UCF CRCV REU – Week 5

By: Felipe Monsalvo

Detection of Coastal Features from Satellite Imagery using Computer Vision

UCF CRCV REU - Project 29

Lead: Harry Newton, Ph.D., Leidos Data Scientist

REU Student: Felipe Monsalvo

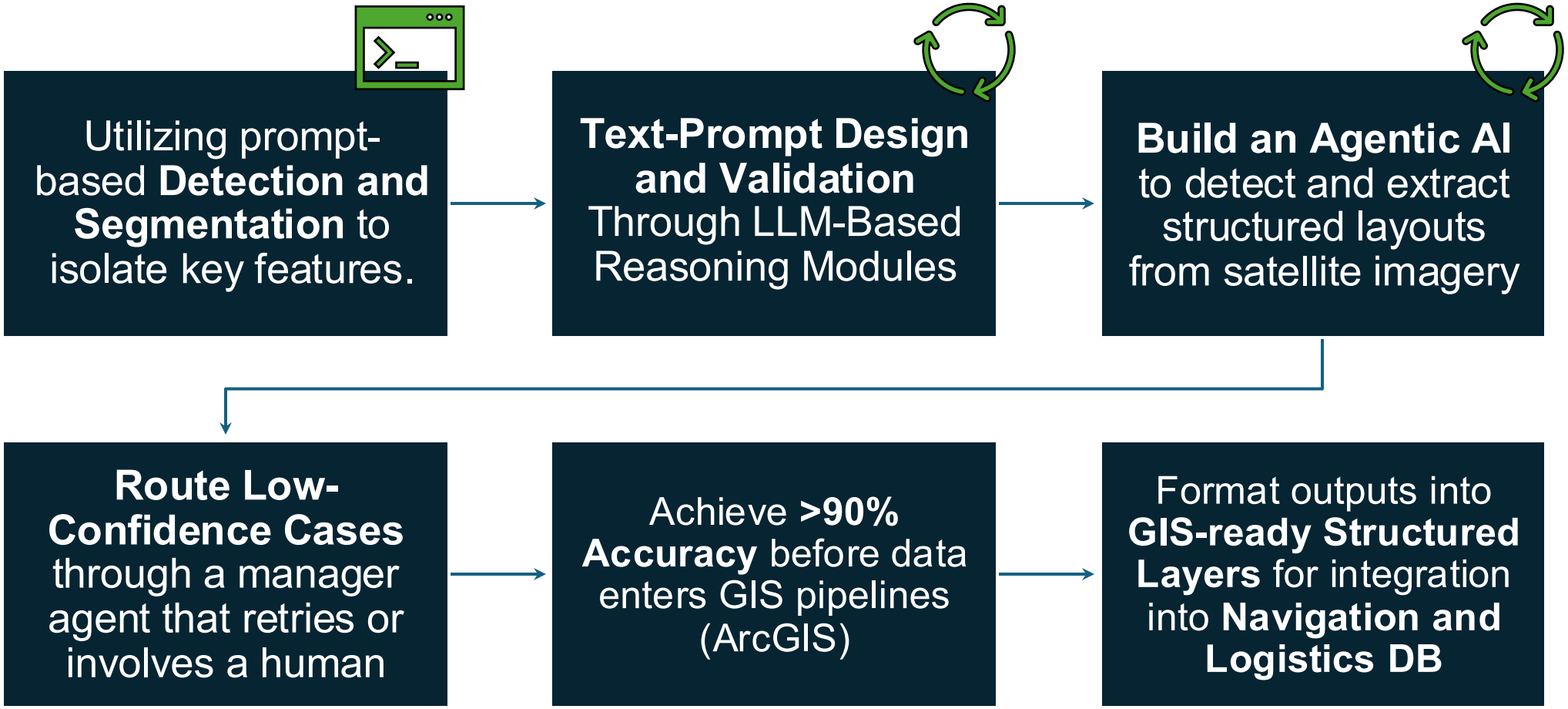


Enabling AI to interpret satellite imagery with near-human accuracy



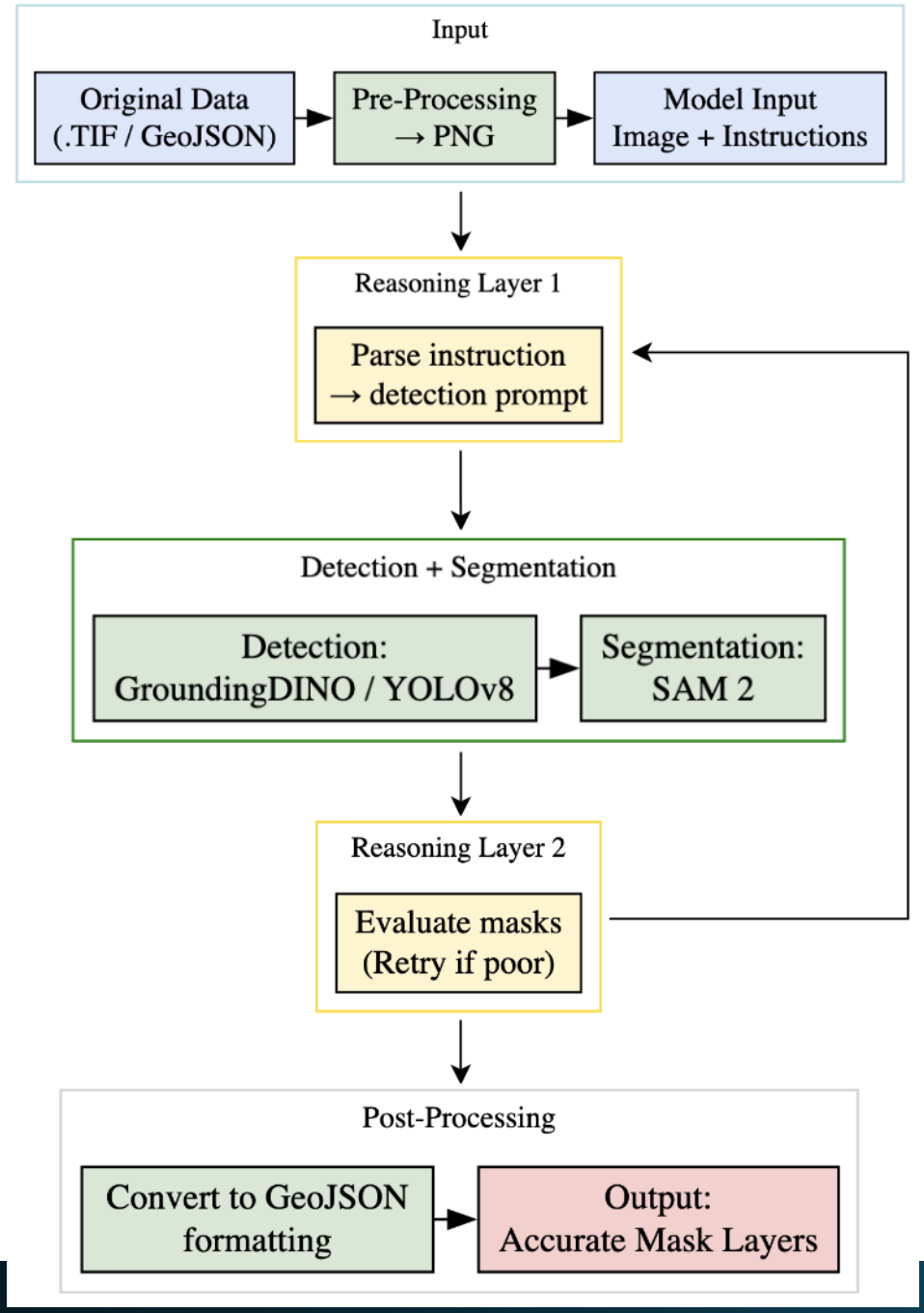
Supports maritime logistics & national safety systems

Project Scope – Goals of the Agentic AI System



Agentic Vision Pipeline Flow

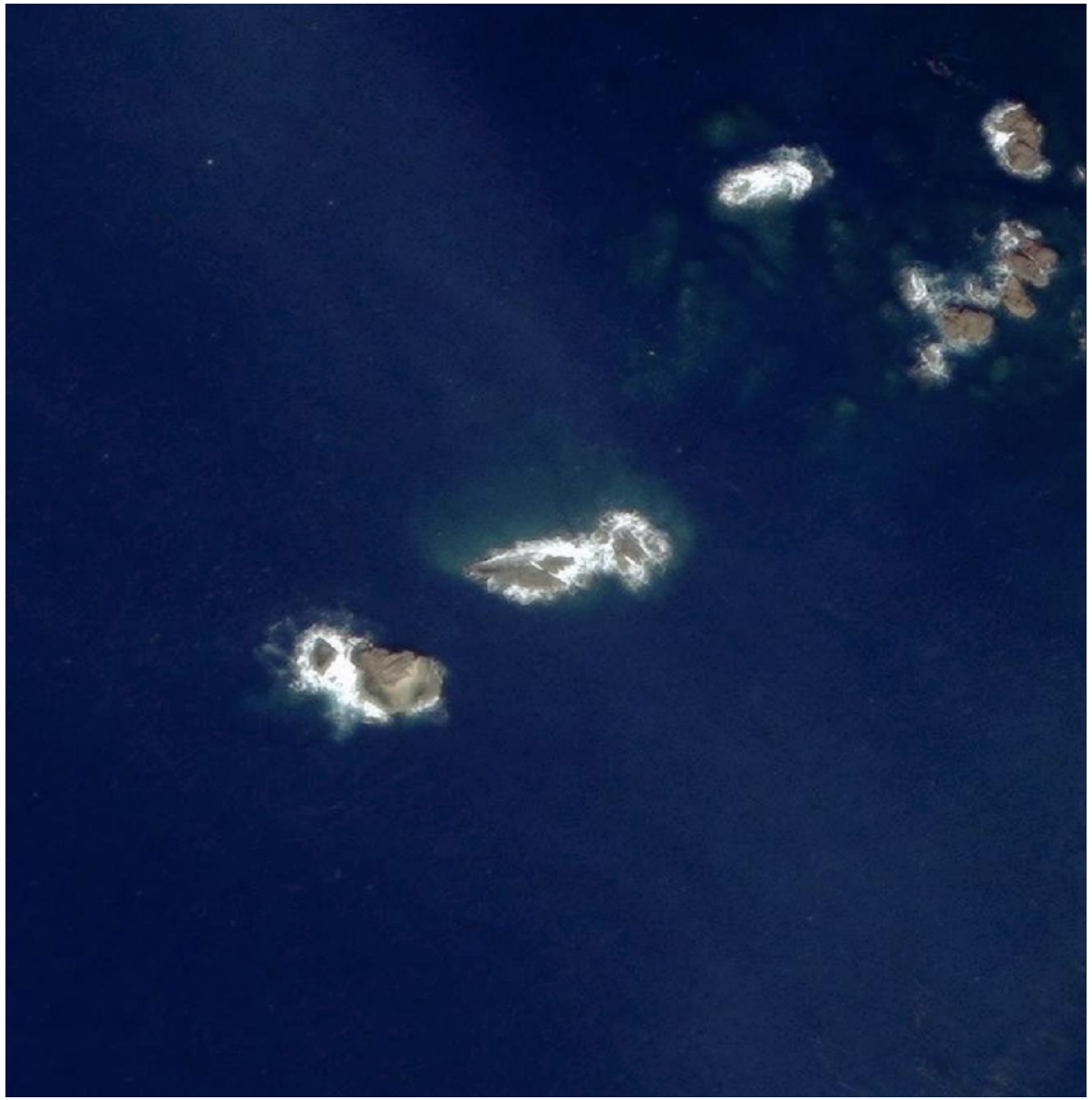
- **Pre-Processing & Input:** Convert .TIF/GeoJSON to .PNG + text instructions
- **Reasoning Layers:** Generate text-prompt (Layer 1) and validate masks (Layer 2)
- **Detection:** Use GroundingDINO for object bounding boxes
- **Segmentation:** Apply SAM2 for detailed mask generation
- **Post-Processing & Output:** Export accurate masks as GeoJSON layers

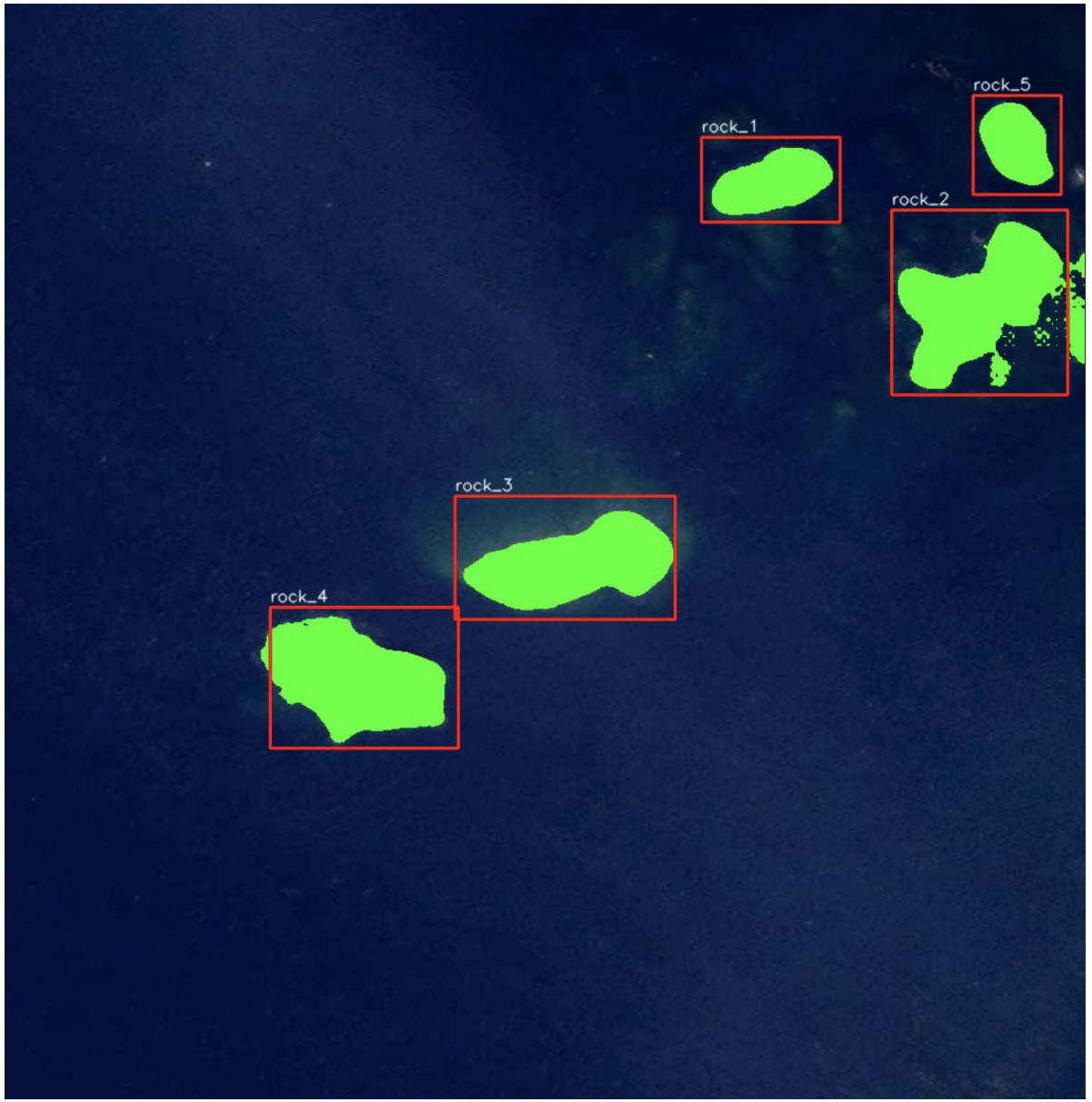


Completed

- Set up GroundingDINO and SAM 2 (Local Windows + Linux Docker).
- Successfully ran GroundingDINO on satellite imagery
- Linked GroundingDINO to SAM2 via COCO-format JSON boxes
- Segmented using GroundingDINO + manual ground truth box mix

Past Results





In Progress

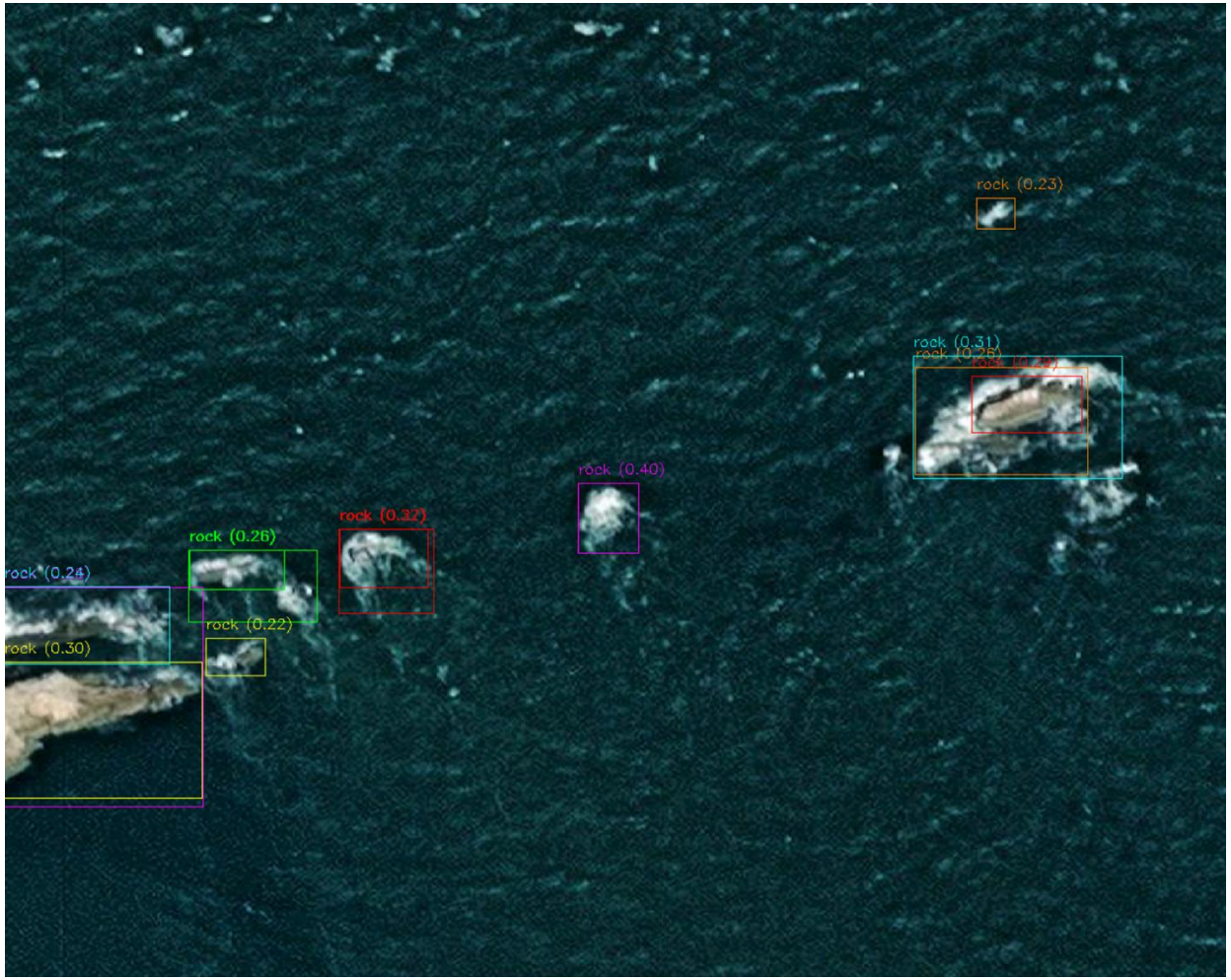
Current Steps:

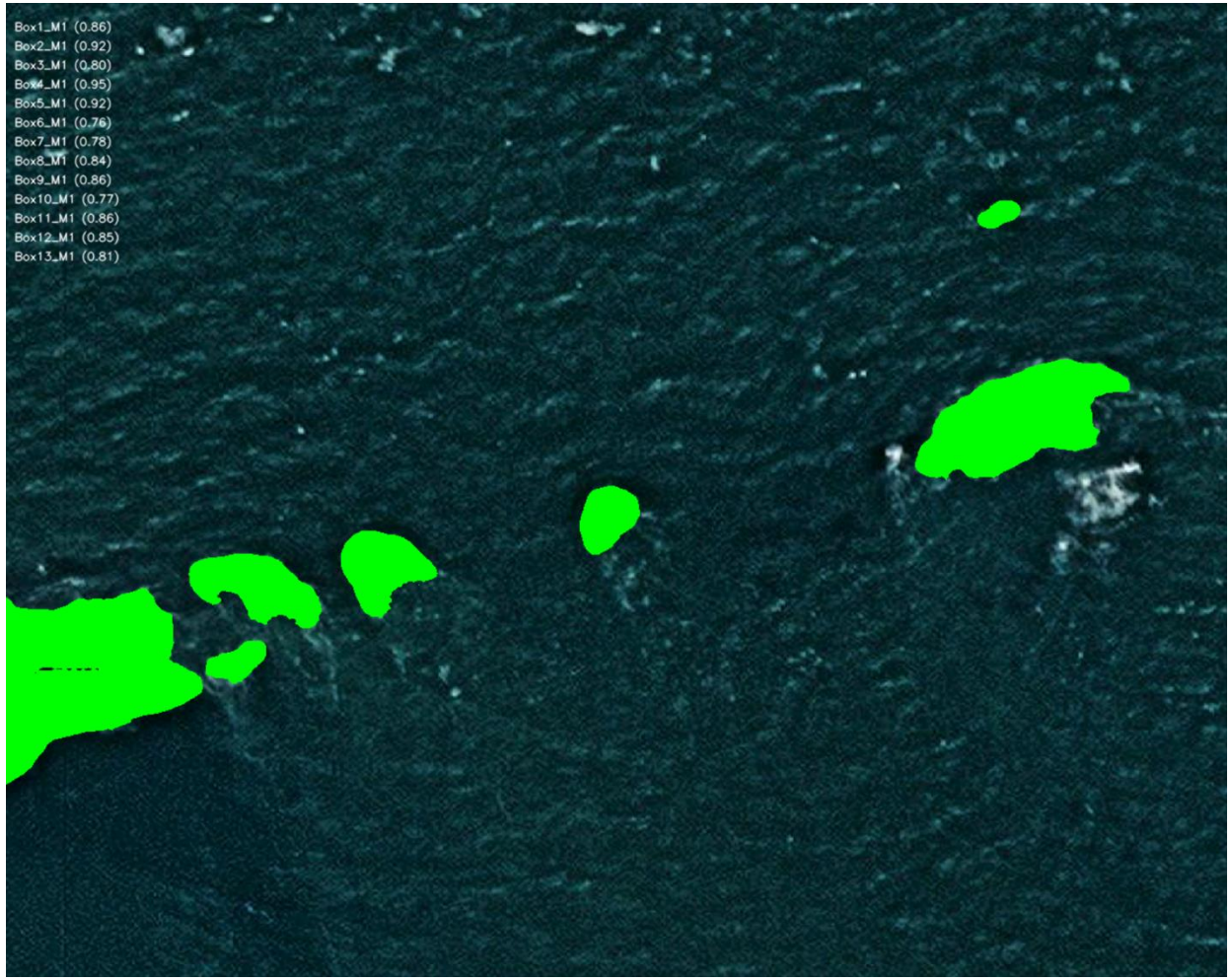
- Refine text prompts to improve detection accuracy in noisy satellite imagery
- Implement supervised-self learning on large dataset

Next this week:

- Design reasoning modules for prompting and evaluation
- Integrate .TIF and .GeoJSON inputs with PNG conversion and post-processing to GeoJSON

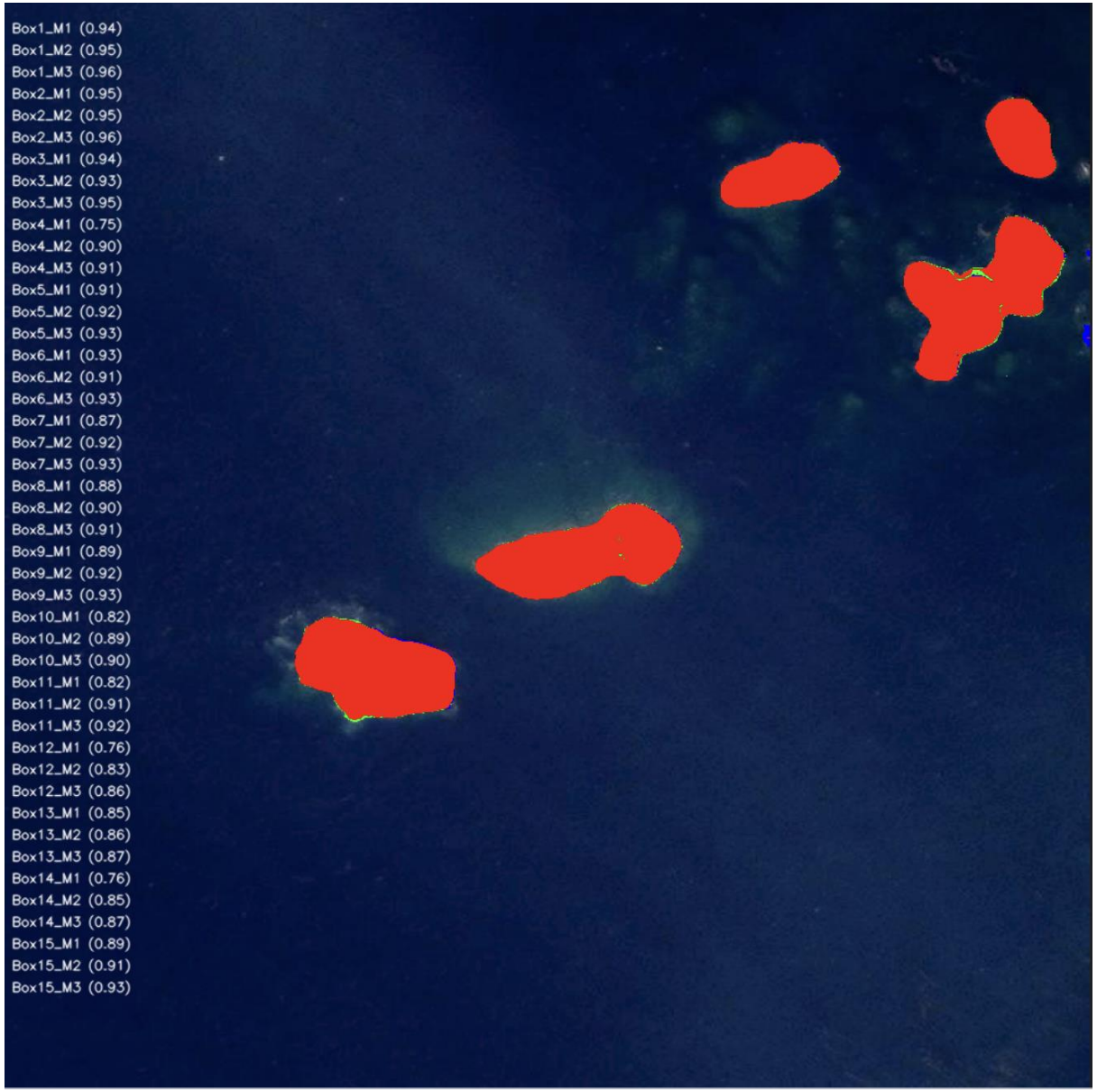
Current Results





Current Results





Schedule

Scheduled Start	Scheduled Finish	Actual Finish	Status	Tasks	Notes
6/2	6/2	6/2	Completed	Kickoff Meetings with Sponsor. Data Agreement.	Met with Leidos engineers to see their code and data.
6/3	6/11	6/9	Completed	Write project plan outlining agentic architecture, data flow, and risk factors for validation accuracy and ambiguity handling. Survey and select open-source CV models (Grounding-DINO, YOLO, SAM, etc).	Copy submitted to Dr Lobo
6/6	6/11	6/11	Completed	Started training on Grounded SAM 2 Model using synthetic data and real NOAA satellite inputs. Began setting up local machine's virtual environment with GroundingDINO for better boxed detection accuracy.	Model research and environment setup
6/11	6/15	6/15	Completed	Train and refine segmentation models using provided data and satellite inputs. Consider image augmentation and symbol permutation. Attend CVPR and participate in workshops/talks.	SAM 2 fully running and good starting results
6/18	6/25	6/25	Completed	Integrate detection model to generate initial boxes for SAM2; prompts guide detection, and segmented masks refine output for downstream tasks.	GroundingDINO and SAM 2 are functional and linked
6/26	7/2		To Do	Fine-tune GroundingDINO and SAM2 with text-prompt engineering and supervised-self learning	
7/6	7/16		To Do	Achieve standalone ViT model performance > 90% correct classification and geolocation before full system integration.	
7/17	7/21		To Do	Map outputs to geolocation post-processed data suitable for input to national databases.	
7/22	7/25		To Do	Test system rigorously and document performance through metrics (accuracy, F1-score, confusion matrix).	
7/30	7/30		To Do	Final Report due by midnight	

Thank You