Multi-Scale High-Resolution Vision Transformer for Semantic Segmentation

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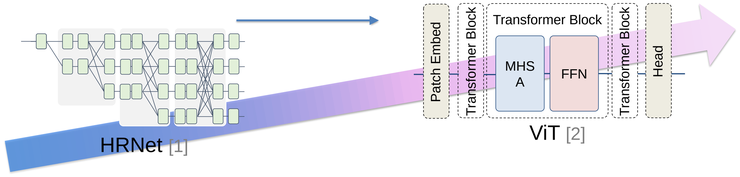
Introduction & Motivation

➢ **Performance** vs. **Efficiency** trade-off in **dense vision tasks**

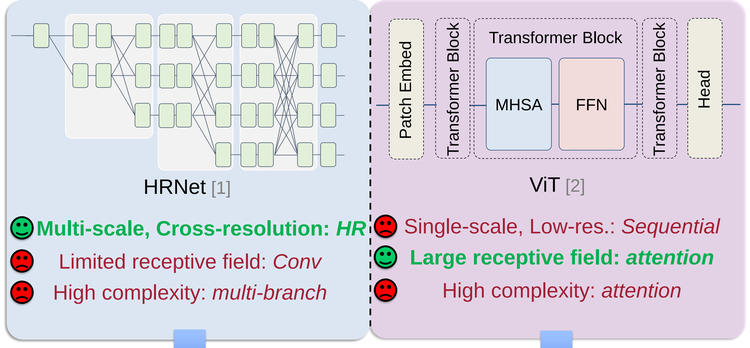
- **Low hardware cost on edge devices**
- **High-performance detection, segmentation, etc.**

➢ **CNN** **Vision Transformer**



➢ How to ***inherit*** from **HRNet** and **ViTs** and ***evolve***?

Directly merge HRNet + ViT: **prohibitive cost**



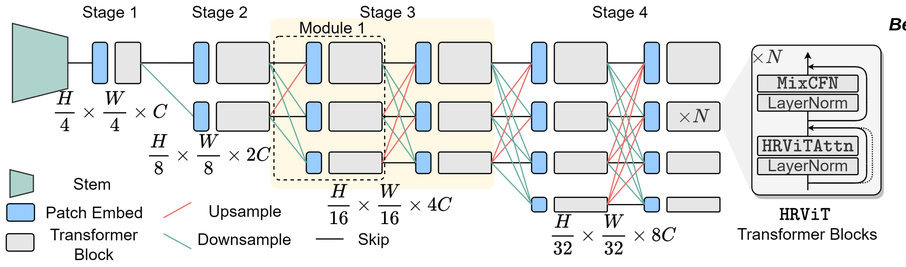
inherit Multi-scale, Cross-resolution ..... HR/multi-branch

Large receptive field ..... Self-attention

evolve ***High efficiency*** ..... ?

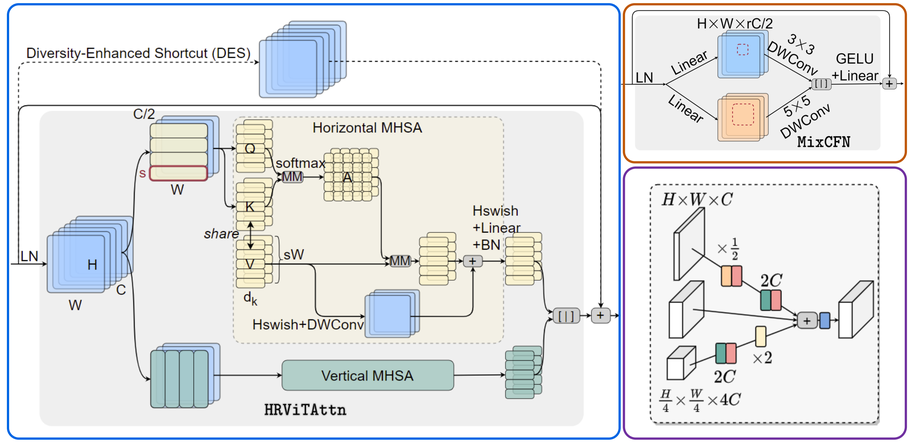
Need **synergistic customization**

Proposed HRViT Architecture



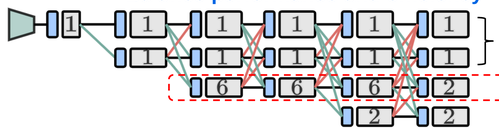
➢ ***Efficient block optimization***

- **Augmented attentions** + **Mixed-scale FFN** + **Cross-resolution fusion**



➢ ***Heterogenous branch design***

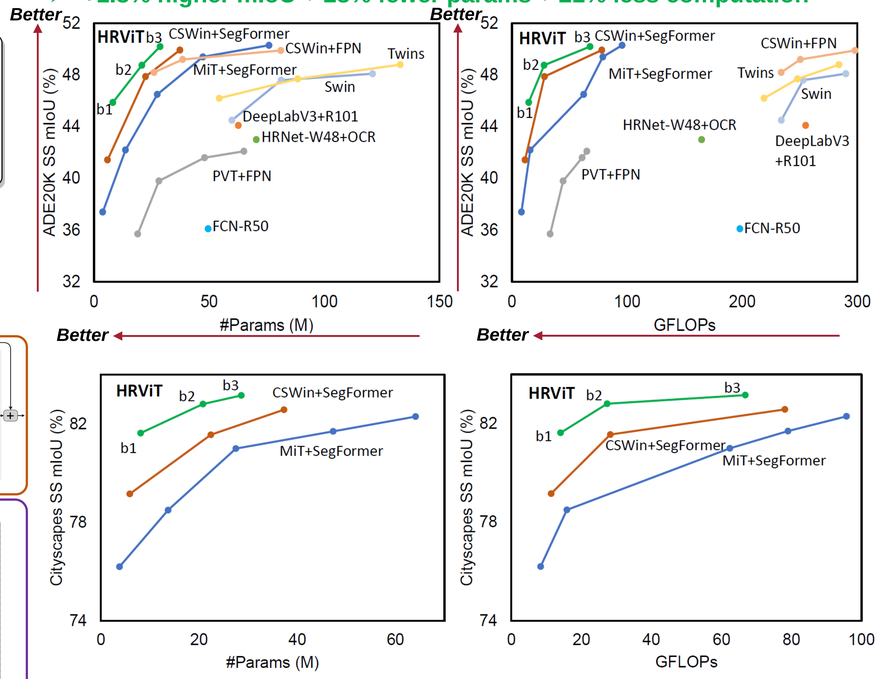
- Customized window size, branch depth, MLP ratio, #channels, etc
- **Balance performance and efficiency**



Res.	#Params	FLOPs	Features
HR	Low	Heavy	• **Fine-grained** • **Local**
MR	Mid	Mid	• **High Expressivity**
LR	High	Light	• **Global view**

Semantic Segmentation on ADE20K / Cityscapes

➢ **+1.8% higher mIoU + 28% fewer params + 21% less computation**



Conclusion & Future Direction

➢ ***Multi-scale representation learning*** is critical to ViTs

➢ ***Co-optimization*** is the key to balancing performance and efficiency

➢ Extend to more dense prediction vision tasks + deploy to **edge** devices

Open-source: github.com/facebookresearch/HRViT

References

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[3] E. Xie, et al., "SegFormer: Simple and Efficient Design for Semantic Segmentation with Transformers," NeurIPS, 2021.
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