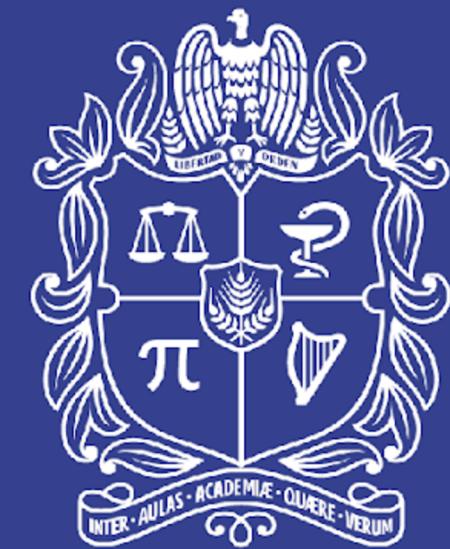


#SOMOSUNAL



UNIVERSIDAD
NACIONAL
DE COLOMBIA

PROYECTO CULTURAL, CIENTÍFICO Y COLECTIVO DE NACIÓN

Deep learning based model for building identification using aerial imagery and LiDAR data.



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PhD: Agricultural sciences

Ronneberger et al., 2015
Zhu et al., 2017; Li et al.,
2020

- Models such as U-Net and DeepLabV3
- key advantage in heterogeneous urban contexts

Deep Learning in semantic building segmentation

Limitations of Deep Learning models in the presence of vegetation

Audebert et al., 2018
Kampffmeyer et al. (2016)

- Visual interference
- Spectral ambiguity

Lin et al., 2019; Qi et al., 2017
Chen et al. (2021)

- Light Detection and Ranging
- DSM, DTM, CHM

CONTEXT



LiDAR data in segmentation models

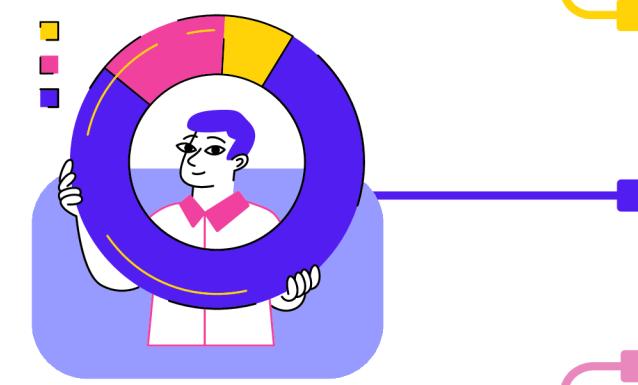
Important

Automated building identification



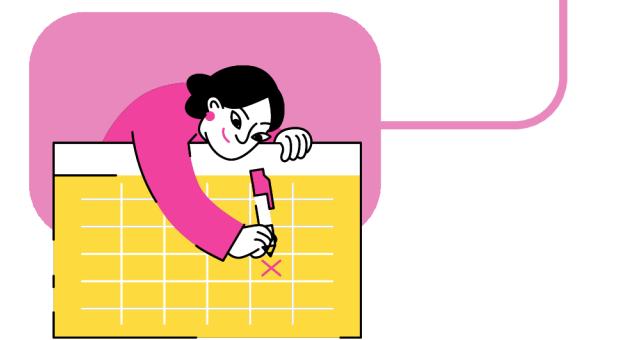
What happen?

Effectiveness decreases significantly in scenarios where there is visual interference

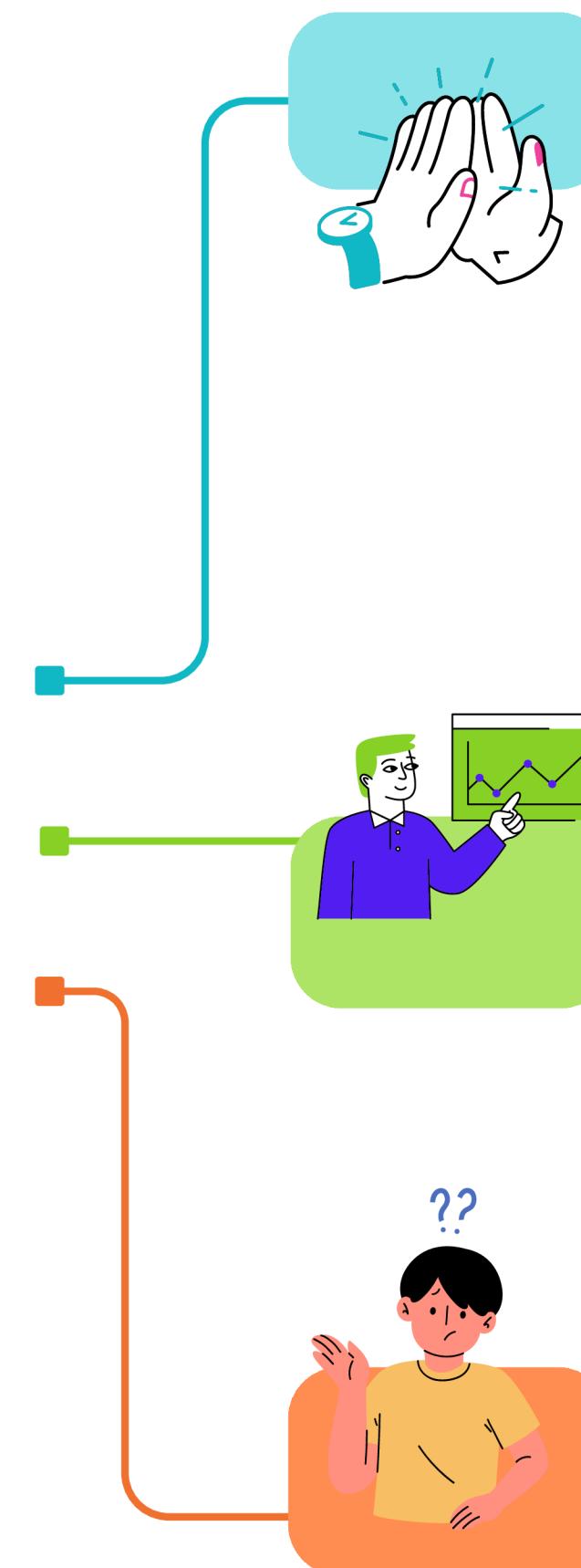
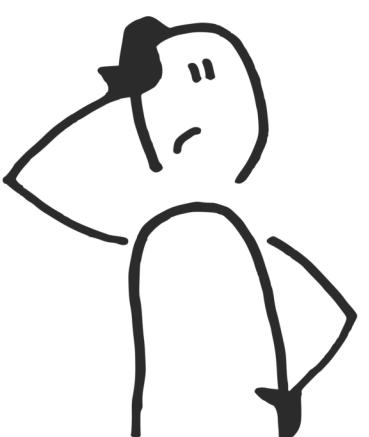


Result

Partial obstruction of canopies, spectral ambiguity and loss of clear edges, affecting capture accuracy



PROBLEM and JUSTIFICATION



What to do?

#SOMOSUNAL

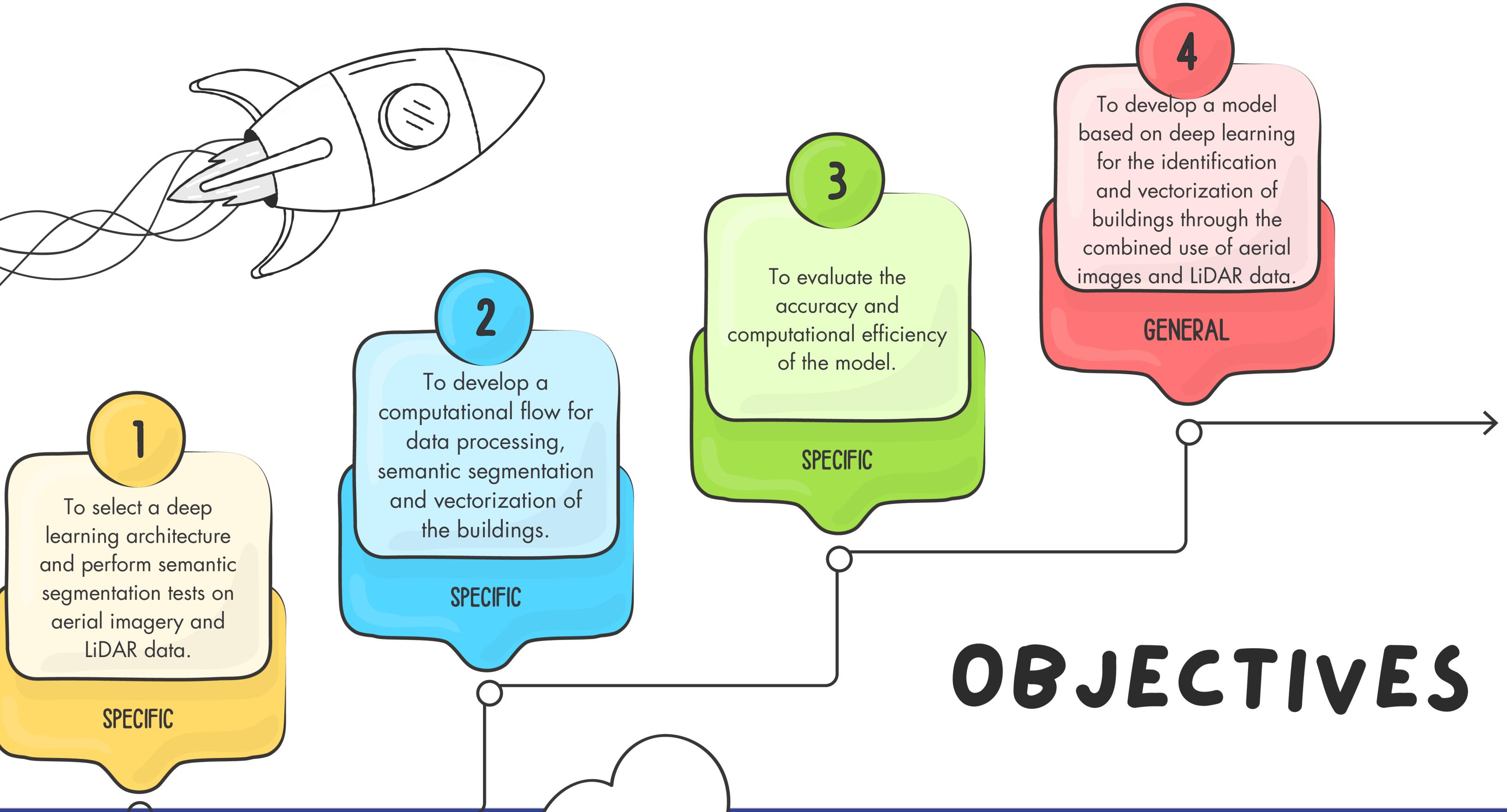
The integration of altimetric data from LiDAR sensors represents a significant opportunity to enrich model input.

Proposal

Proposes the training of a model based on multi-input Deep Learning.

Research question

How does the combination of LiDAR data and aerial photographs increase the accuracy of semantic segmentation and vectorization of buildings using a Deep Learning model?



MATERIALS AND METHODS



DATA

- RGB orthoimages.
- LiDAR point clouds.
- Vectors of constructions.



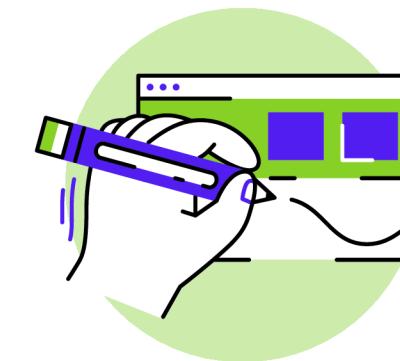
SOFTWARE

- QGIS, LAStools, CloudCompare
- Python 3.11, TensorFlow o PyTorch
- Jupyter y VSCode



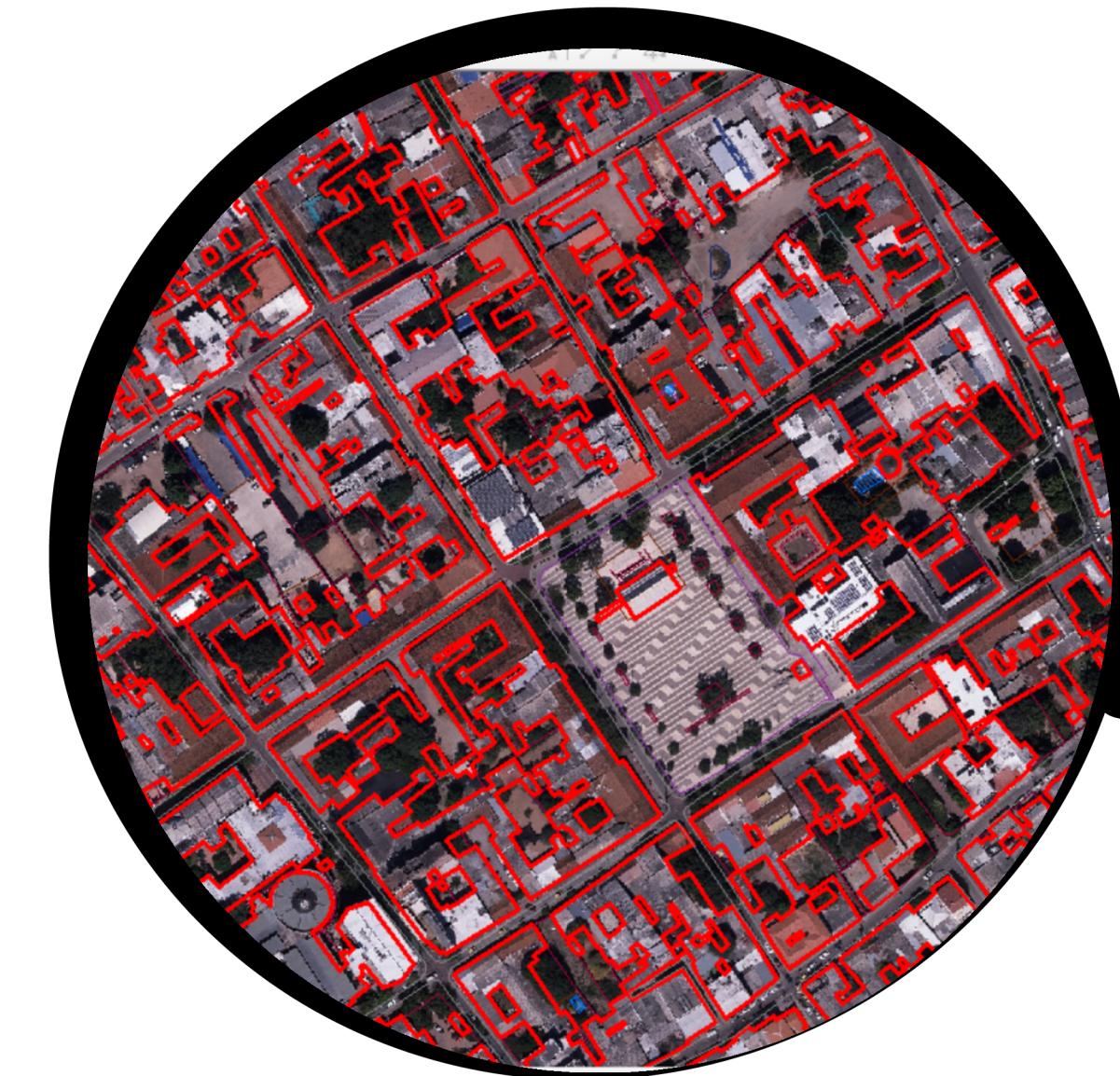
HARDWARE

- Personal workstation with GPU.
- Cloud storage..



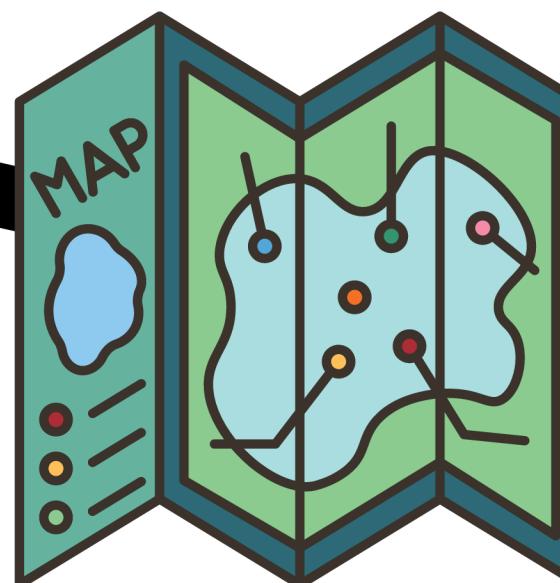
OTHER SUPPLIES

- Manual labeling assisted by QGIS plugins.
- Digital photogrammetry

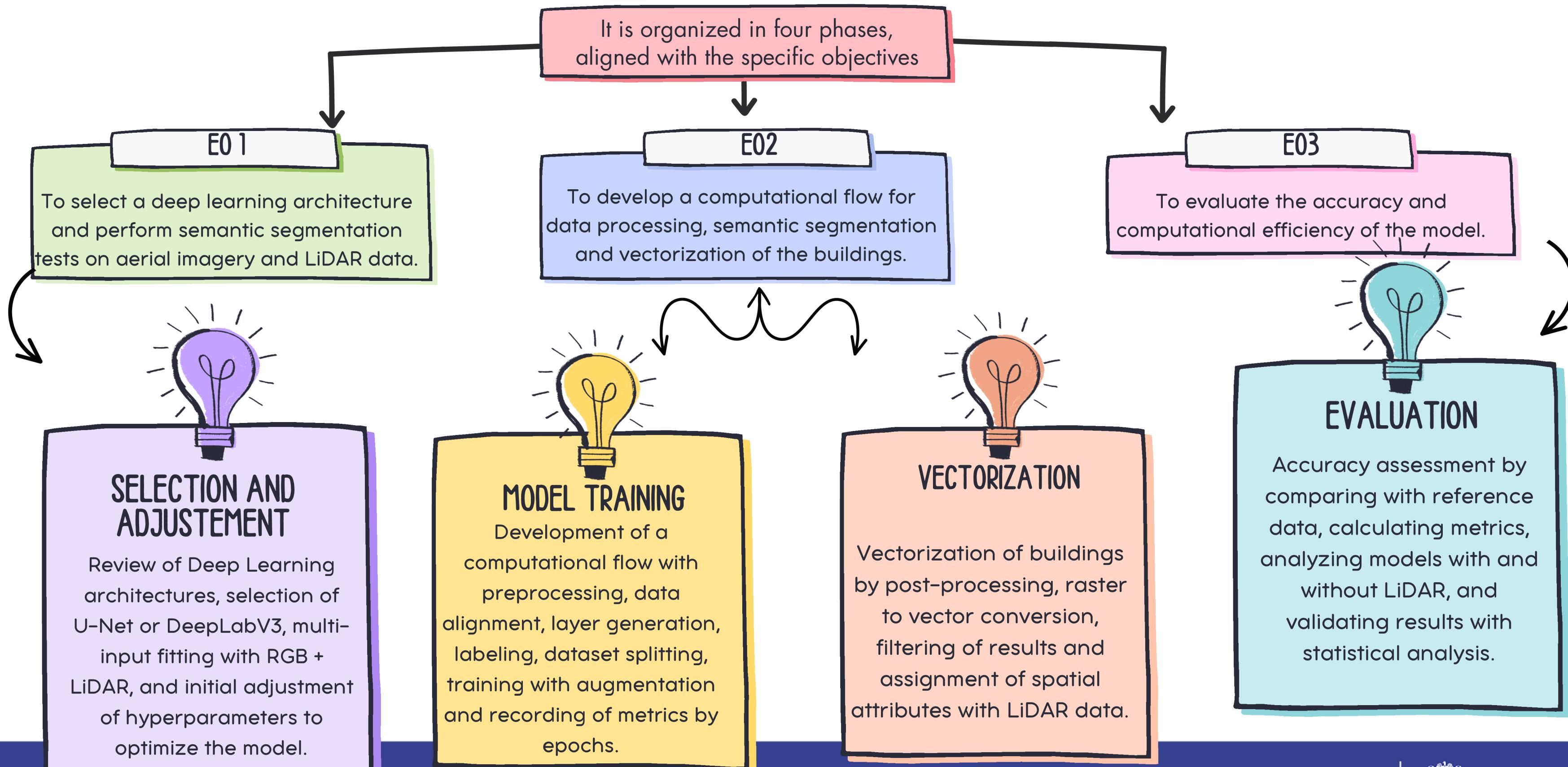


STUDY AREA

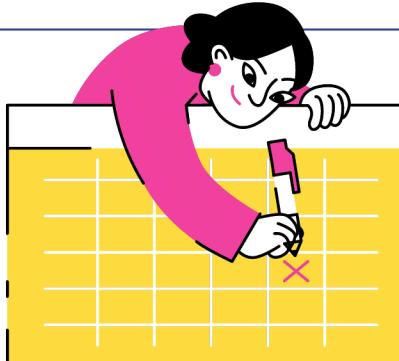
- Valledupar city, selected for its high density of buildings and presence of vegetation cover.



METHODOLOGY



SCHEDULE OF ACTIVITIES

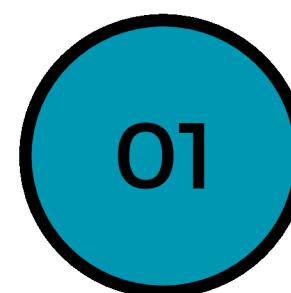


1-3 MONTH

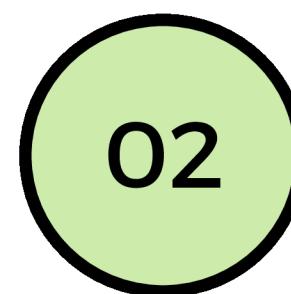
3-6 MONTH

6-9 MONTH

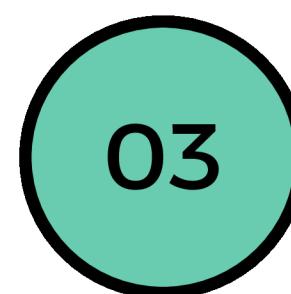
9-12 MONTH



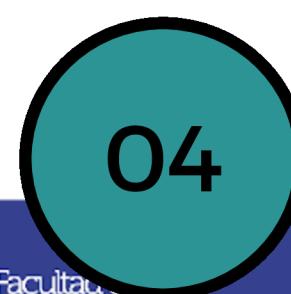
SELECTION AND TESTING



COMPUTATIONAL DEVELOPMENT



VECTORIZATION



ACCURACY EVALUATION

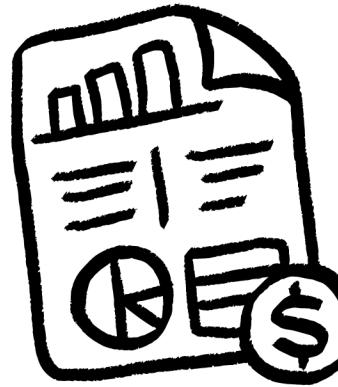
Revision, selection,
adaptation and
adjustment

Alignment, layer generation, dataset
splitting, training, iterations/
validations

Post-processing,
conversion and
filtering

Comparison, metrics calculation,
analysis and report writing

BUDGET



PERSONNEL

Thesis candidate
Tutor professor

\$27.800.000



TECHNICAL SERVICES

Assisted manual
labeling

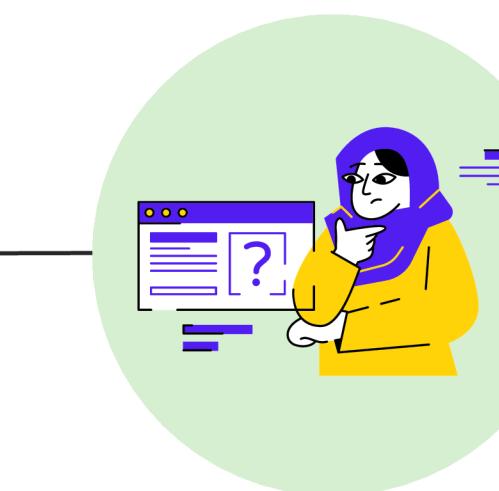
\$1.800.000



EQUIPMENT

Cloud
storage/rental

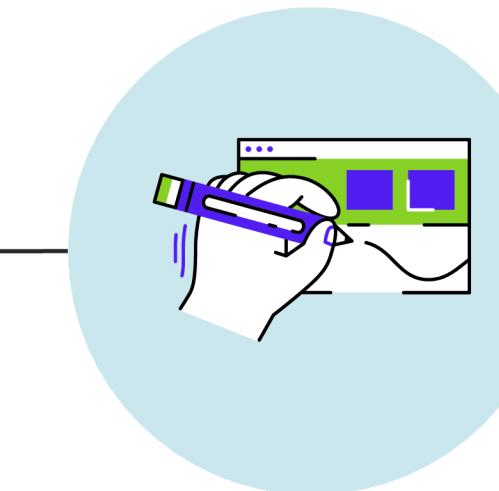
\$1.000.000



MATERIALS AND SUPPLIES

External disk
and licenses

\$2.500.000



RESEARCH PAPER

Deliverables and
thesis revisions

\$1.500.000

TOTAL: \$34.600.000



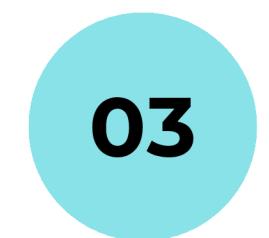
The development of a semantic segmentation model that combines aerial imagery and LiDAR data to identify buildings.



An automated workflow to process the data and train the model in a reproducible way.



EXPECTED RESULTS

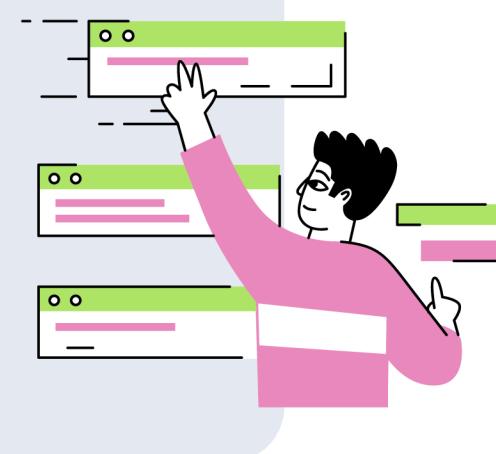


Vector layers of the buildings identified by the model.

Model accuracy assessment



The work will be documented through a public repository and publication of a scientific article.





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