Semi-supervised Segmentation in Remote Sensing Image

Presented by [redacted]

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[redacted]

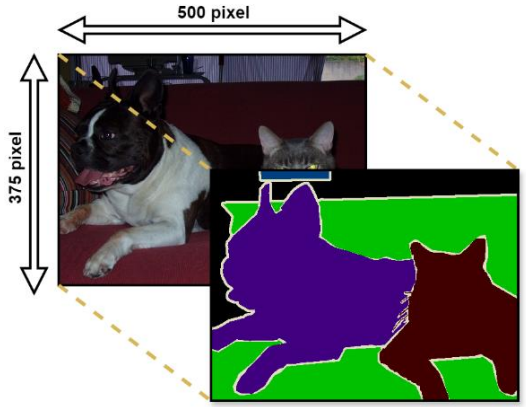
Question

- What is the different between remote sensing image and general image?
- Why we need the remote sensing image?
- What is semi-supervised segmentation and why we need it?

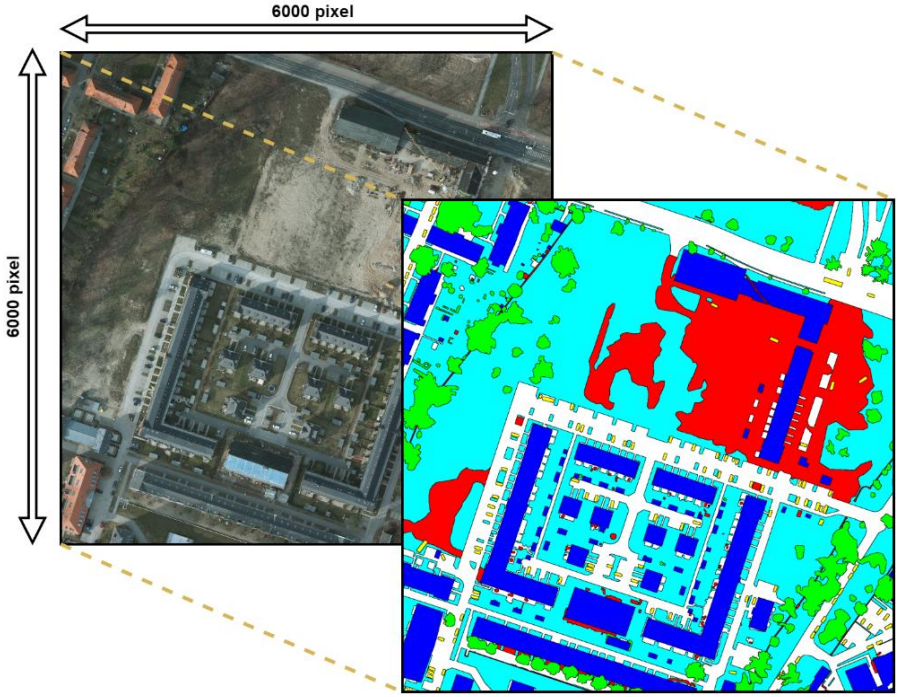
Remote Sensing Image

- Environment Monitoring
- Urban Planning
- Precise Agriculture
- Water Resources Management
- ... …

Why semi-supervised Segmentation?



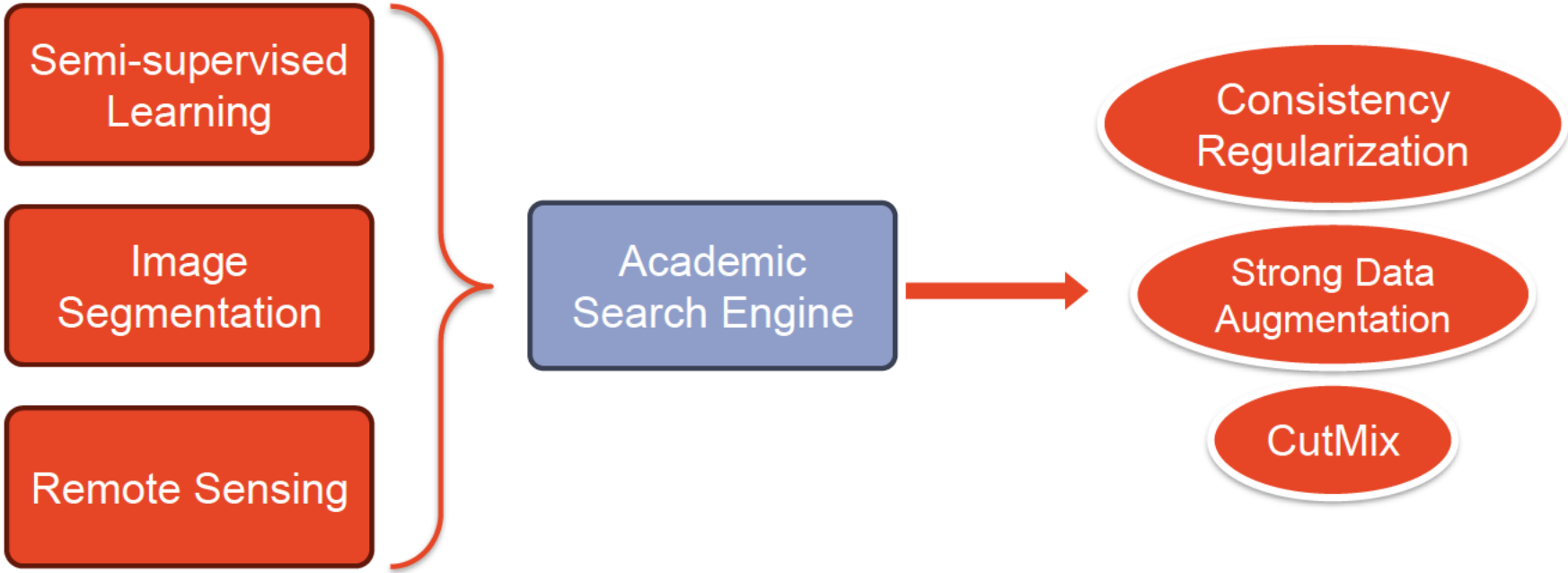
Easy Annotation



Labor-intense Annotation

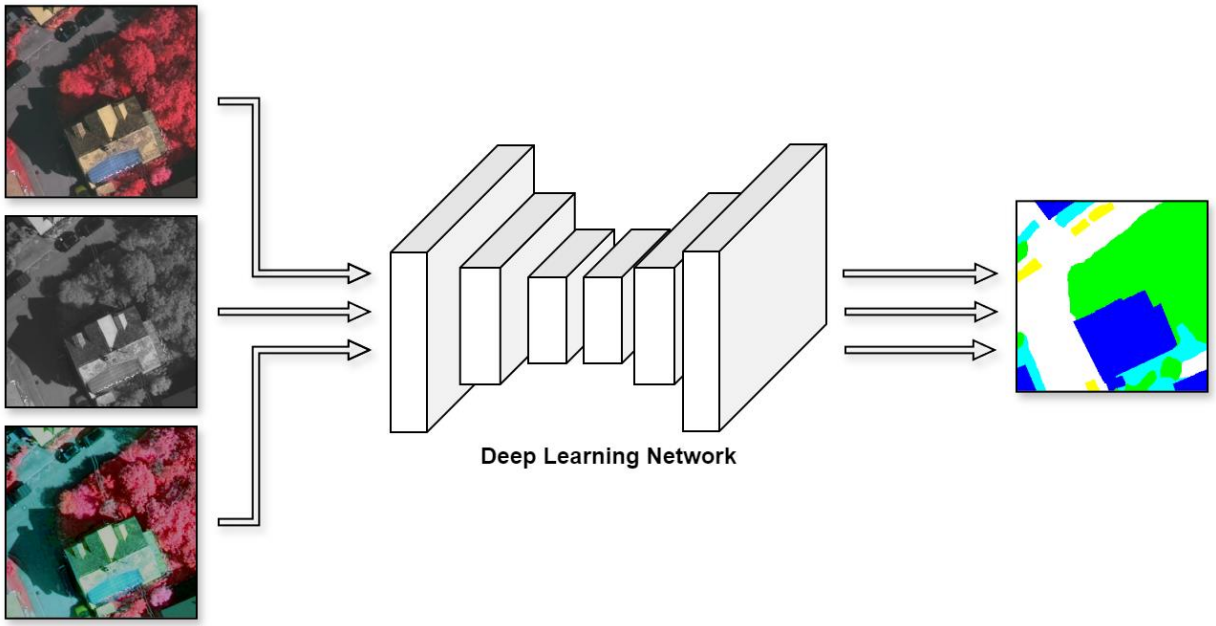
Literature Review

Literature Review

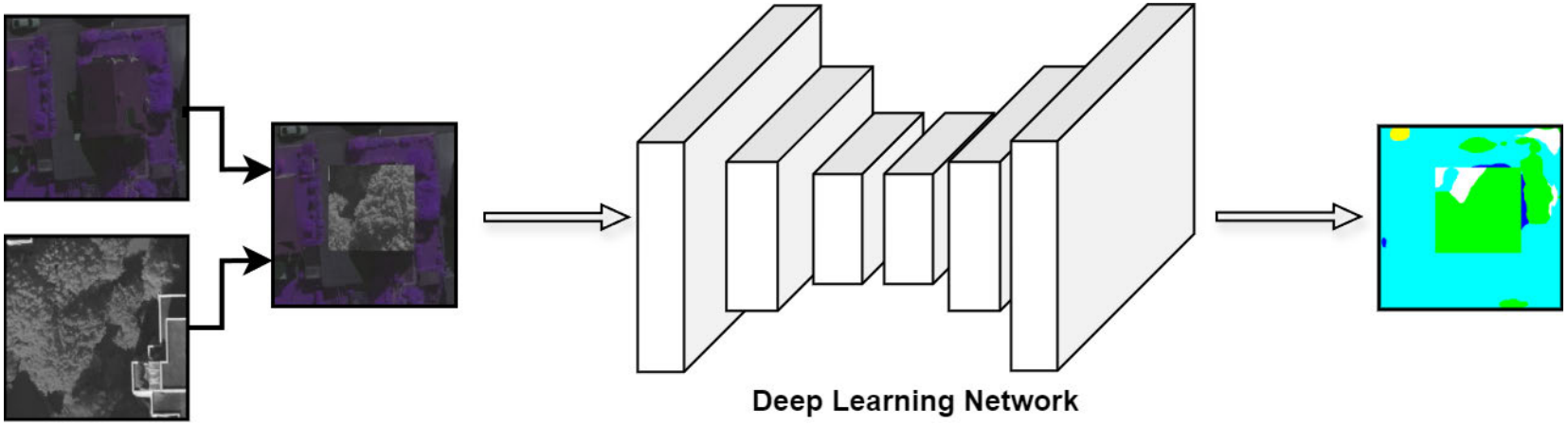


“The prediction of one input should remain **consistent** under **different perturbation**.”

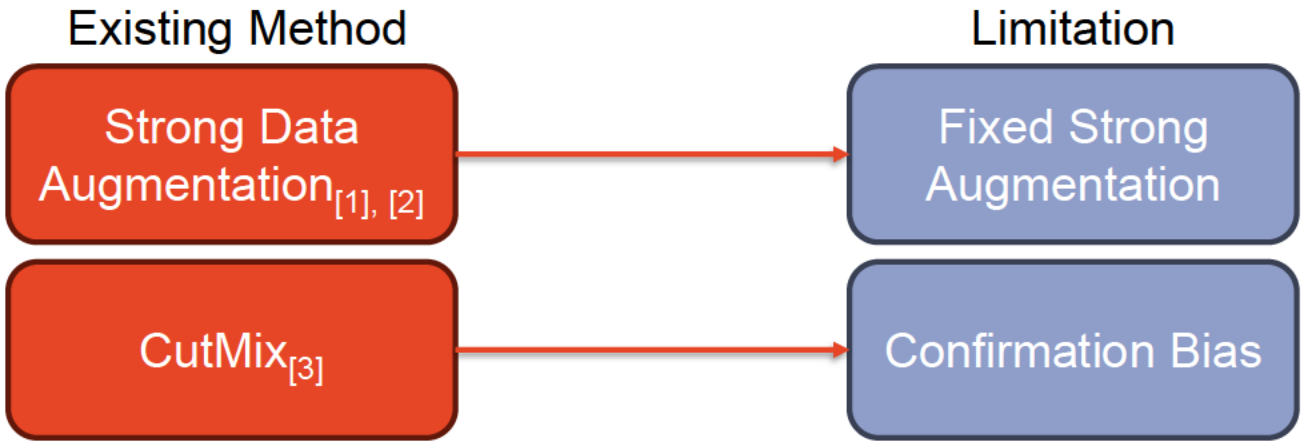
Consistency Regularization: Strong Data Augmentation



Consistency Regularization: CutMix



Gap

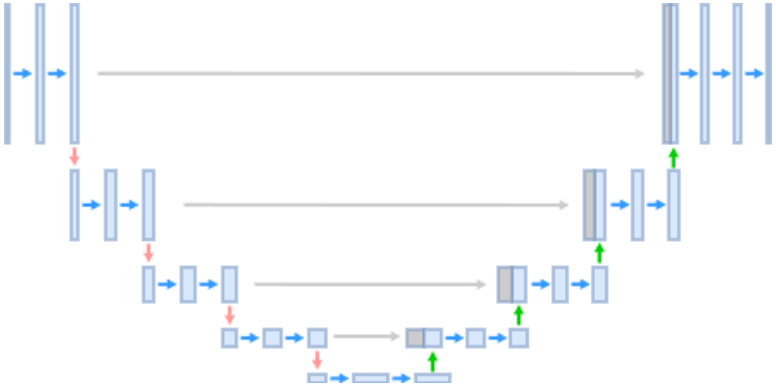

Existing Method
Limitation
Strong Data Augmentation[1], [2]
Fixed Strong Augmentation
CutMix[3]
Confirmation Bias

Research Method

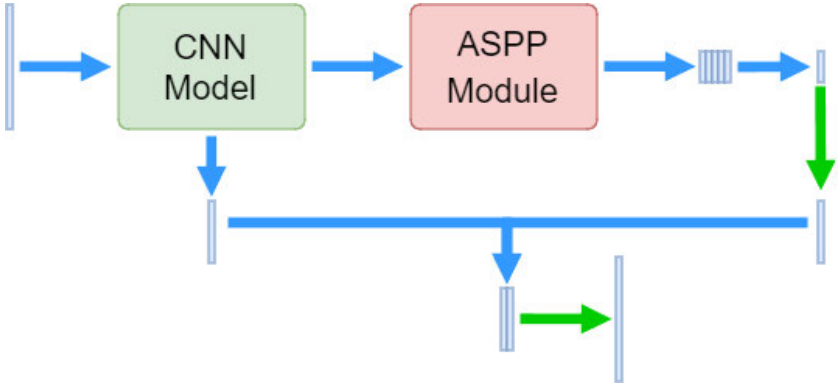
Dataset

Dataset	Number of Image	Resolution	Number of Class	Data Format
Vaihingen	33	1,996 x 1,995 ~ 3,216 x 2,550	5	TIF
Potsdam	38	6,000 x 6,000	6	TIF
DFC22	766	2,000 x 2,000	12	TIF
iSAID	1411	455 x 387 ~ 12,029 x 5,014	15	PNG

Backbone Model



UNet[4]



Deeplabv3+[5]

Idea of Proposed Method

Uniform Strength Augmentation

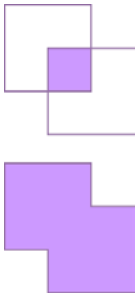
Augmentation technique with uniform strength, simplifying the fine-tune process and increasing the performance.

Adaptive CutMix

Apply CutMix according to the capability of the current model

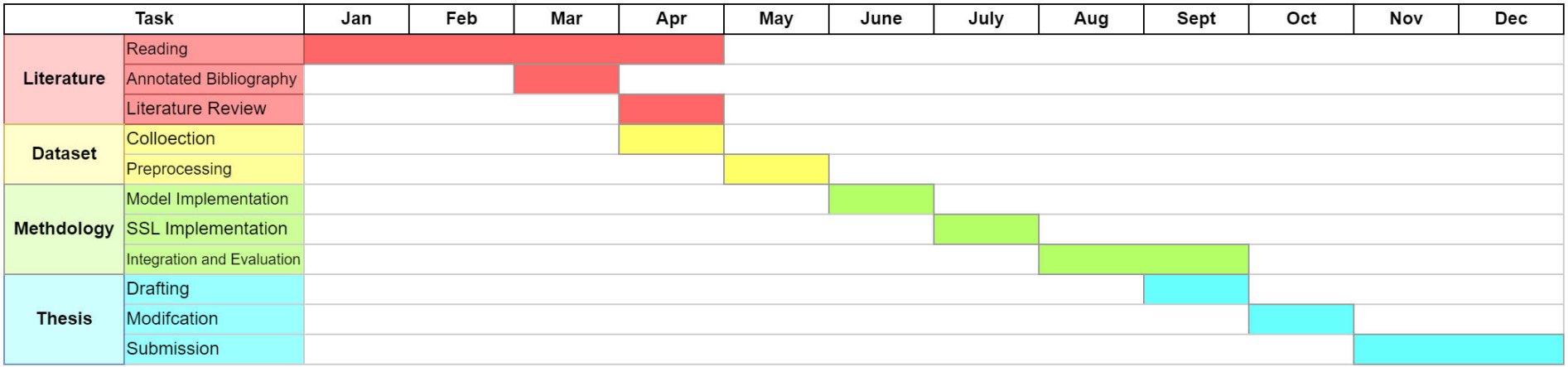
Evaluation Metrics

$$Intersection\ over\ Union = \frac{Area\ of\ Overlap}{Area\ of\ Union}$$



$$F1\ Score = \frac{2 \times Precision \times Recall}{Precision + Recall}$$

Task, Plan and Timetable



Reference

[1] Lu, X., Jiao, L., Li, L., Liu, F., Liu, X., Yang, S., ... & Chen, P. (2023). Weak-to-strong consistency learning for semisupervised image segmentation. *IEEE Transactions on Geoscience and Remote Sensing*.
[2] Xin, Y., Fan, Z., Qi, X., Geng, Y., & Li, X. (2024). Enhancing Semi-Supervised Semantic Segmentation of Remote Sensing Images via Feature Perturbation-Based Consistency Regularization Methods. *Sensors*, *24*(3), 730.
[3] Wang, J. X., Chen, S. B., Ding, C. H., Tang, J., & Luo, B. (2021). RanPaste: Paste consistency and pseudo label for semisupervised remote sensing image semantic segmentation. *IEEE Transactions on Geoscience and Remote Sensing*, *60*, 1-16.
[4] Ronneberger, O., Fischer, P., & Brox, T. (2015). U-net: Convolutional networks for biomedical image segmentation. In *Medical image computing and computer-assisted intervention–MICCAI 2015: 18th international conference, Munich, Germany, October 5-9, 2015, proceedings, part III 18* (pp. 234-241). Springer International Publishing.
[5] Chen, L. C., Zhu, Y., Papandreou, G., Schroff, F., & Adam, H. (2018). Encoder-decoder with atrous separable convolution for semantic image segmentation. In *Proceedings of the European conference on computer vision (ECCV)* (pp. 801-818).

Thanks For Listening