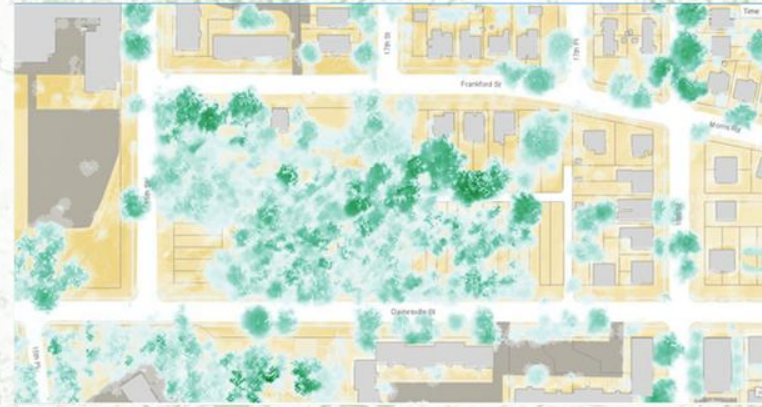


# **Geospatial Artificial Intelligence (GeoAI) for Estimating Tree Covered Area and Number of Trees in Historical Sites: A Case of The Old Moat of Nakhonratchasima Municipality City, Thailand**



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# Topics

**1. Background and Objectives**

**2. Literature Review**

**3. Historical Areas (> 100 years) in The Old Moat of Nakhonratchasima Municipality City (NMC)**

**4. Materials and Methods**

**5. Results and Conclusions**

**6. Next operations**

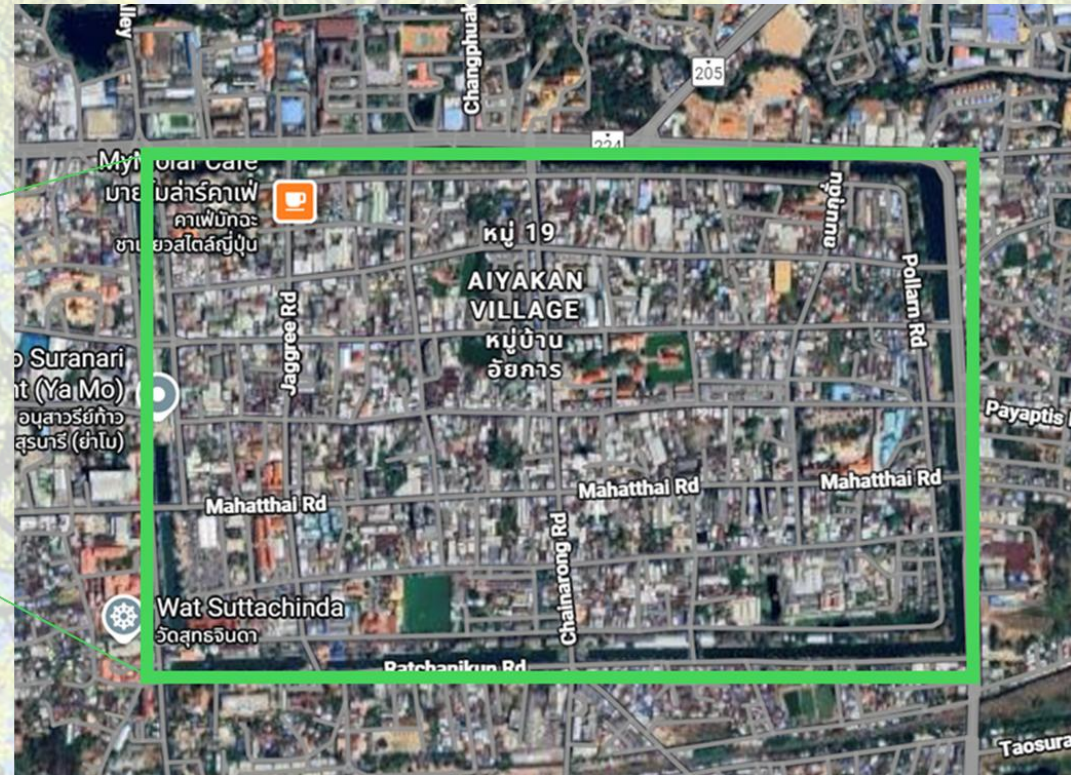
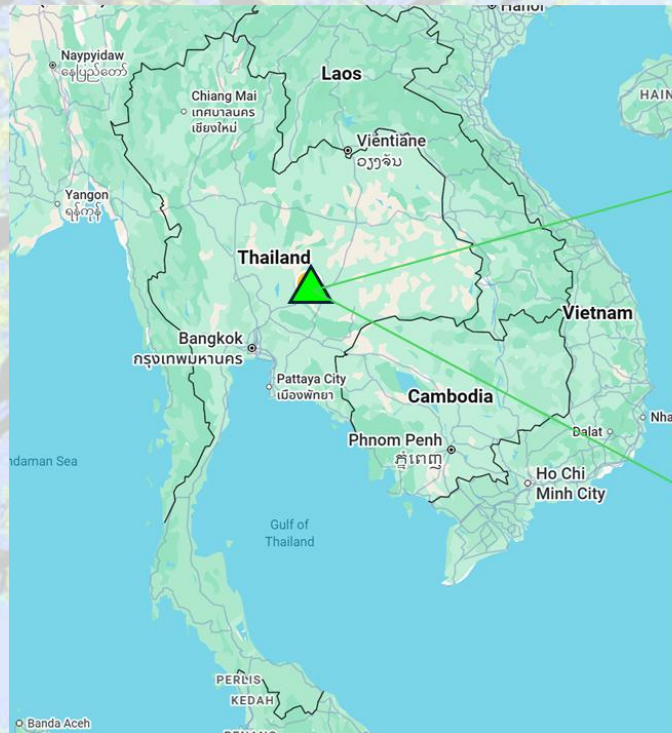
**7. References**

# 1. Background

- **Urban trees** are critical in historical (historic) sites because of their heritage and conservation value, serving as living landmarks and protecting structures from environmental damage.
- **Urban forest (trees)** plays a vital role in highlighting the historical and cultural significance of trees in cities (National Recreation and Park Association (NRPA), 2024).
- Consequentially, **urban trees and forests** are efficient and cost-effective nature-based solutions that can deliver on Sustainable Development Goals (SDGs), particularly on SDG 11 (sustainable cities and communities), SDG13 (climate action) and SDG15 (life on land). Importantly, they can simultaneously deliver other local, national and global goals including the Paris Agreement, Sendai Framework, Convention on Biological Diversity and New Urban Agenda (United Nations Economic Commission for Europe (UNECE), 2024).

# 1. Background (Con't)

- Therefore, the objective of this study is to estimate tree canopy cover and number of trees in historical sites. This study decided to study in The Old Moat of Nakhonratchasima Municipality City (NMC) (as **squared-green line** in Figure below) where establishes in Nakhon Ratchasima province of the North-Eastern Thailand



# 2. Literature Review (Some Interesting Examples)

No.	Titles and Authors	Interesting points
1	Advancing tree detection in forest environments: A deep learning object detector approach with UAV LiDAR data (Jarahizadeh & Saehi, 2025)	- A novel Individual Tree Detection (ITD) method was introduced for using a modified You Only Look Once V7 (YOLO V7) deep learning object detection framework, employing UAV LiDAR data.
2	Tree counting of tropical tree plantations using the maximum probability spectral features of high-resolution satellite images and drones (Sari et al., 2025)	- Tree plantation maps were created using the difference backscatter VV (Vertical transmit, Vertical receive) and VH (Vertical transmit, Horizontal receive) from satellite data of Sentinel-1 for tree counting.
3	AI in forestry: Tree counting from drone images (Rushton, 2020)	- The tree detection was made from three-band images: RGB (true color) as well as Near Infrared, Red and Green images (False Infrared color) based on the training of two detectors; one that locates and extracts the treetops individual and a second detector, which identifies the polygons of the plantation lines.
4	Deep learning enables image-based tree counting, crown segmentation, and height prediction at national scale (Li et al., 2023)	- This paper proposed a deep learning-based framework that provides location, crown area, and height for individual overstory trees from aerial images at country scale.



In this study, there are 7 historic areas:

**1** Monument and **6** Temples  
(Wat in Thai language)

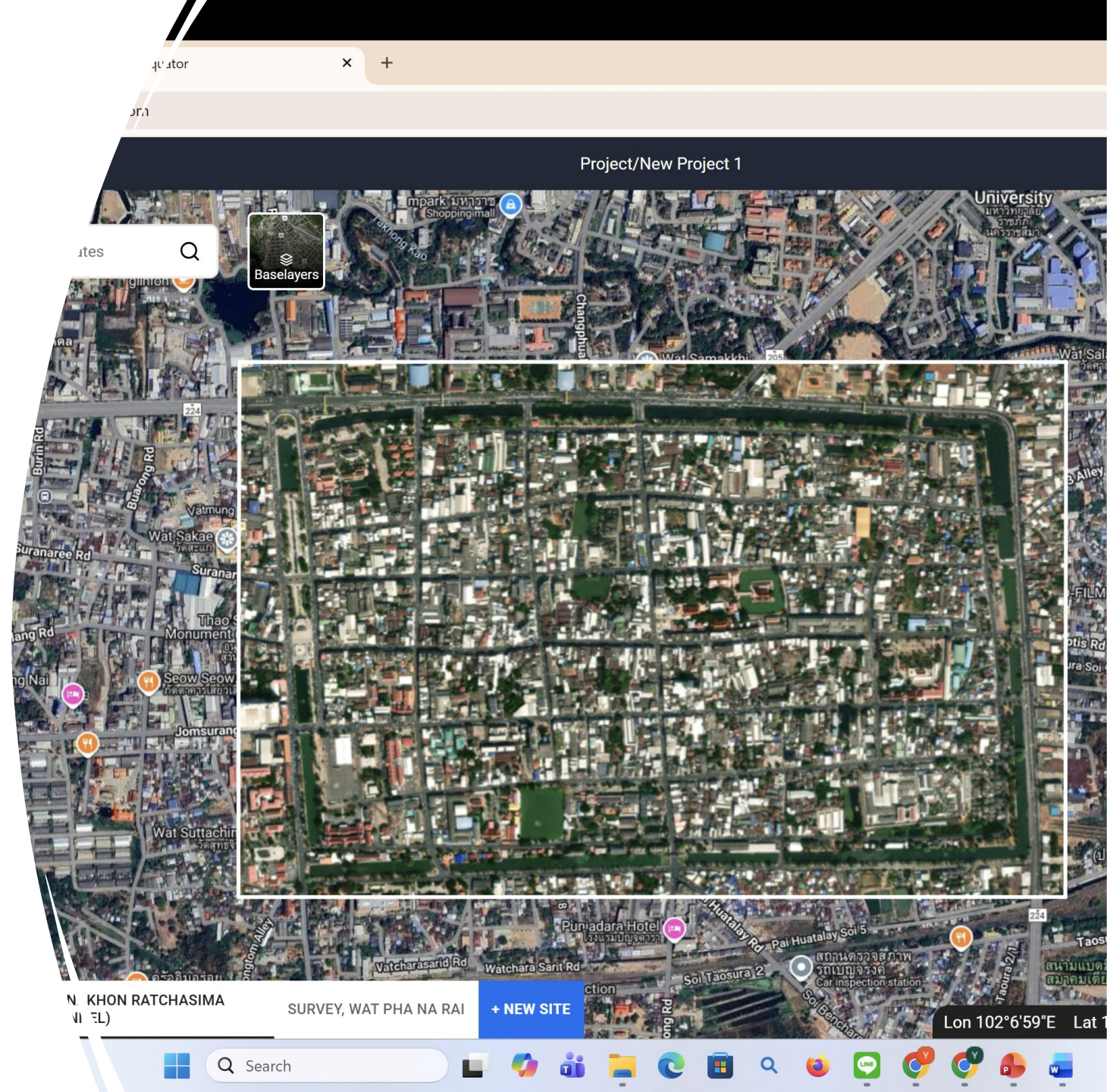
1. Thao Suranaree Monument
2. Wat Phayap
3. Wat Bueng (Phra Aram Luang)
4. Wat Sa Kaeo
5. Wat Isan
6. Wat Pha Narai Maha Rat
7. Wat Bun

International Conference on Biodiversity

### **3. Historical Areas (> 100 years) in The Old Moat of NMC**

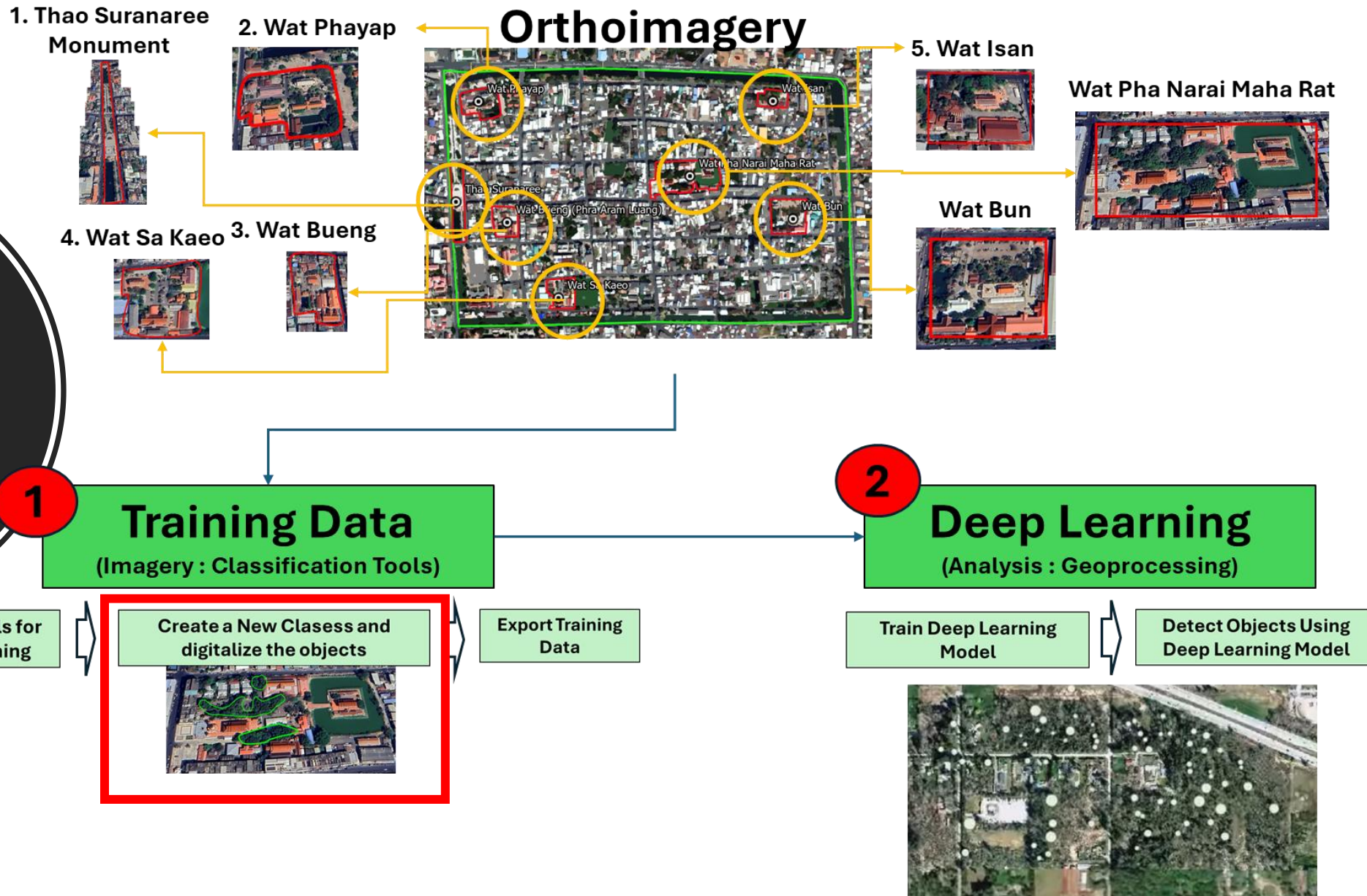
# 4. Materials and Methods

- This study used orthoimage that was downloaded from web of EQUATOR (<https://maps.equatorstudios.com/>) as Figure the left side of audiences.



# Framework of This Study

## 4. Materials and Method (Con't)



# 5. Results and Conclusions

- Detecting tree canopy cover-based deep learning in 7 historical sites:

1. Thao Suranaree Monument  
about 0.14 sq.km. (496 trees)

2. Wat Phayap  
about 0.16 sq.km. (185 trees)

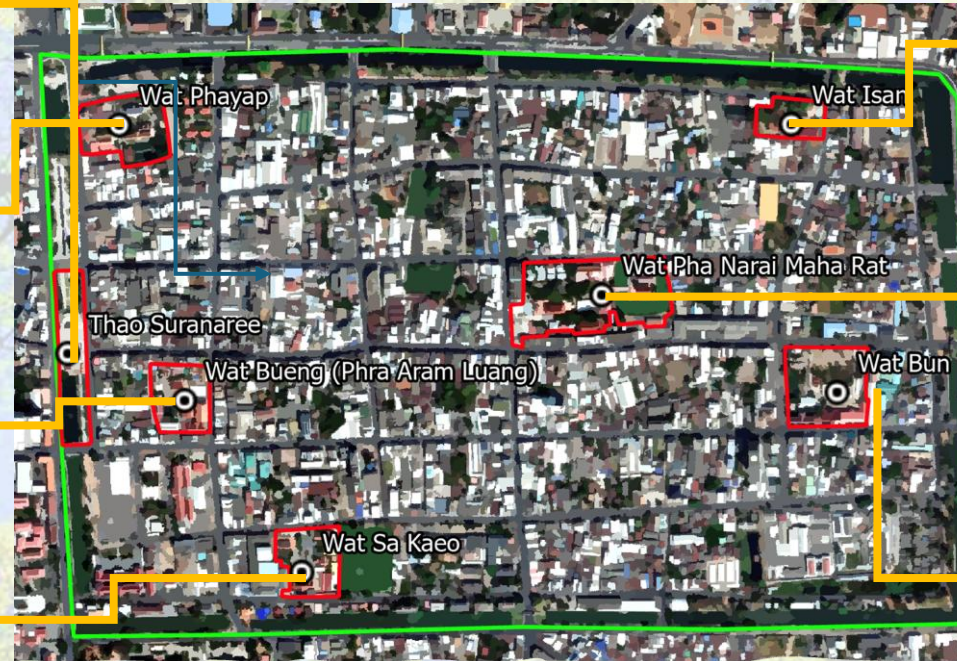
3. Wat Bueng (Phra Aram Luang)  
about 0.06 sq.km. (206 trees)

4. Wat Sa Kaeo  
about 0.08 sq.km. (316 trees)

5. Wat Isan  
about 0.03 sq.km. (193 trees)

6. Wat Pha Narai Maha Rat  
about 0.21 sq.km. (195 trees)

7. Wat Bun  
about 0.17 sq.km. (396 trees)



(Total 0.85 sq.km. and 1,987 trees)

Consequently, the implemented GeoAI approach provides important insights to urban planners and government to monitor urban trees with the enhanced **Individual Tree Inventory** and strategies mitigation plan to reduce the impact of climate change and global warming.

## **6. Next operation**

**1. The accuracy of the tree cover created by this study is compared to those of existing tree cover in true field.**

**2. This work lays the foundation for establishing a tree-level inventory for the historical sites in Nakhon Ratchasima province using remotely sensed data.**

**3. Moreover, the results are regressed against coarser resolution tree cover maps to predict the area covered by tree crowns at a provincial level.**

# 8. References

Jarahizadeh, S. & Salehi, B. (2025). Advancing tree detection in forest environments: A deep learning object detector approach with UAV LiDAR data. **Urban Forestry Greening**, 105, 128695. <https://doi.org/10.1016/j.ufug.2025.128695>

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**Thank you**