

Satellite imagery-based crop type mapping for small fields: Semantic segmentation.

Group: SkyPixel

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Agenda

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Approach

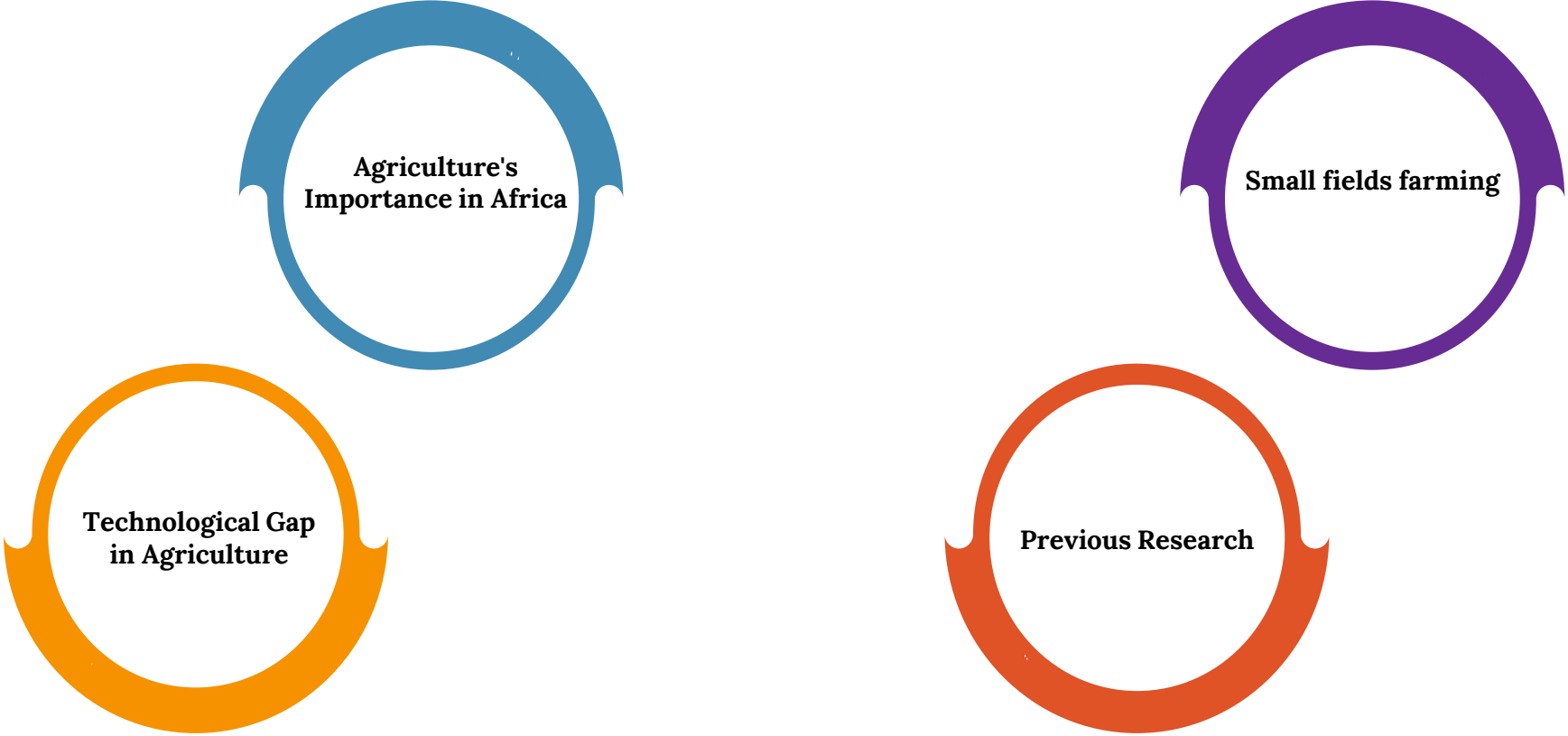
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Problem Statement



**Agriculture's
Importance in Africa**

Small fields farming

**Technological Gap
in Agriculture**

Previous Research

Task description



Novel application

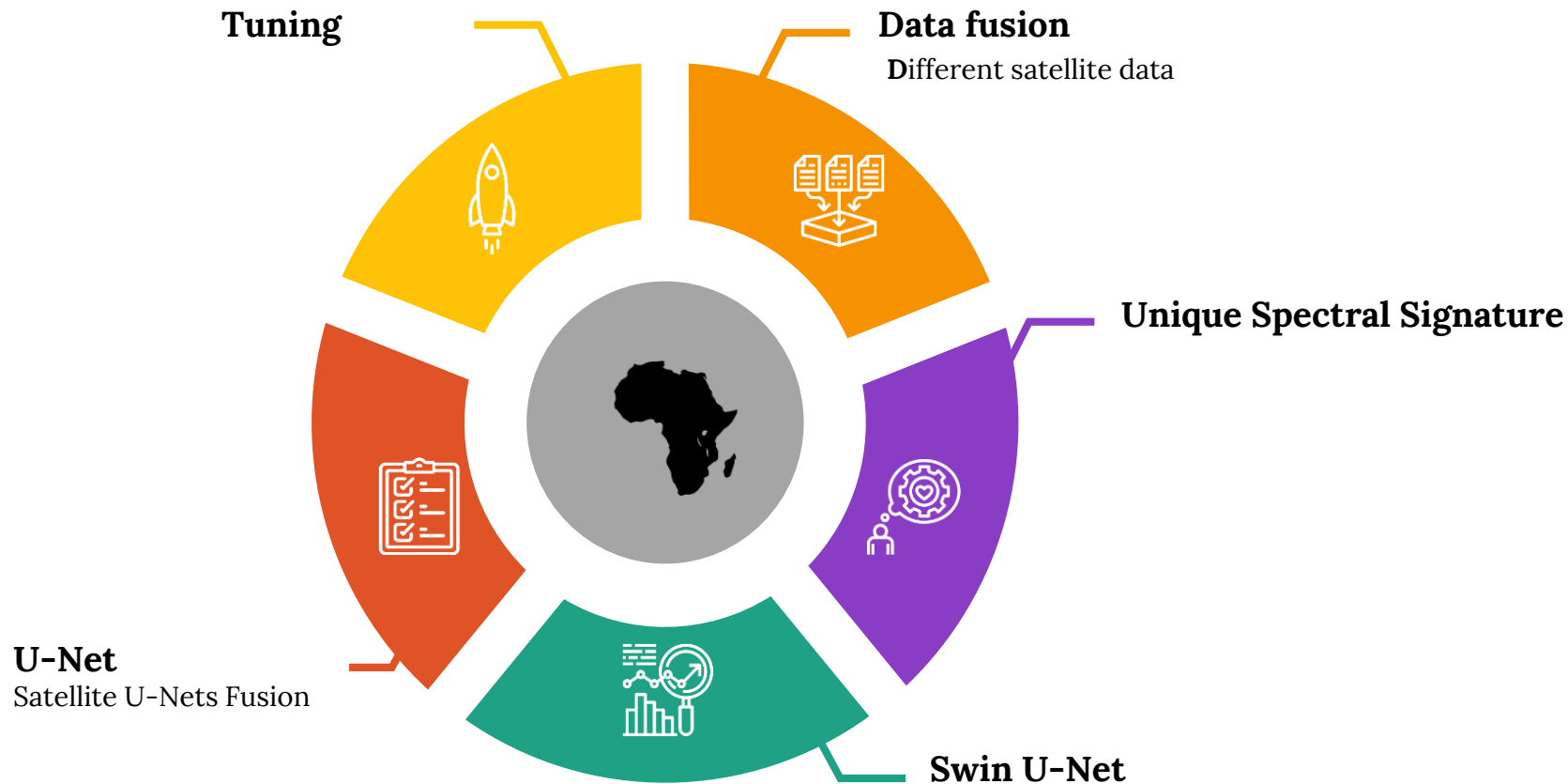
- **Available dataset**
- **Attention model:** Swin-Unet



Dataset

- **Data source:** Planet, Sentinel-1 (S1), and Sentinel-2 (S2) time series images.
- **Dataset size:** 2259 train, 298 validation, 909 test images.
- **Each image shape:** $[N \ C \ H \ W \ T]$
- **Channels (C):** 4, 3, and 10 corresponding to Planet, S1, and S2, respectively.
- **Two approaches:** Time series random sampling and time series averaging.
- **Data Normalization**

Approach



Approach - Swin Transformer

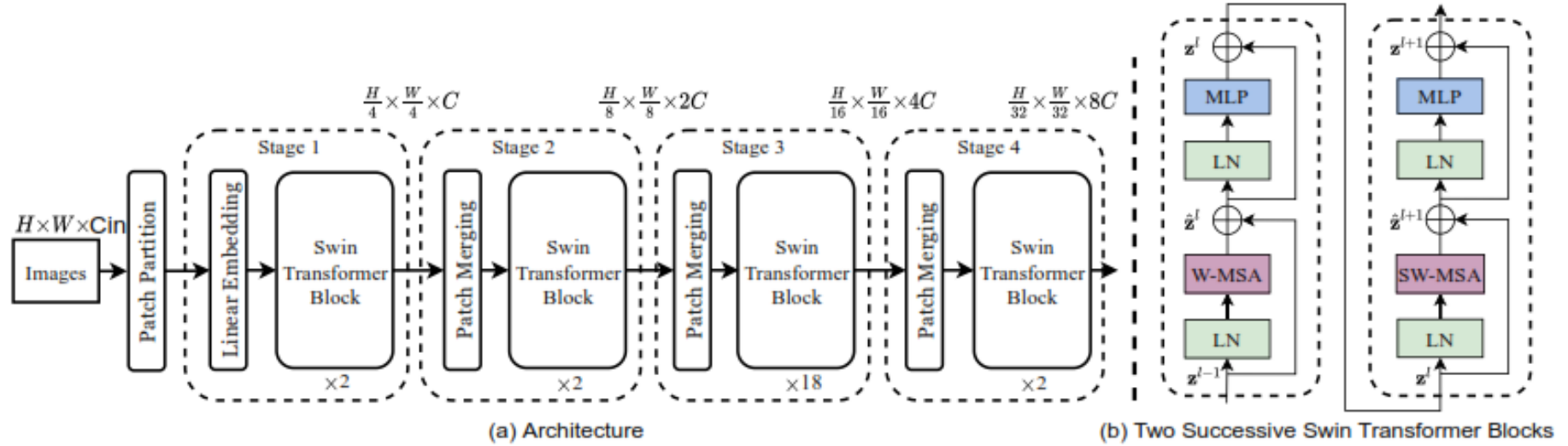


Figure 1: Swin Transformer

Source: Z. Liu et al., "Swin Transformer: Hierarchical Vision Transformer using Shifted Windows," in 2021 IEEE/CVF International Conference on Computer Vision (ICCV), Montreal, QC, Canada: IEEE, Oct. 2021, pp. 9992–10002. doi: 10.1109/ICCV48922.2021.00986.

Approach - Swin Unet

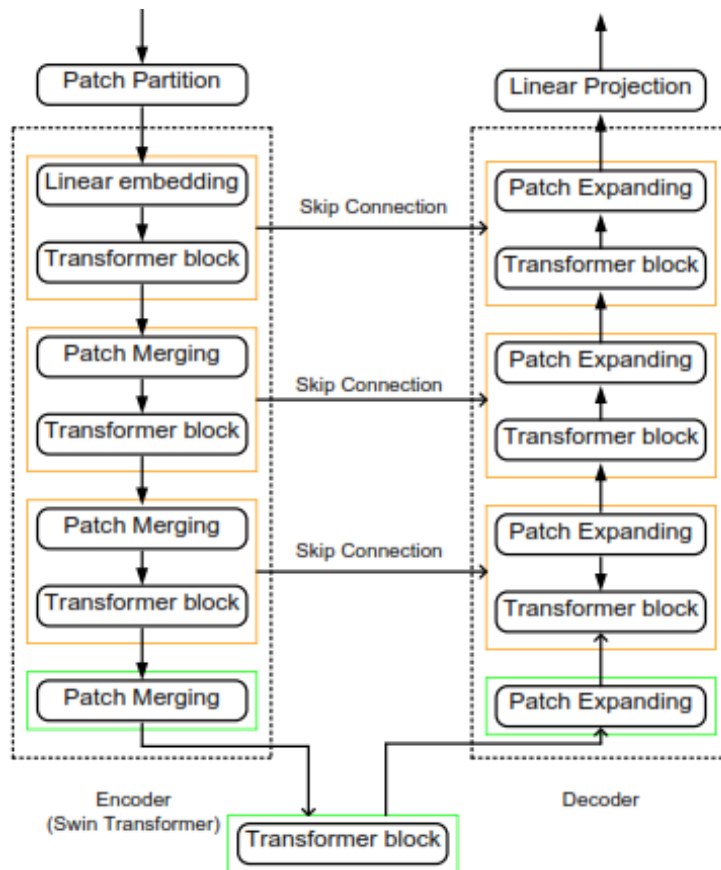


Figure 2: Swin Unet

Approach - Implemented Architecture

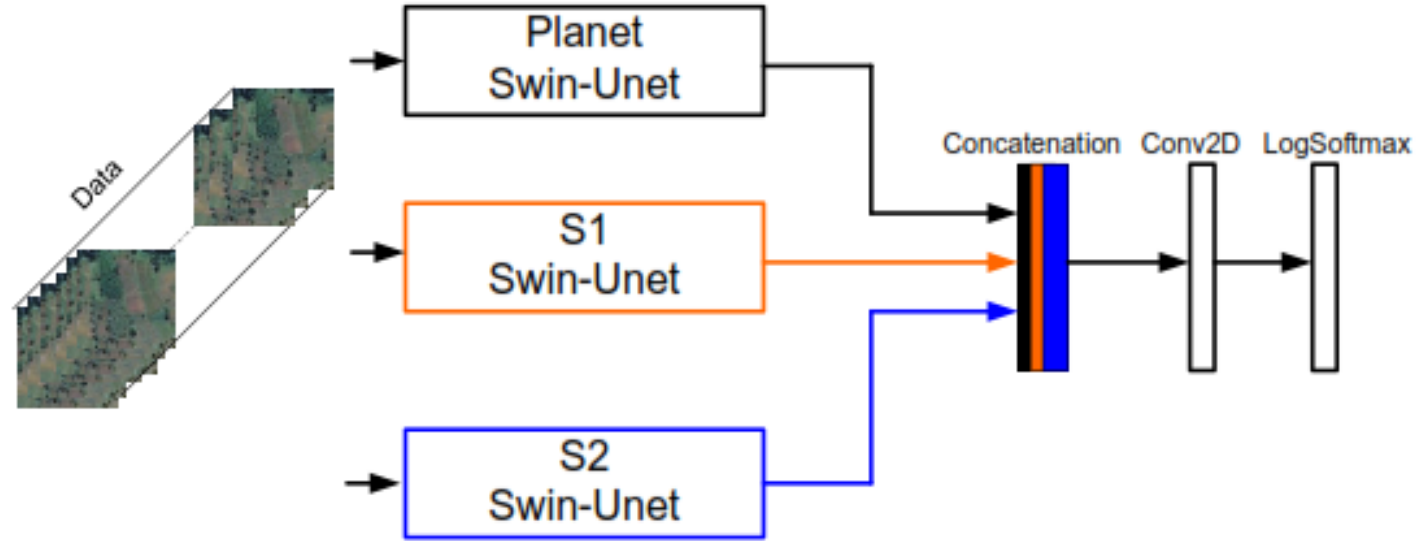


Figure 3: Architecture

Results and discussion

- **Performance metric - accuracy**

Performance	Discussion
Our approach: 93.6%	<ul style="list-style-type: none">- Achieved higher general accuracy.- Biased on non-cropped areas.
Related work: 60.9%	<ul style="list-style-type: none">- Performed well on classifying crops.- Did not report performance on non-cropped areas.

Table 1: Performance results

- Attention-based approach is also useful in analysing satellite data for small fields.
- Flexible Swin U-Net architecture enabled numerous experimentations.

Conclusion

01

Attention-based Approach

- Focused on enhancing performance for smaller agricultural fields
- Achieved fair general performance

03

Data Augmentation Exploration

- Recommend investigating various data augmentation techniques

02

Spectral Bands in Focus

- Current work centered on spectral bands
- Suggests exploring different spectral indices for future research

Thank You!