

Automatic Building Footprint Extraction from UAV Imagery GeoAI Lab – Department of Geomatic Engineering, KNUST

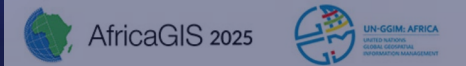


AfricaGIS 2025



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INFORMATION MANAGEMENT

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Project Overview (Phase 1)

- AI-based extraction of **georeferenced building footprints**
- **Faster, cheaper**, and more **consistent** than manual digitizing
- Supports engineering, planning, AfDB water project needs
- Collaboration: **GeoAI Lab & Ghana Water Limited**



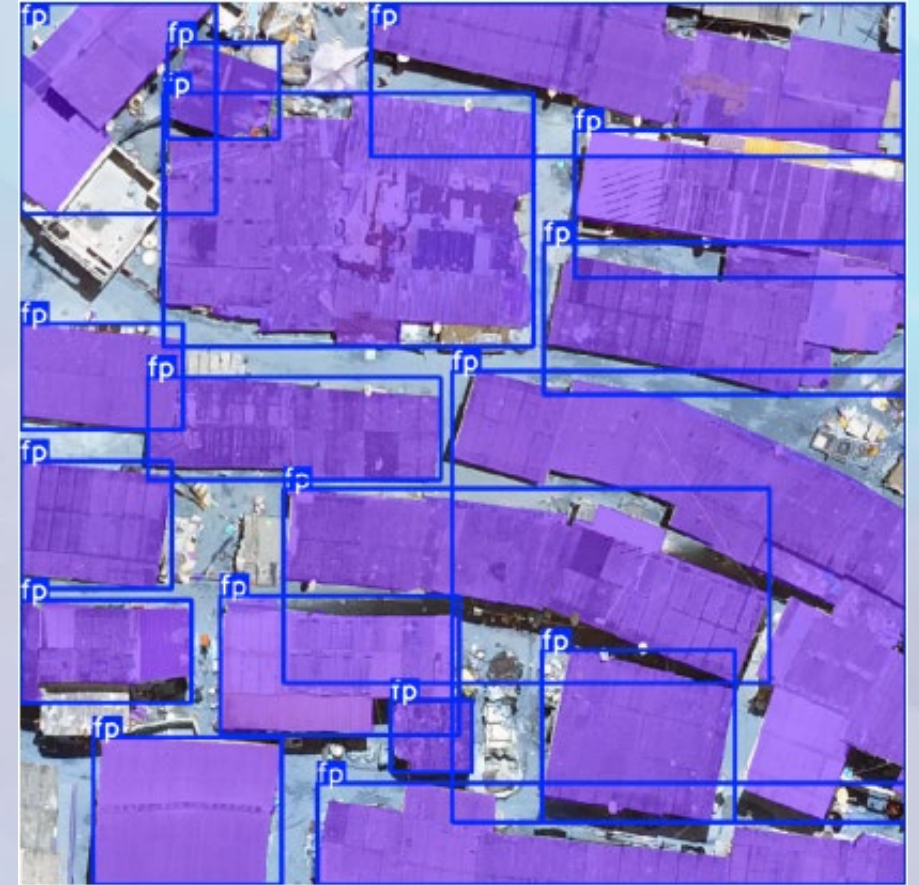
Data Preparation

- Orthomosaics chipped into **1024×1024 tiles**; each containing 5 – 30 buildings
- **Manual annotation** by 150+ students
- Quality control ensured consistency
- **Diverse roof types** and settlement patterns across Ghana



Model Training and Accuracy

- Instance segmentation model:
YOLOv11
- 85% training data, 15% validation
- Validation (751 images):
 - Precision: **0.993**
 - Recall: **0.989**
 - mAP50: **0.994** | mAP50-95: **0.959**

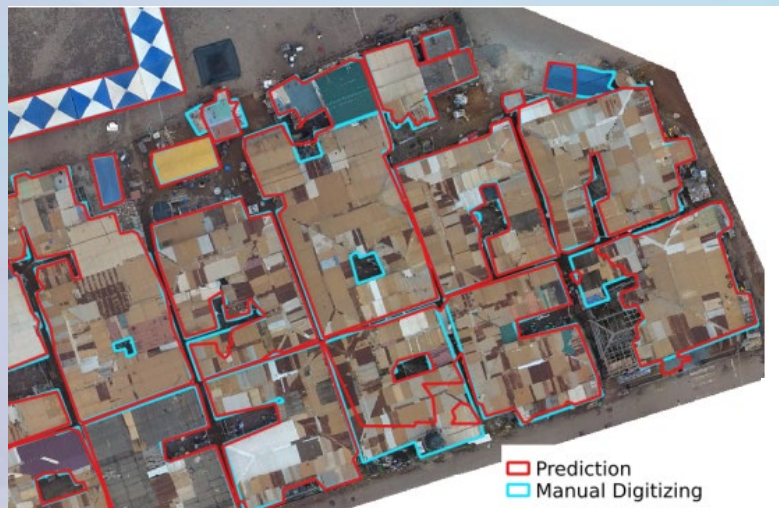


Inference Pipeline

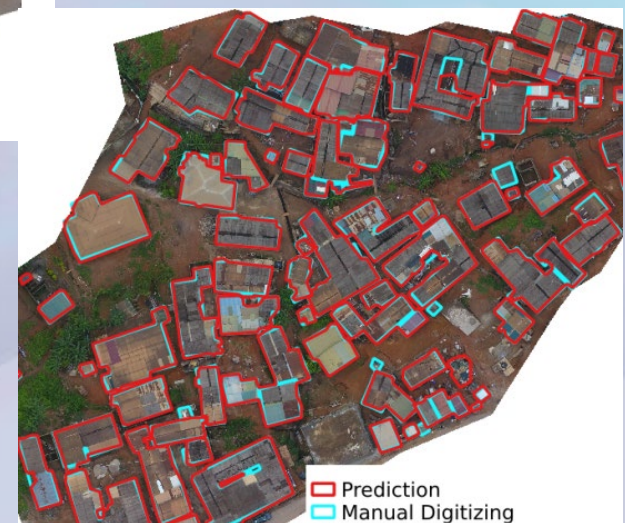
Steps:

1. Tile orthomosaic
2. Segment chips using trained model
3. Polygonize + clean shapes
4. Output: **Shapefile building footprints**

Inferences:



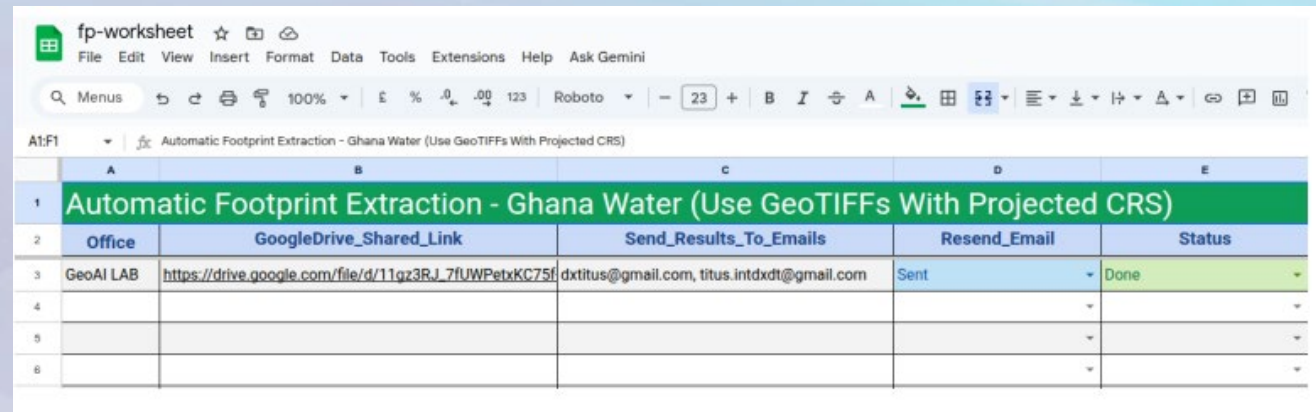
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Benefits – Segmentation Service for GWL

1. Upload GeoTIFF to Drive
2. Submit link + email via request form
3. Receive shapefile via email
4. Enables AI mapping without technical knowledge

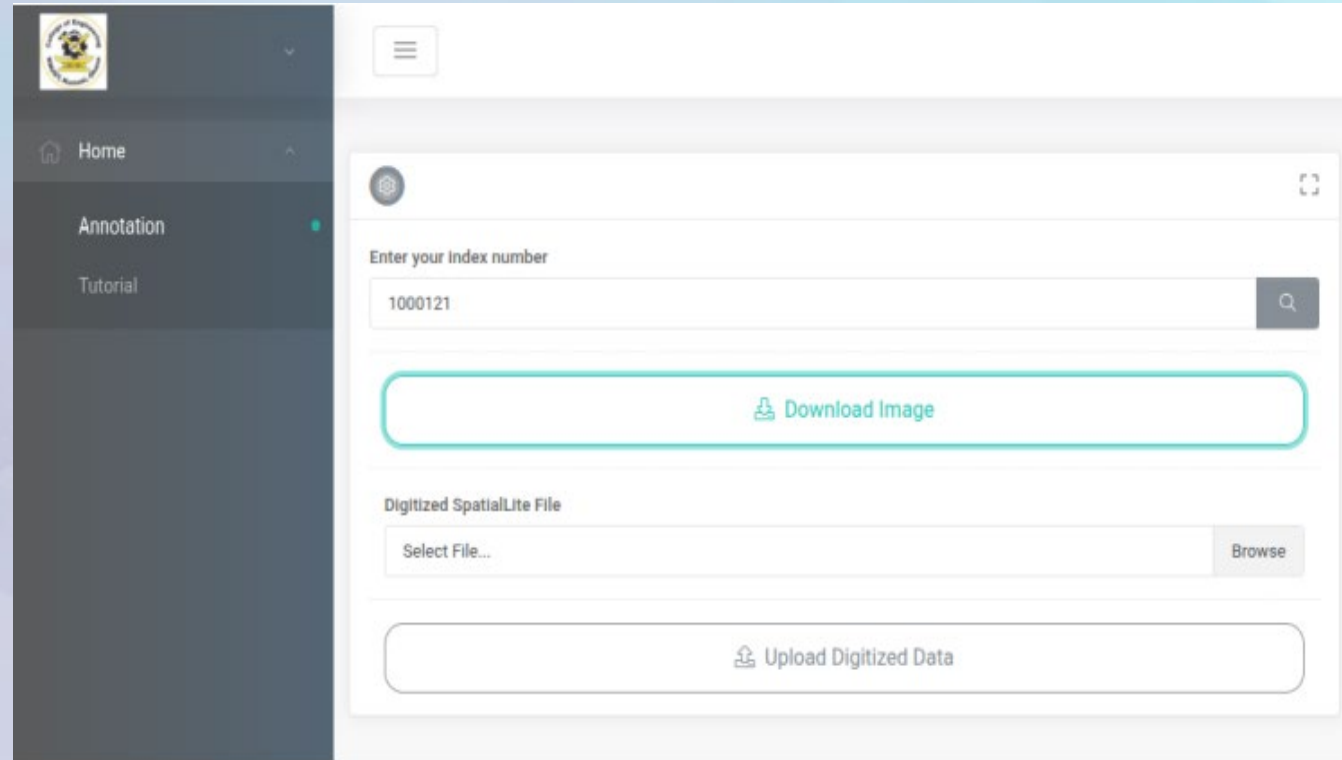


The screenshot shows a Google Sheet interface with the title 'Automatic Footprint Extraction - Ghana Water (Use GeoTIFFs With Projected CRS)'. The sheet has five columns: Office, GoogleDrive_Shared_Link, Send_Results_To_Emails, Resend_Email, and Status. The first row (row 1) is a header row with a green background. The second row (row 2) contains the following data: Office: GeoAI LAB, GoogleDrive_Shared_Link: https://drive.google.com/file/d/11gz3RJ_7fUWPetxKC75f, Send_Results_To_Emails: dxtitus@gmail.com, titus.intdxdtd@gmail.com, Resend_Email: Sent, Status: Done. The third row (row 3) is empty. The fourth row (row 4) is empty. The fifth row (row 5) is empty. The sixth row (row 6) is empty.

	A	B	C	D	E
1	Automatic Footprint Extraction - Ghana Water (Use GeoTIFFs With Projected CRS)				
2	Office	GoogleDrive_Shared_Link	Send_Results_To_Emails	Resend_Email	Status
3	GeoAI LAB	https://drive.google.com/file/d/11gz3RJ_7fUWPetxKC75f	dxtitus@gmail.com, titus.intdxdtd@gmail.com	Sent	Done
4					
5					
6					

Benefits – Capacity building

- 150+ undergraduate annotators, 5 MPhil students
- UAV mapping, annotation, segmentation workflows
- Web-based annotation training environment



Future Work (Phase 2)

- Add classes: uncompleted buildings, buildings with concrete roofs, water tanks
- Improve polygon regularization
- Full-scale cloud inference service
- National deployment + stakeholder workshop

Conclusion

- Successful AI-assisted building extraction demonstrated
- High accuracy and consistent results across multiple sites
- Supports future national-scale geospatial automation

Thank you

