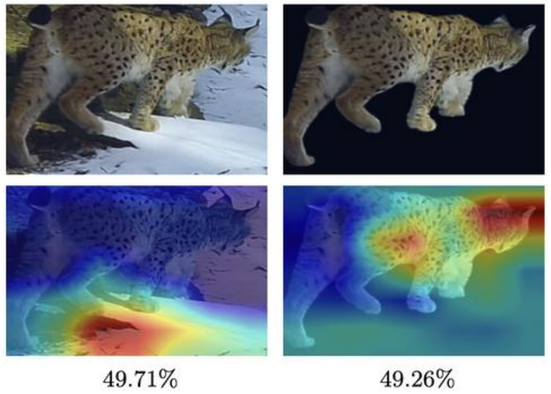
[Chung *et al.*, 2022]



[Li *et al.* 2023]

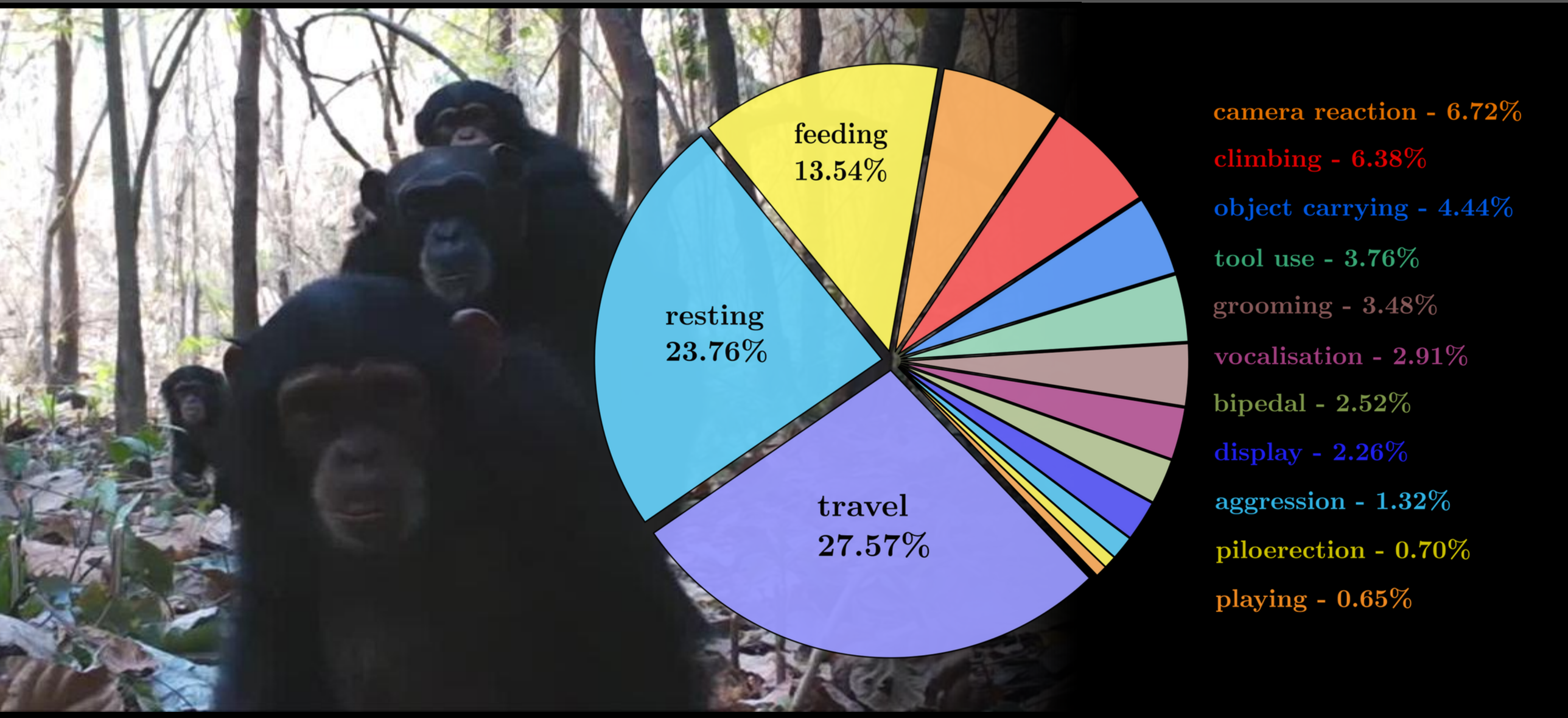
Backgrounds in animals (ID & species identification)





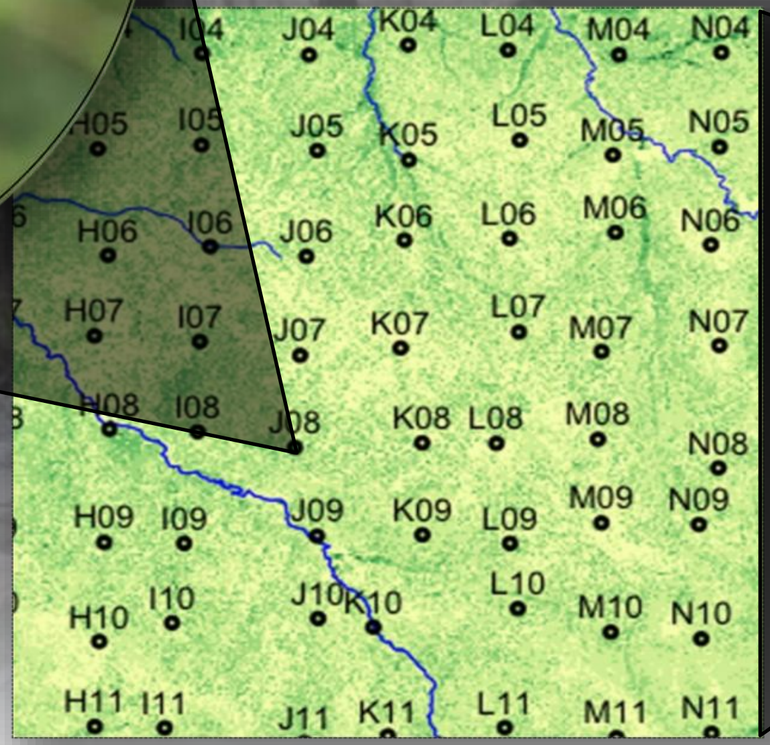
[Picek *et al.*, 2024]

PanAf-FGBG Dataset: 5,070 wild camera trap videos

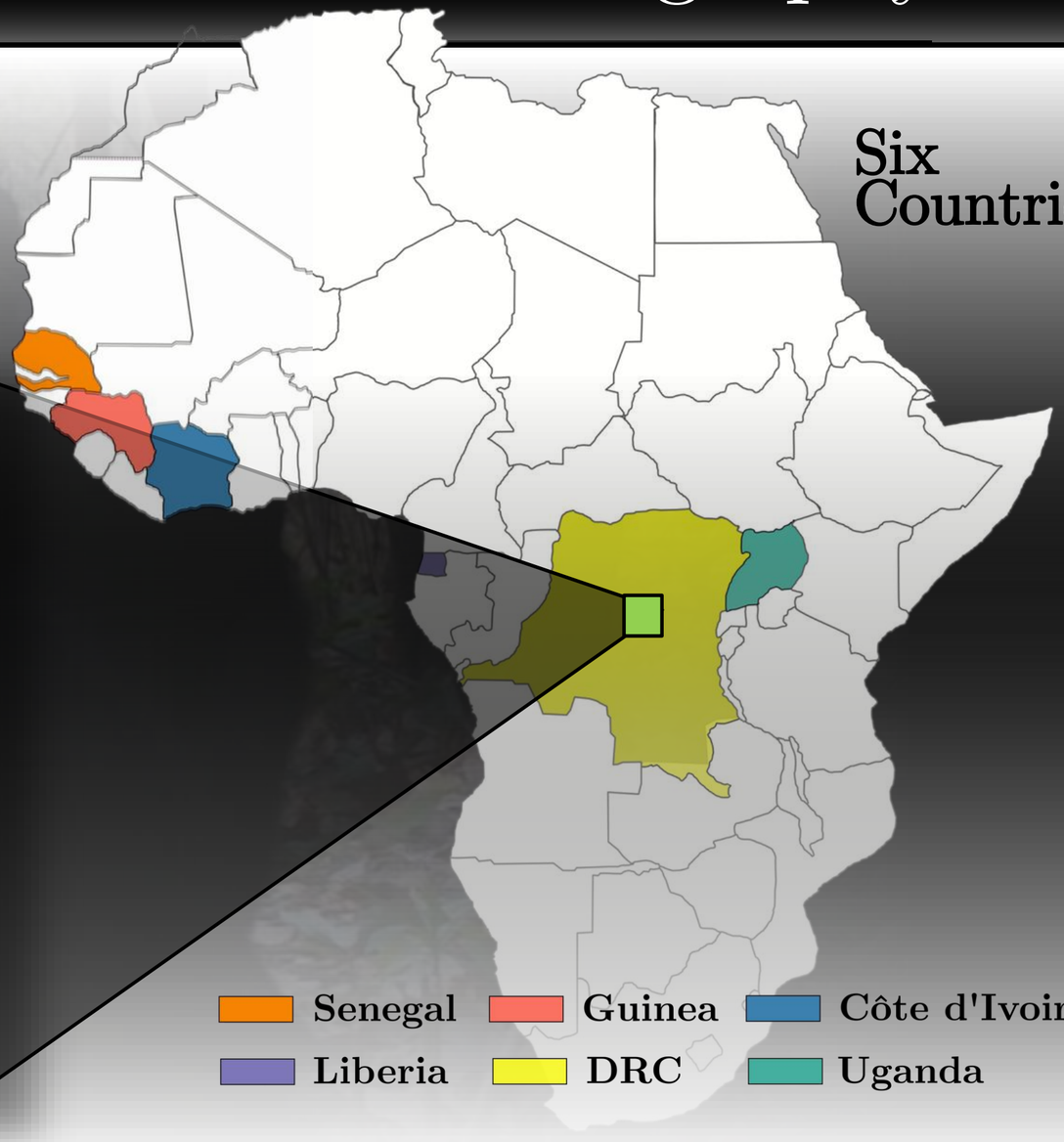


Footage Collection and Geography

Camera Trap Sensor



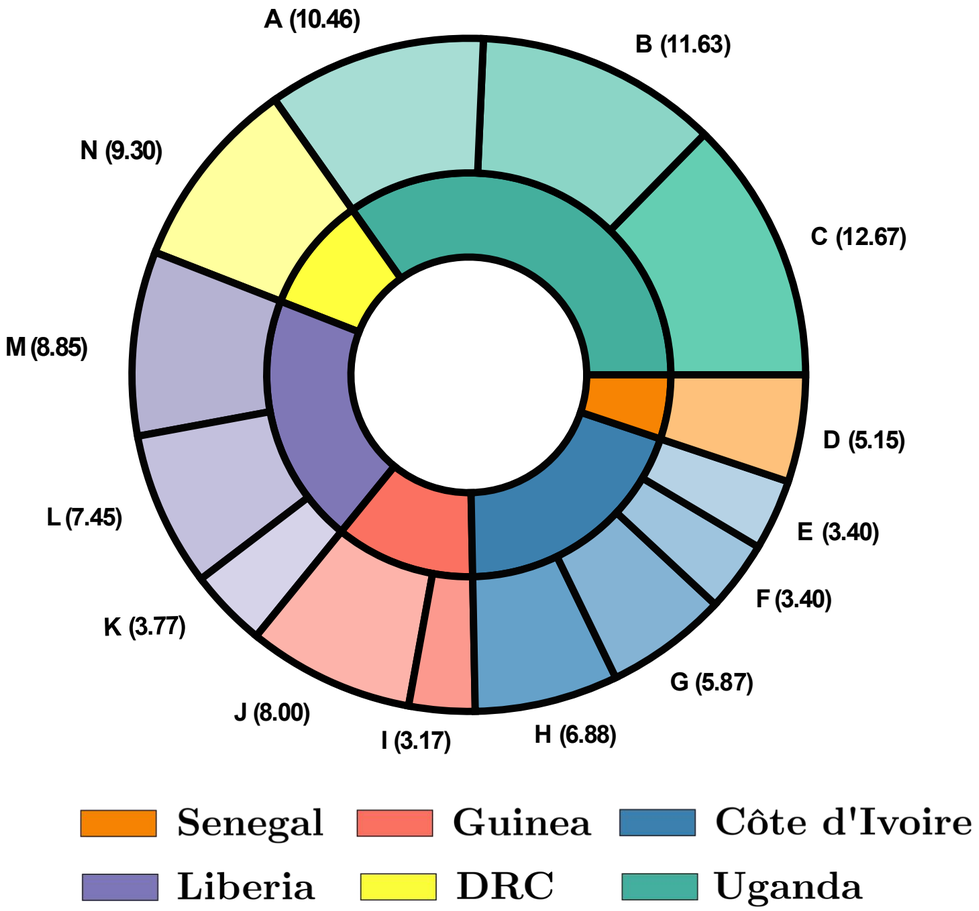
Sensor Grid



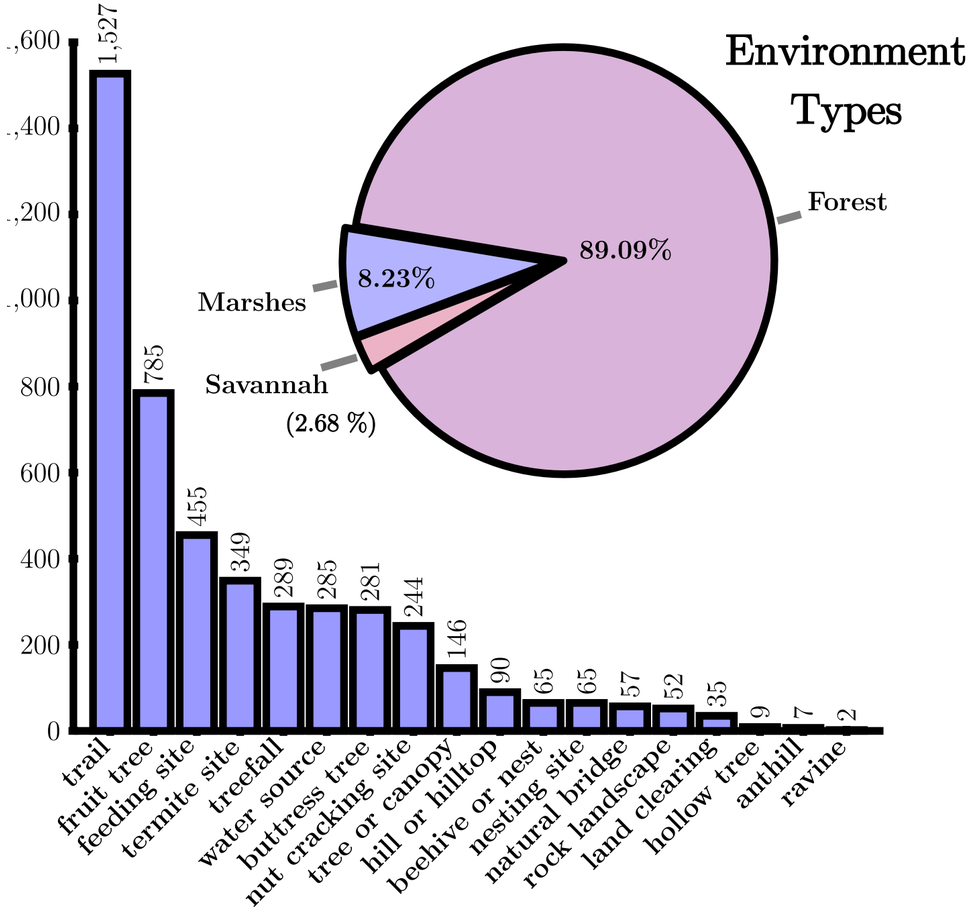
Six Countries

Ecological Diversity

14 Research Sites



18 Habitats, 389 Locations



Behaviours and Species Distribution

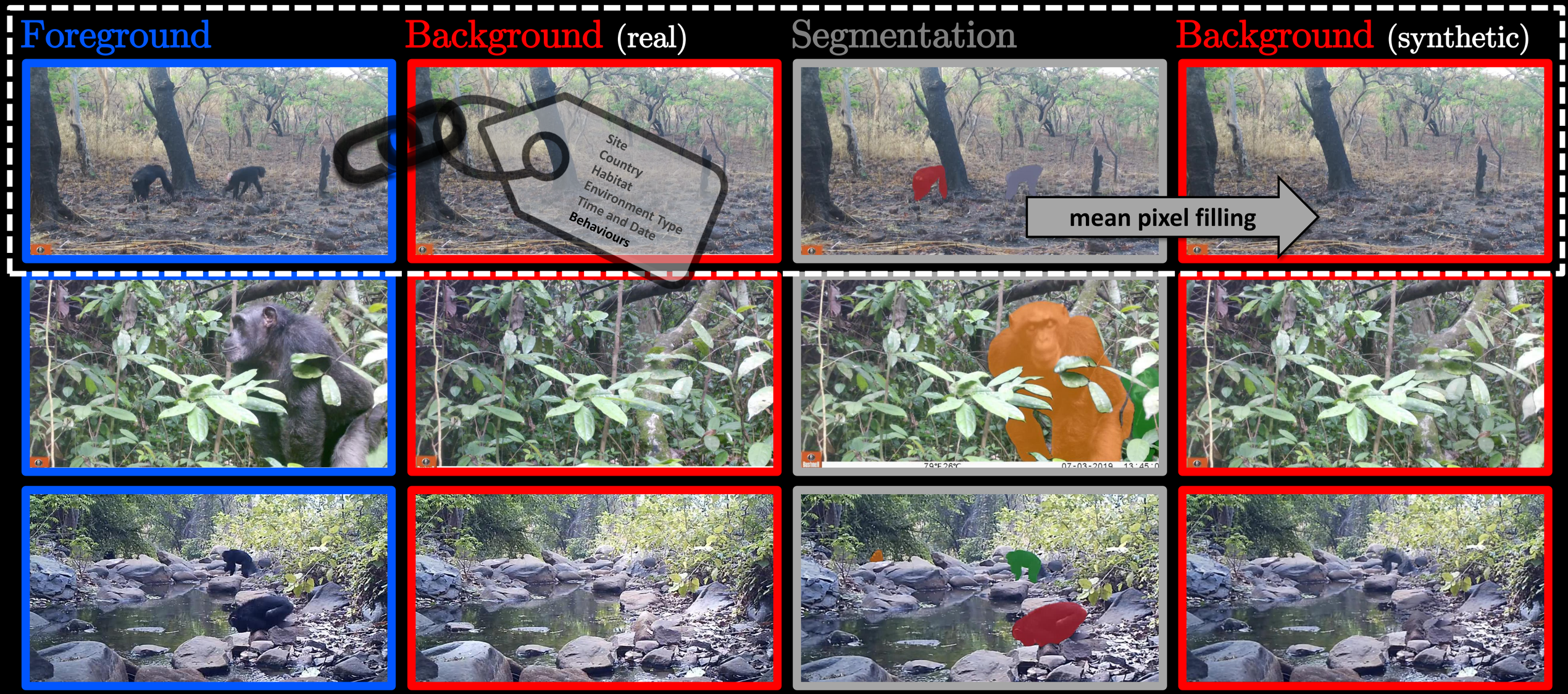
Evolutionary Importance

Ecological Importance

Each sample: foreground-background video pair with metadata

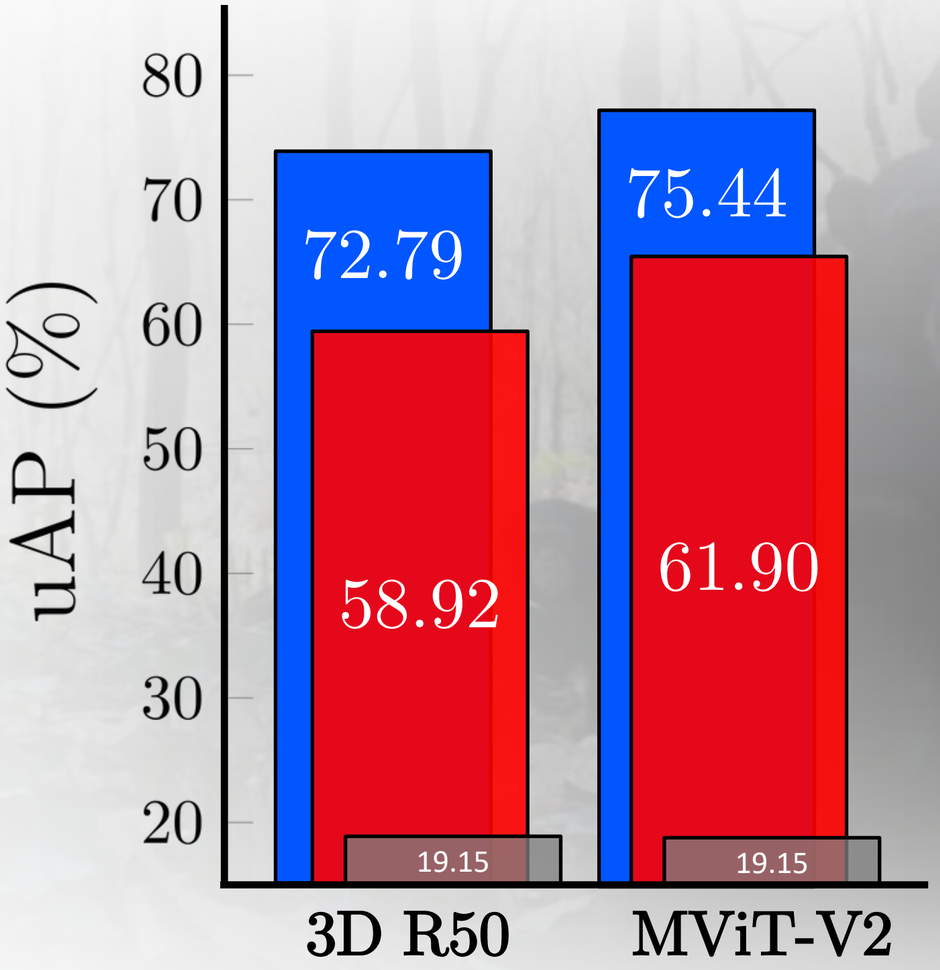
sample

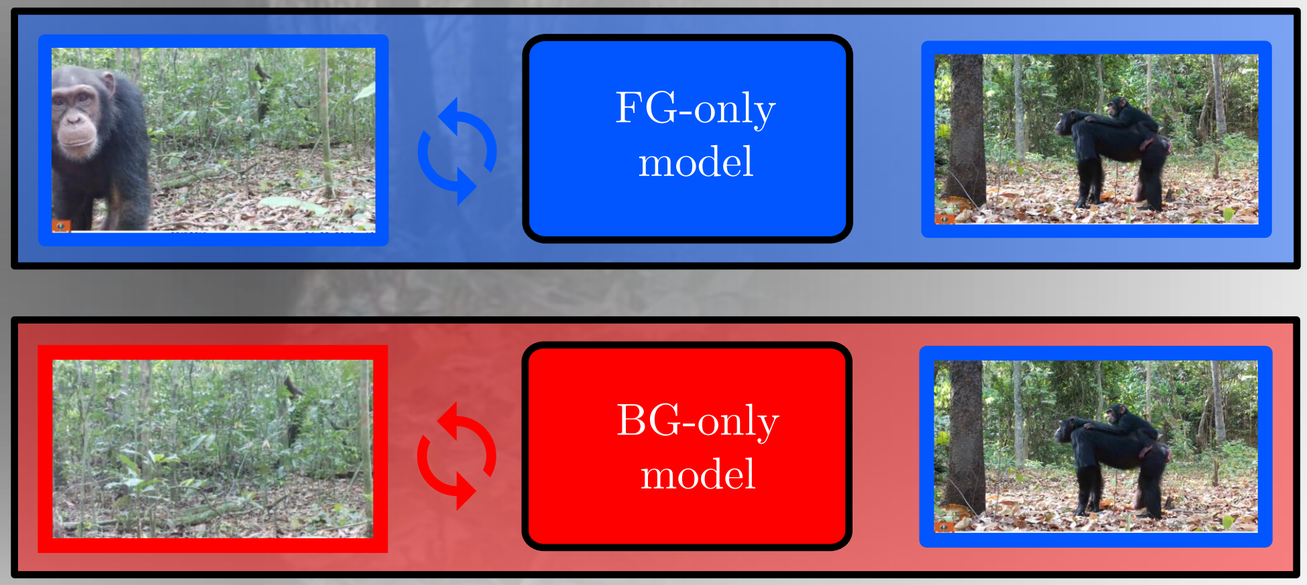
Real-world vs. synthetic BGs, provided for every sample...



Dataset Views for Testing: ID vs. OOD

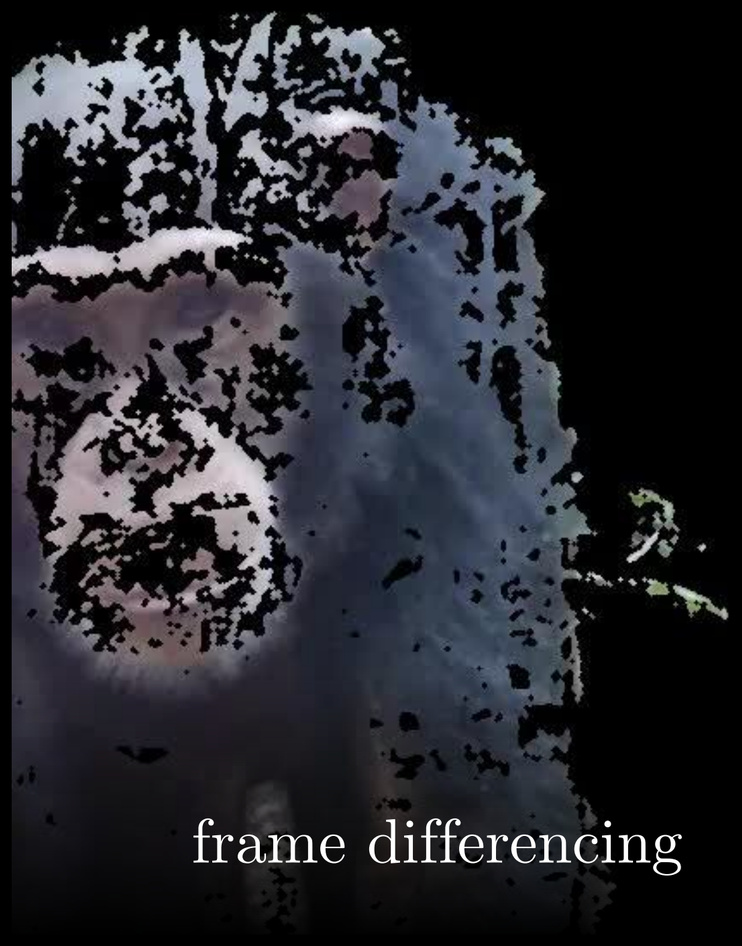
Results: Backgrounds contain rich behavioural information





Old School: Background subtraction in input space

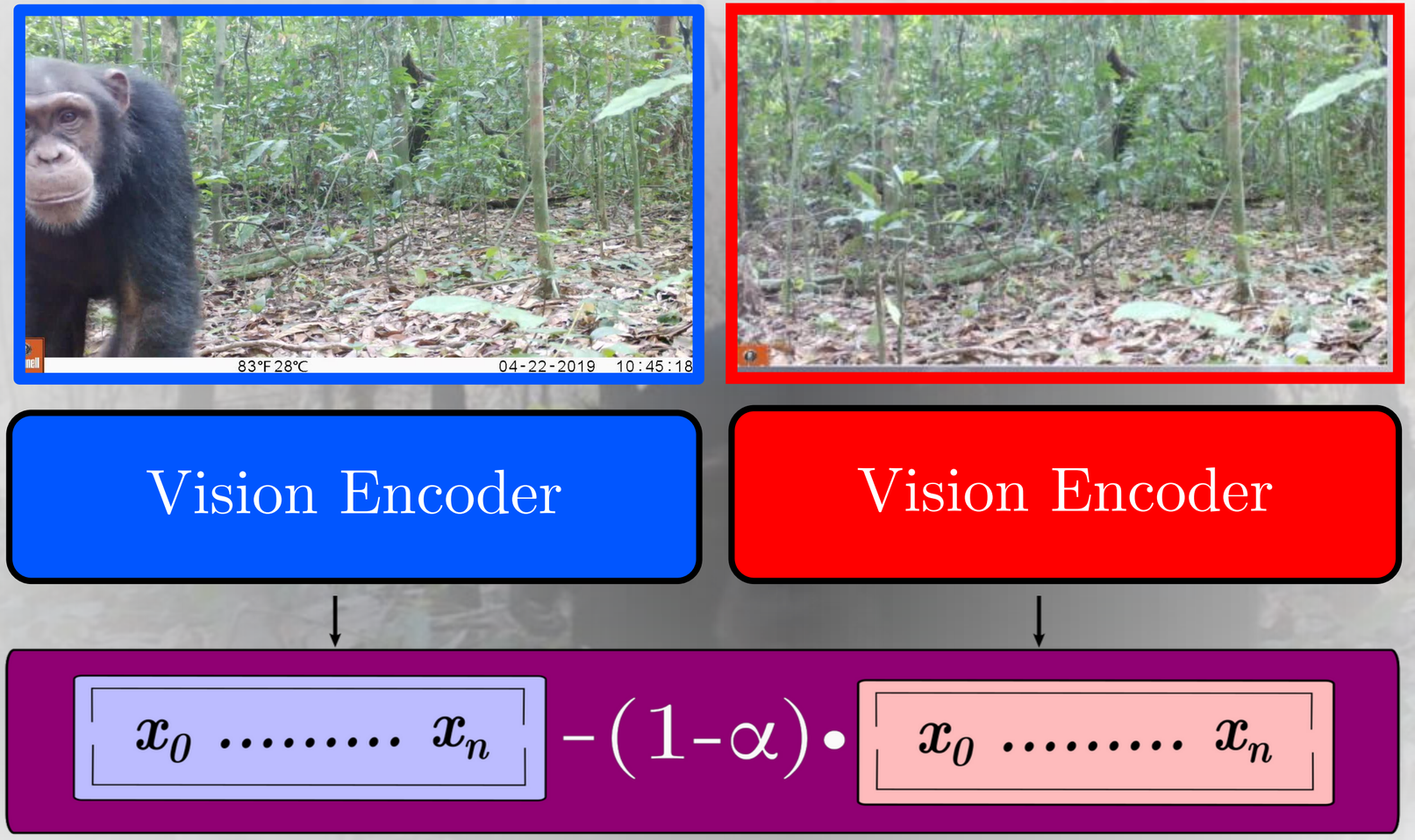
original video



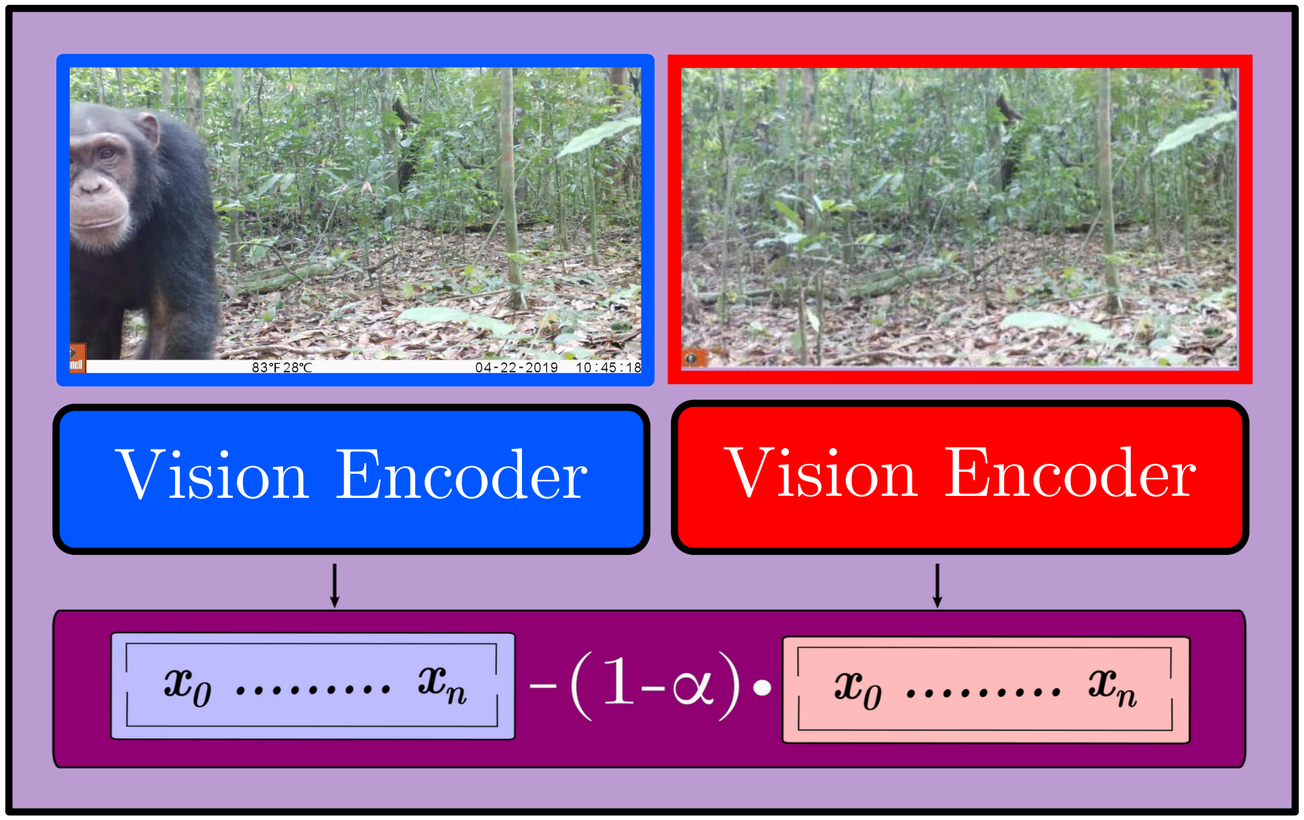
frame differencing

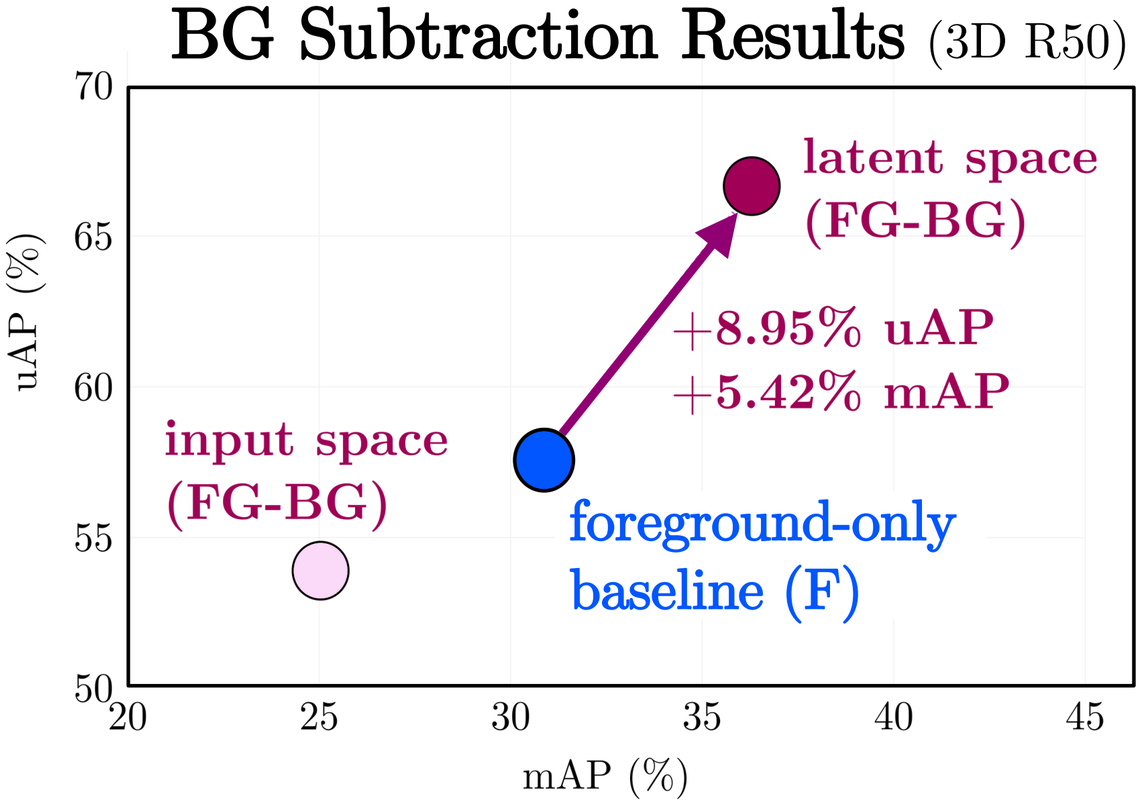
SAM2

BG Subtraction: our latent space technique

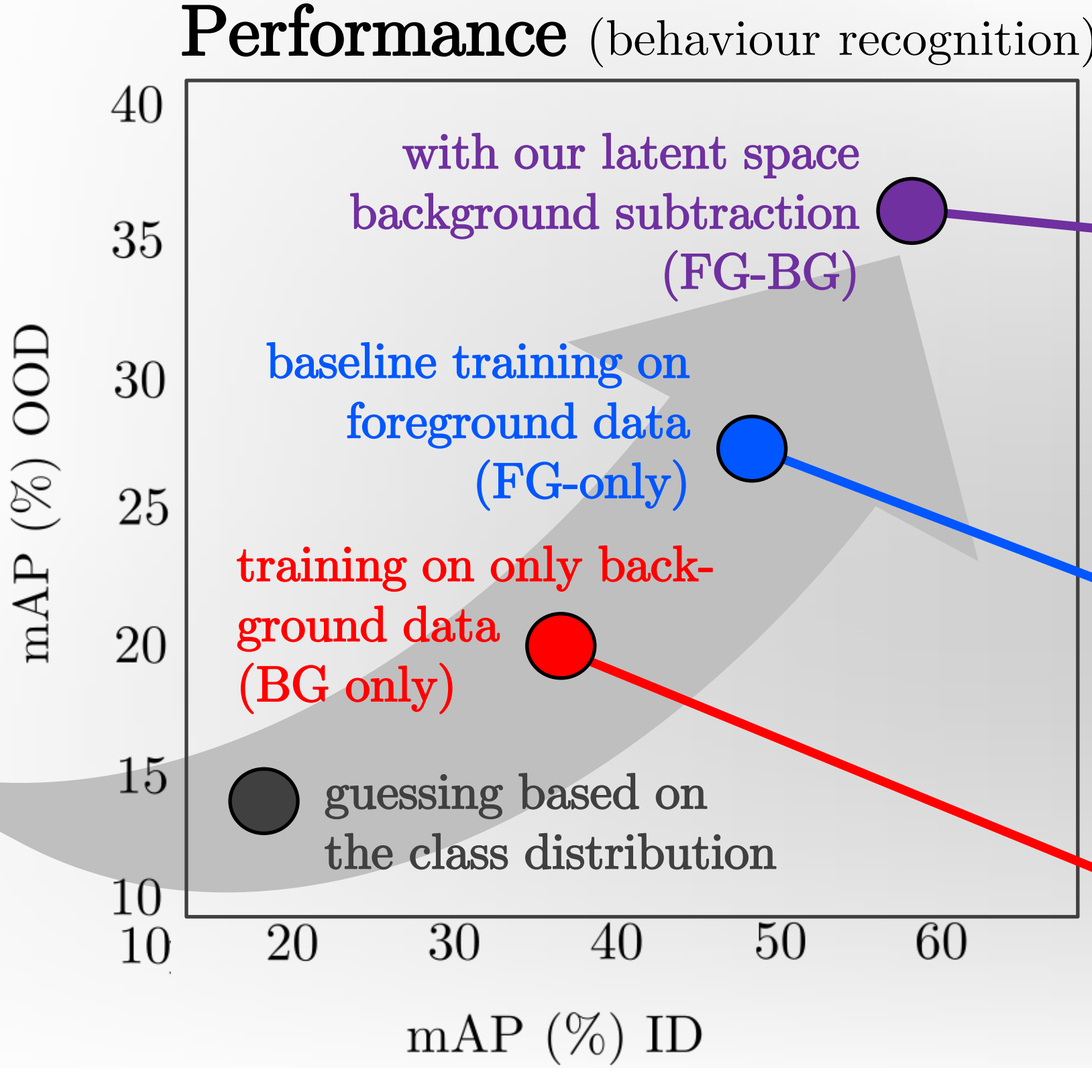


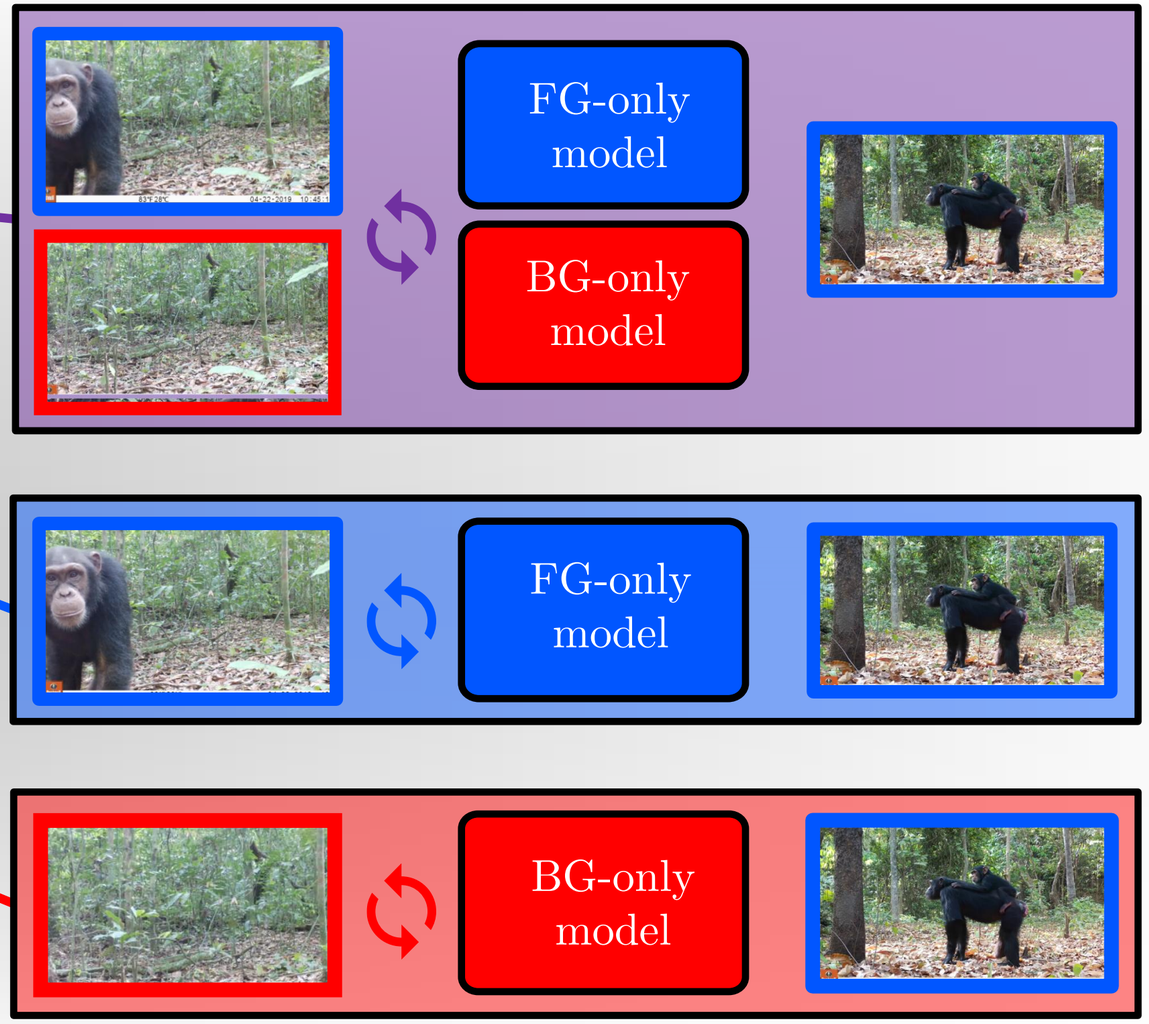
BG Subtraction: effective in latent, not input space





Experimental Summary – Use your BG information!





THANK YOU

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Our Related Research on CV for Great Apes

The PanAf-20k Dataset

Chimp-VLM

Great Ape Detection

Ethical Oversight and Data

PanAf-FGBG comprises footage gathered under ethical oversight as part of the PanAf Programme: The Cultured Chimpanzee. It contains 21 hours of camera trap footage of individual chimpanzees in tropical Africa. Its footage is collected from 389 individual camera locations across 14 national parks in 6 African countries. In total, we provide 5,070 video pairs, each 15 seconds in duration.

Acknowledgements

We thank the Pan African Programme: 'The Cultured Chimpanzee' team and its collaborators for allowing the use of their data for this paper. We thank Amelie Pettrich, Antonio Buzharevski, Eva Martinez Garcia, Ivana Kirchmair, Sebastian Schütte, Linda Gerlach and Fabina Haas. We also thank management and support staff across all sites; specifically Yasmin Moebius, Geoffrey Muhanguzi, Martha Robbins, Henk Eshuis, Sergio Marrocoli and John Hart. Thanks to the team at https://www.chimpandsee.org particularly Briana Harder, Anja Landsmann, Laura K. Lynn, Zuzana Macháčková, Heidi Pfund, Kristeena Sigler and Jane Widness. The work that allowed for the collection of the dataset was funded by the Max Planck Society, Max Planck Society Innovation Fund, and Heinz L. Krekeler. In this respect we would like to thank: Ministre des Eaux et Forêts, Ministère de l'Enseignement supérieur et de la Recherche scientifique in Côte d'Ivoire; Institut Congolais pour la Conservation de la Nature, Ministère de la Recherche Scientifique in Democratic Republic of Congo; Forestry Development Authority in Liberia; Direction Des Eaux Et Forêts, Chasses Et Conservation Des Sols in Senegal; Makerere University Biological Field Station, Uganda National Council for Science and Technology, Uganda Wildlife Authority, National Forestry Authority in Uganda; National Institute for Forestry Development and Protected Area Management, Ministry of Agriculture and Forests, Ministry of Fisheries and Environment in Equatorial Guinea. This work was supported by the UKRI CDT in Interactive AI (grant EP/S022937/1). This work was in part supported by the US National Science Foundation Awards No. 2118240 "HDR Institute: Imageomics: A New Frontier of Biological Information Powered by Knowledge-Guided Machine Learning" and Award No. 2330423 and Natural Sciences and Engineering Research Council of Canada under Award No. 585136 for the "AI and Biodiversity Change (ABC) Global Center".