



Shelter Tents Mapping by Machine Learning and Satellite Imagery

CERN Openlab Summer Student Lightning Talk

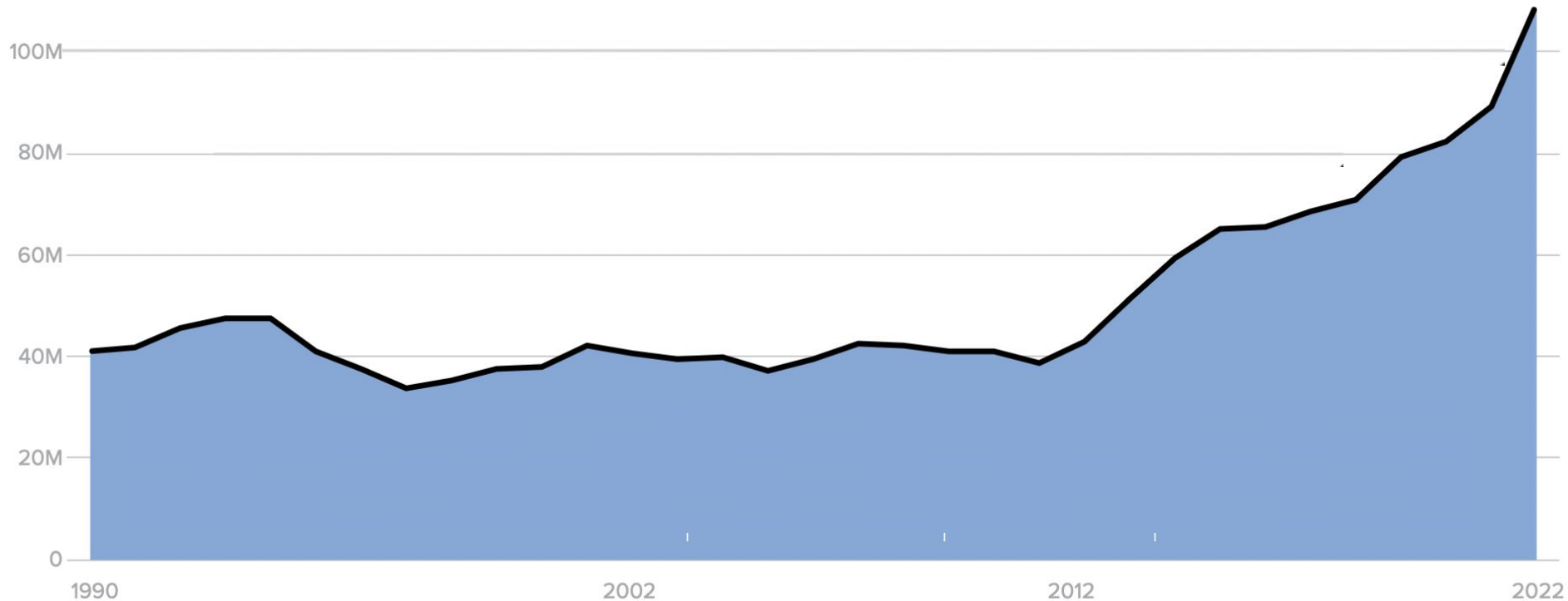
Author: Hsiu-Chi Cheng

Supervisor: Edoardo Nemni, Sofia Vallecorsa

Institute: United Nations Satellite Centre (UNOSAT)

Background

Global Trends Report 2022, United Nations High Commissioner for Refugees

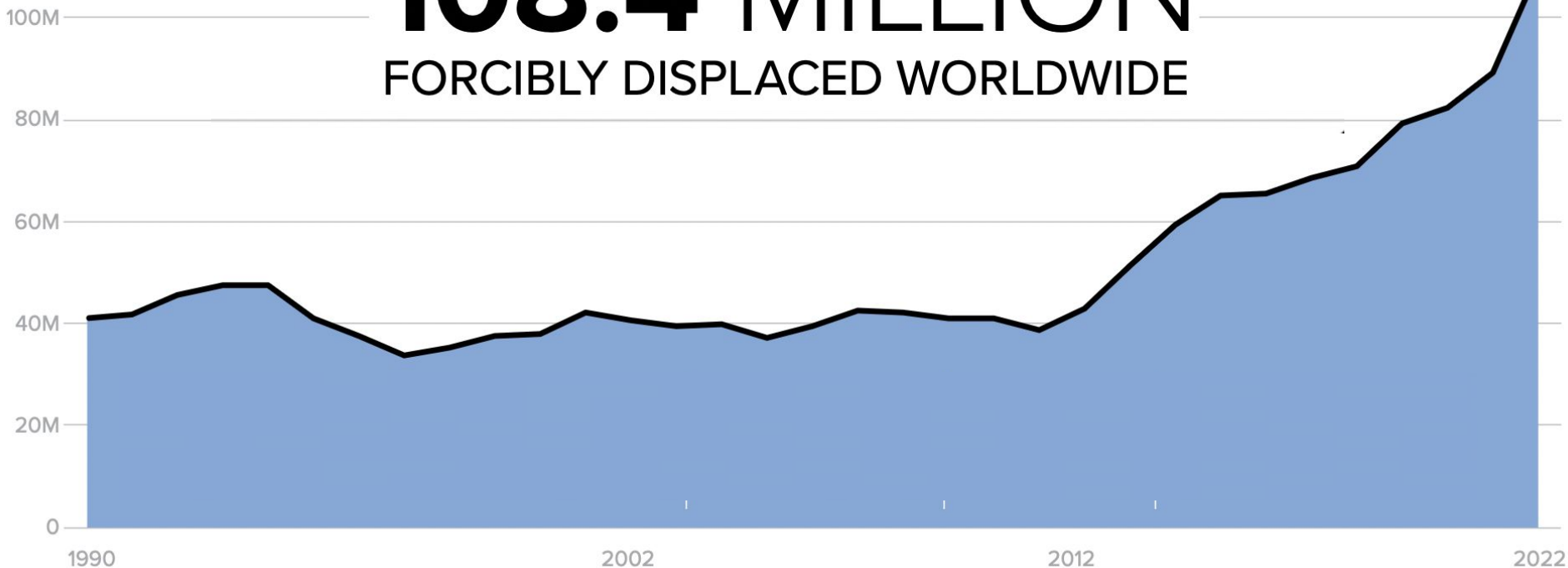


<https://www.unhcr.org/global-trends-report-2022>

Background

Global Trends Report 2022, United Nations High Commissioner for Refugees

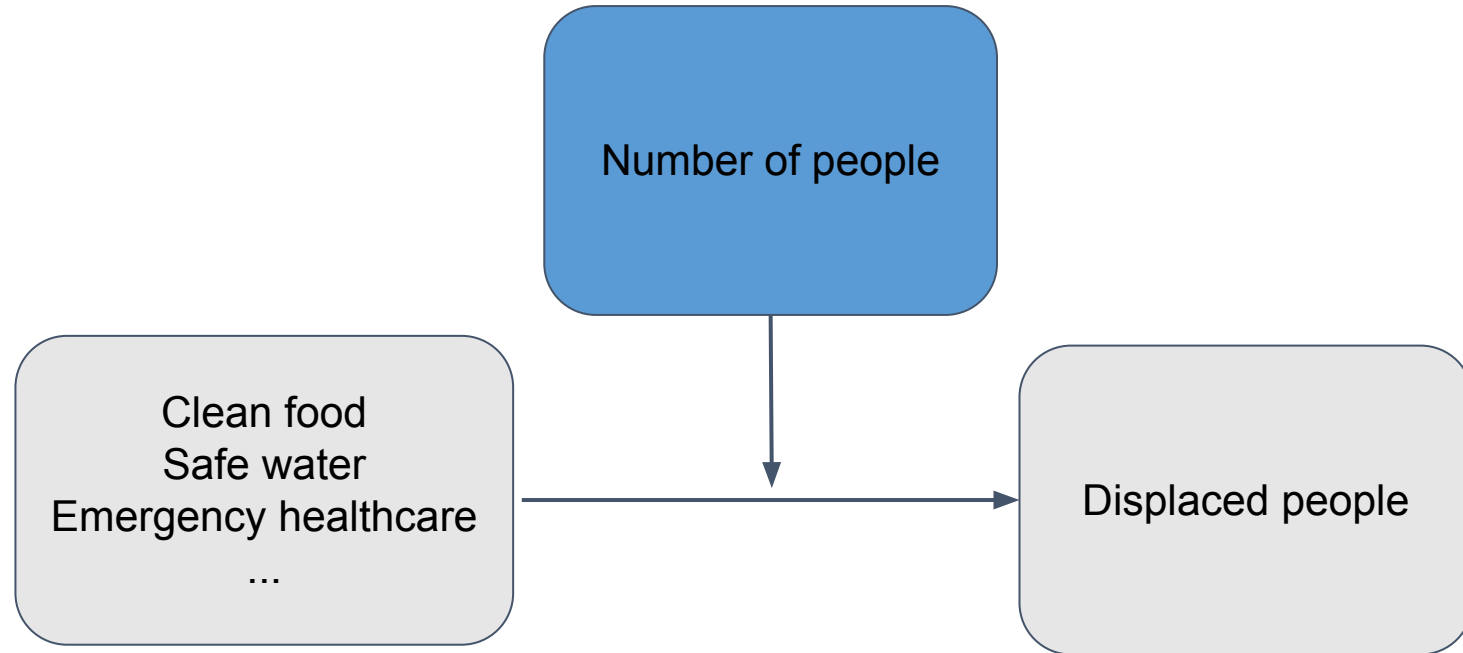
108.4 MILLION
FORCIBLY DISPLACED WORLDWIDE



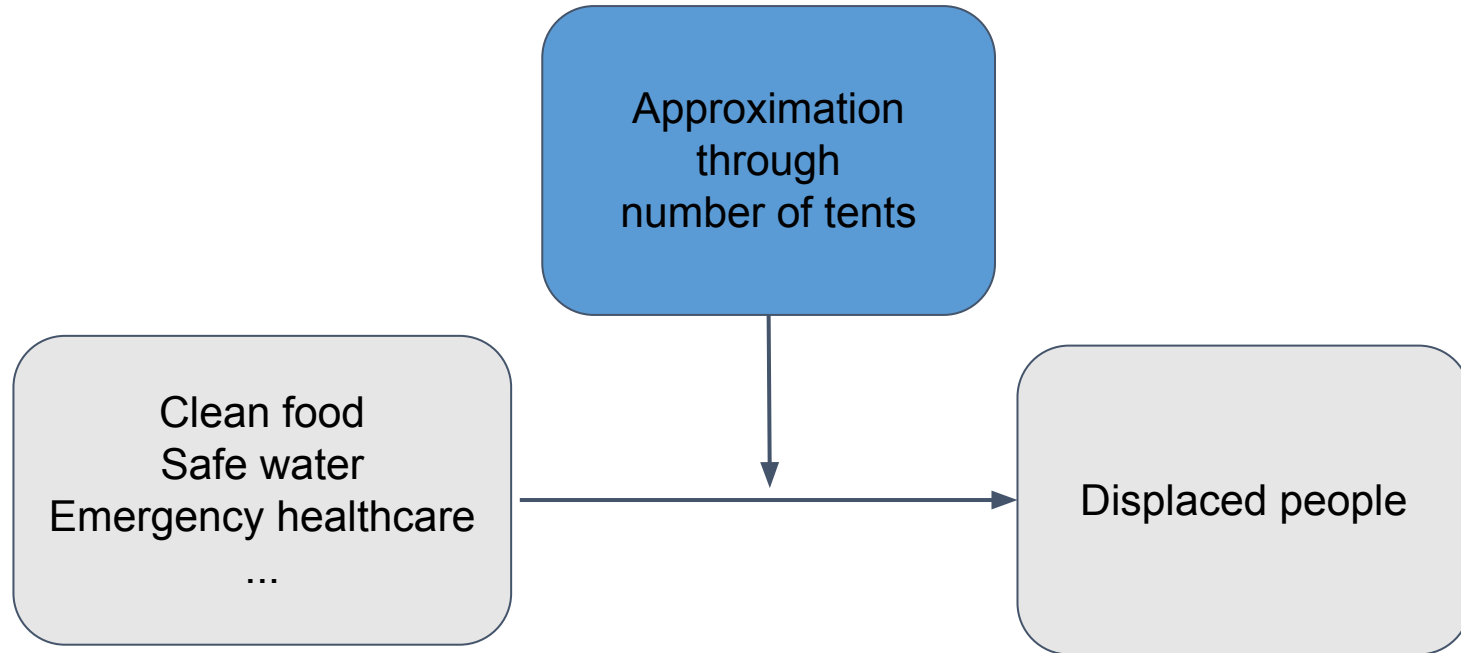
Background



Background



Background



Background

Satellite imagery



Background

Manual labeling



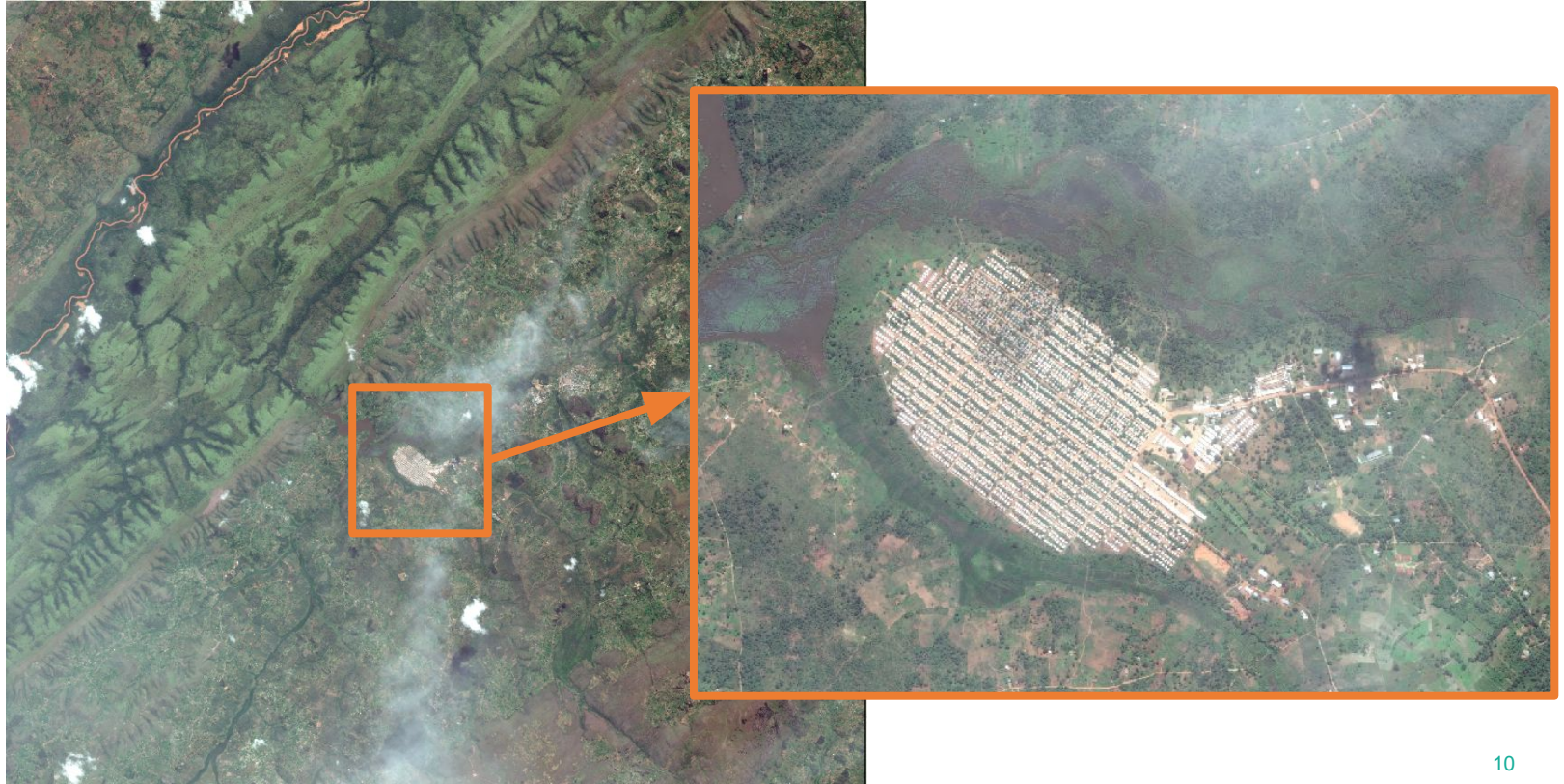
Background

Satellite imagery



Background

Satellite imagery



Background

Satellite imagery



Background

Satellite imagery



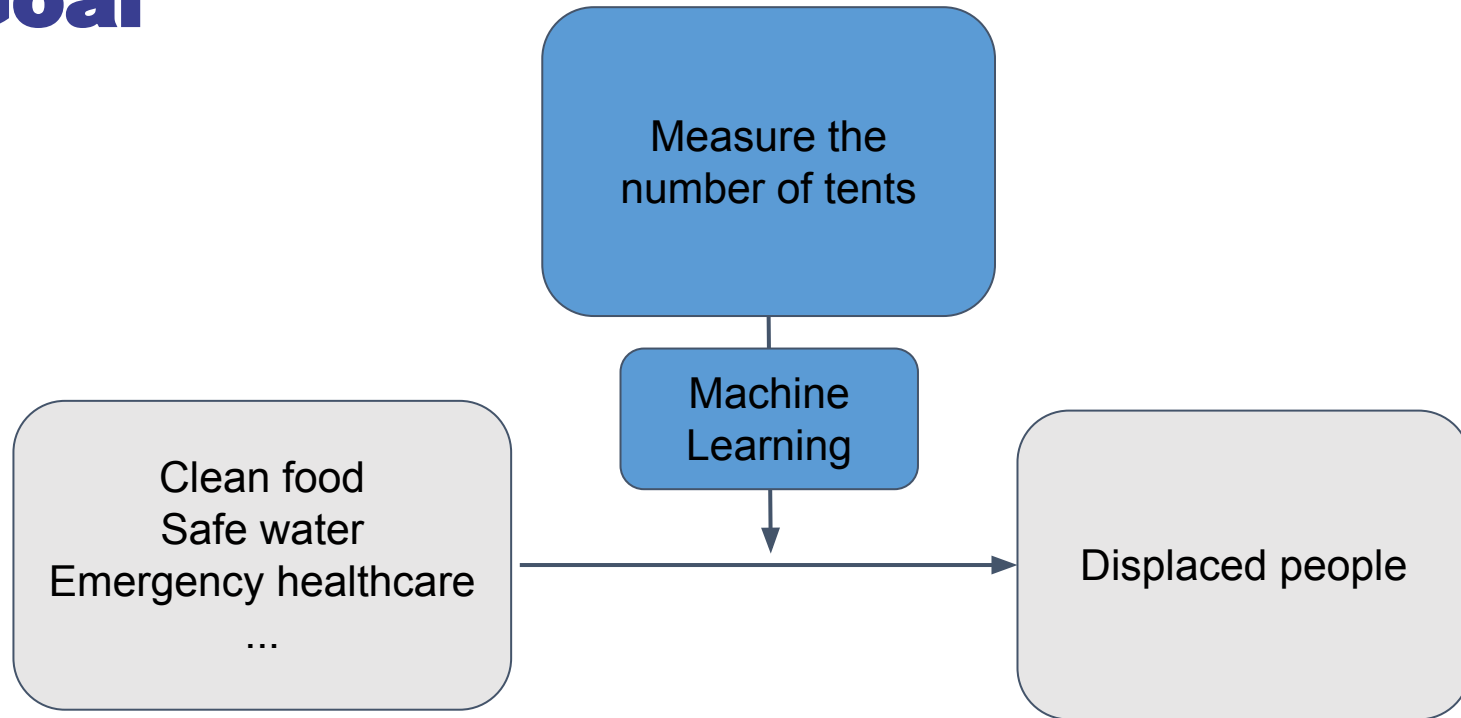
Background

Satellite imagery

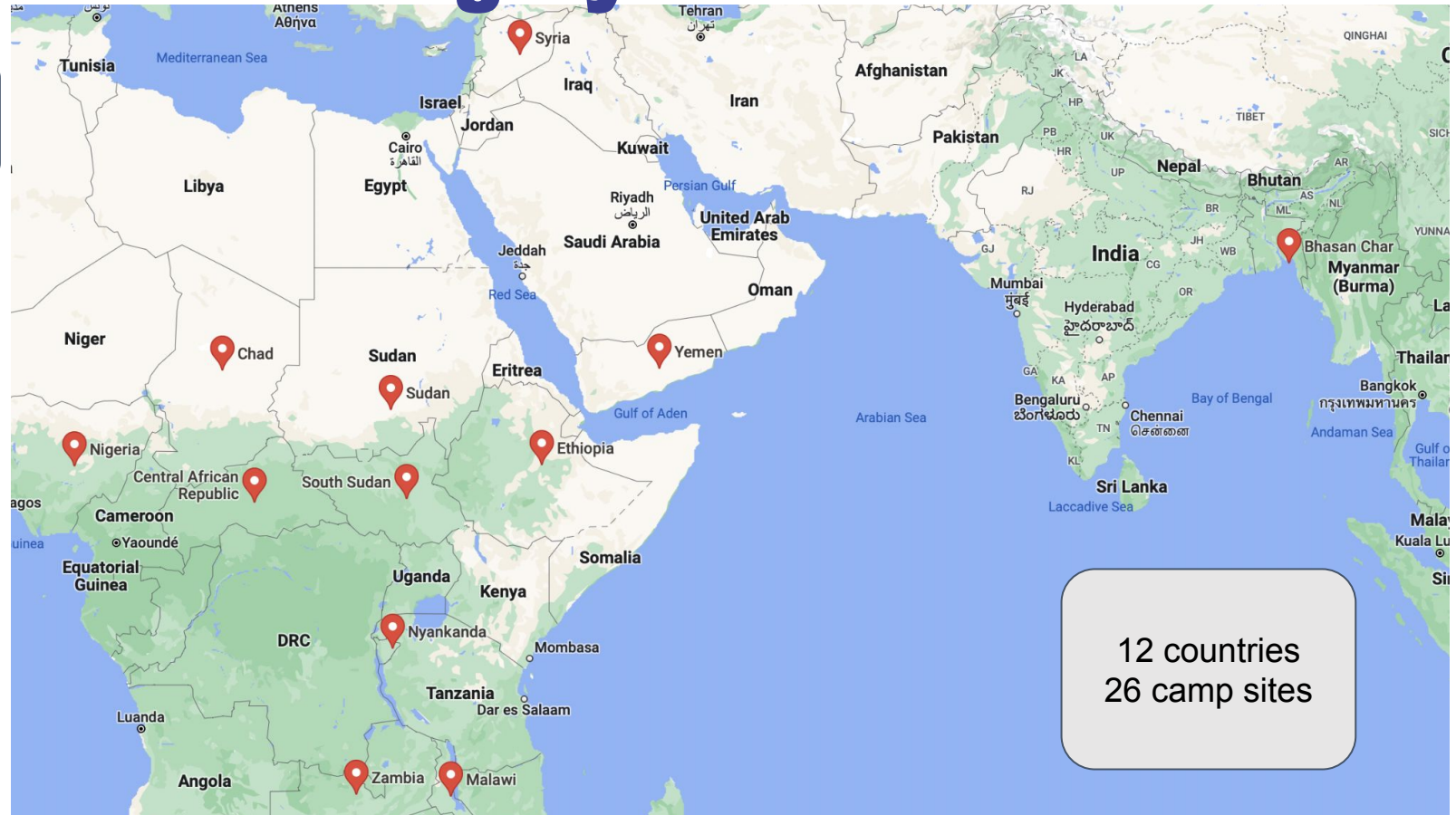


Labor- and time-consuming!

Goal



Satellite Imagery



Raw
imagery

Label Area of Interest (AOI)

Raw
imagery

Satellite
expert



Label shelter tents

Raw
imagery

Satellite
expert

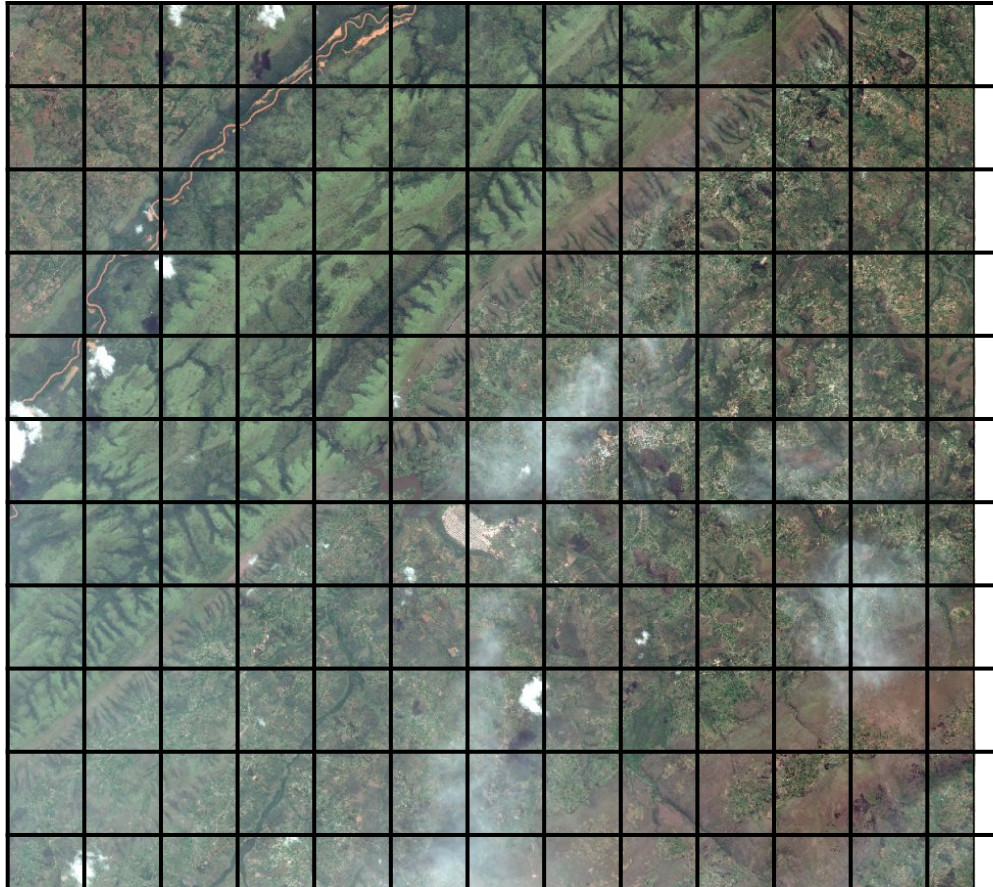


Tile imagery

Raw
imagery

Satellite
expert

AI
expert



Tile imagery

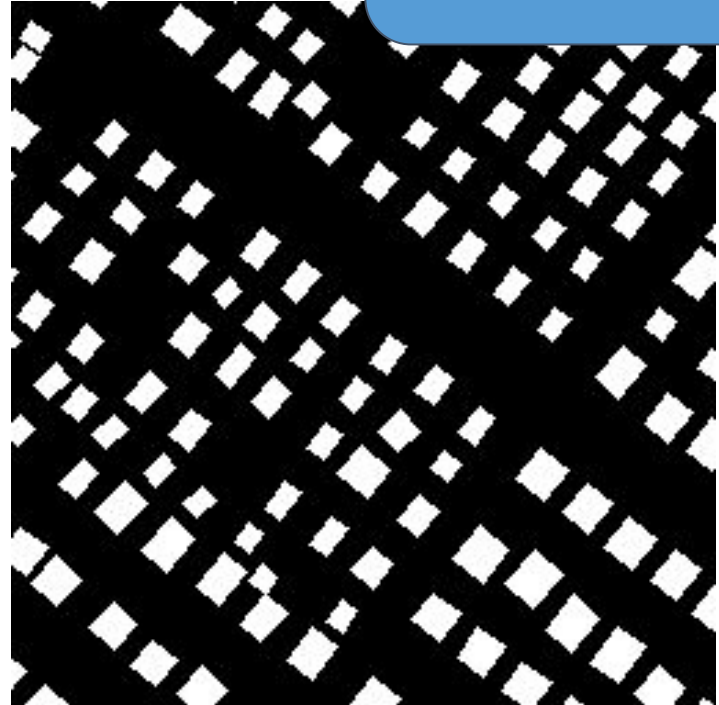
Raw
imagery



Raw
imaery

AI
expert

1. in AOI
2. having at least one tent
|-- yes: save it



Tile imagery

Raw
imagery



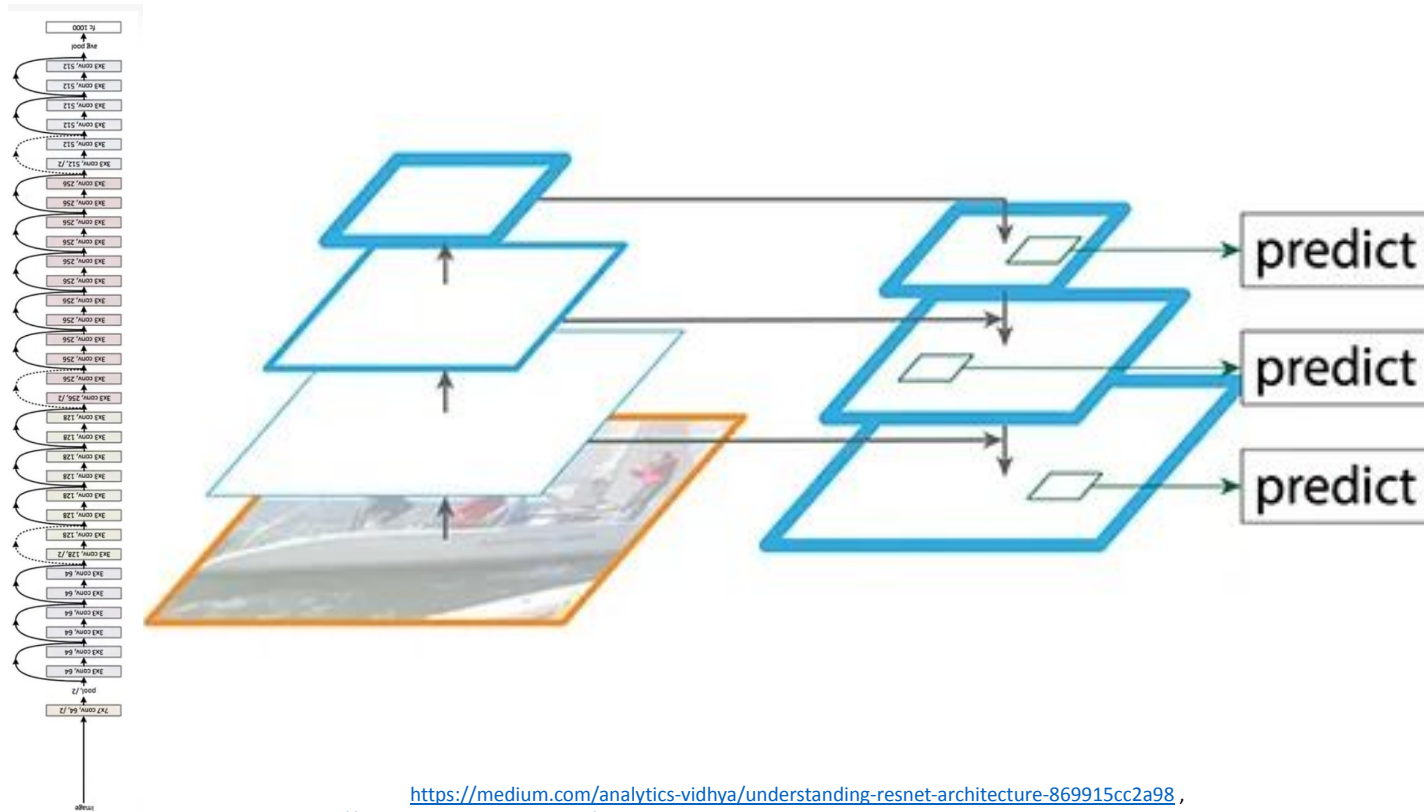
Raw
imaery

AI
expert

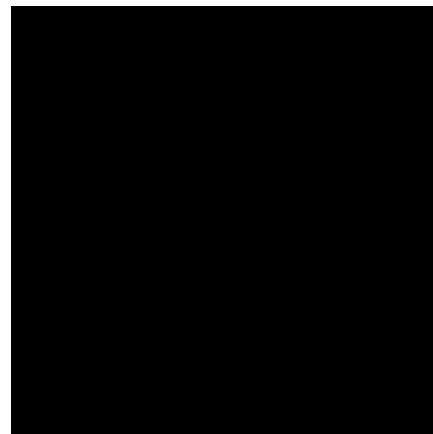
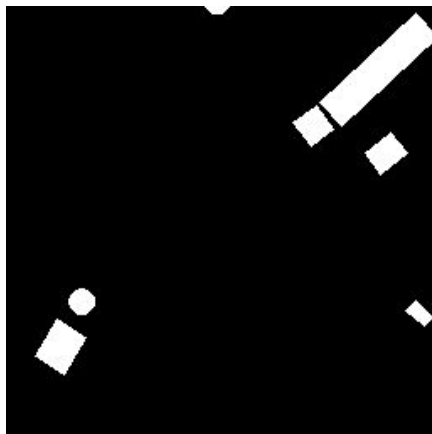
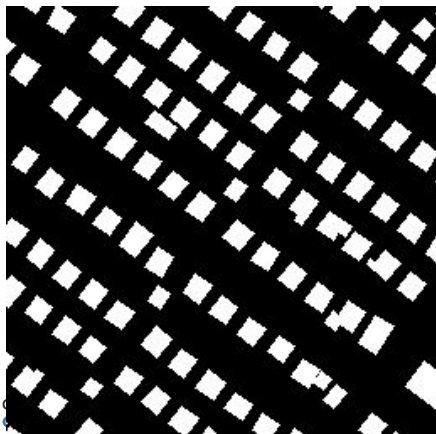
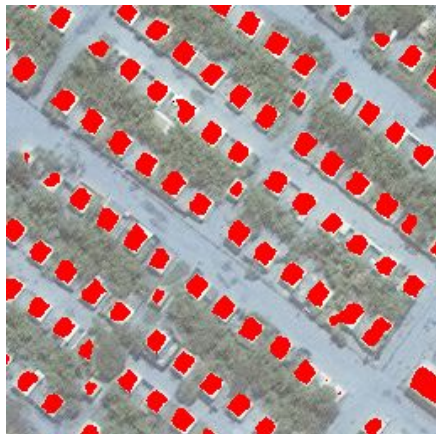
1. in AOI
2. having at least one tent
 - |-- yes: save it
 - |-- no: 10% probability of keeping it

Model

Resnet34 + Feature Pyramid Network

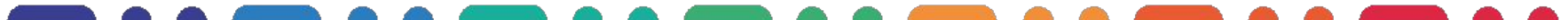
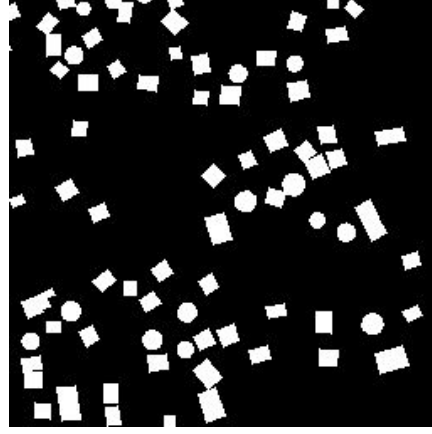
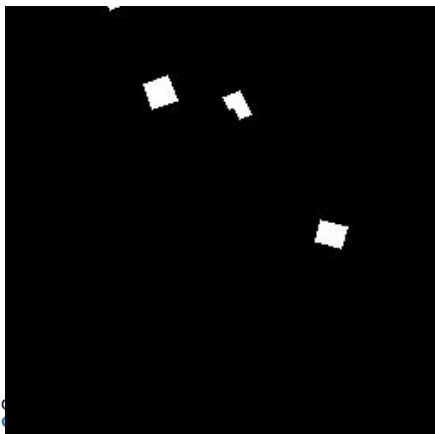
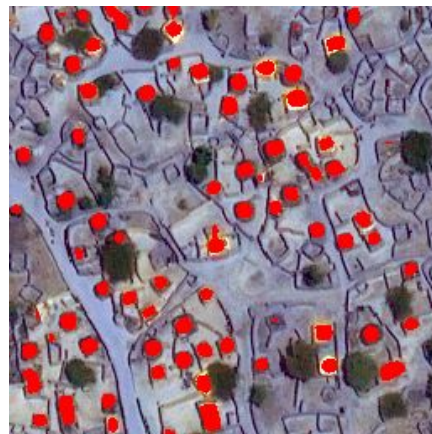
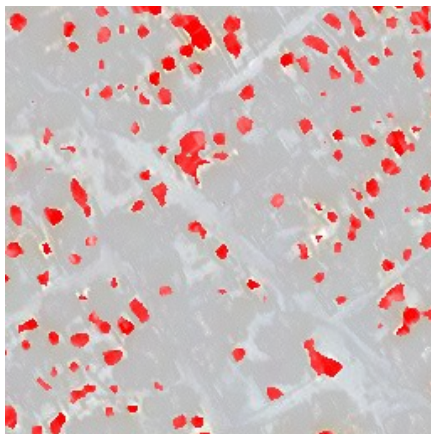


Results



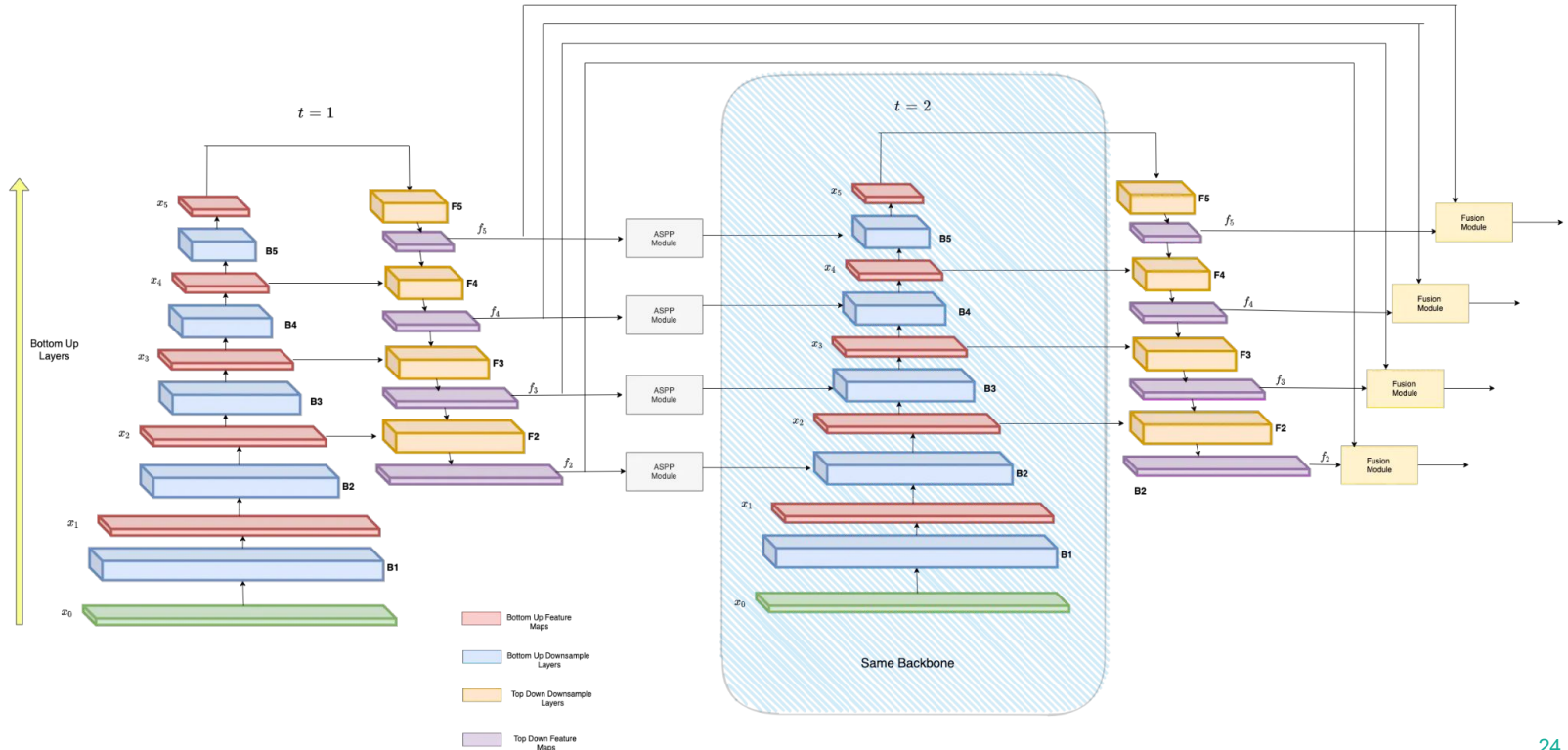
Results

Testing IOU: 62.5%



Ongoing training

DetectoRS - think and look twice





Thanks for listening

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