ZERO-SHOT NEURAL ARCHITECTURE SEARCH (NAS) METHOD BASED ON A MULTI-ARCHITECTURE SEARCH SPACE

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What ?

This work investigates Zero-shot Neural Architecture Search (NAS) in a multi-architecture search space that jointly includes CNN, Transformer, and hybrid CNN–Transformer blocks.

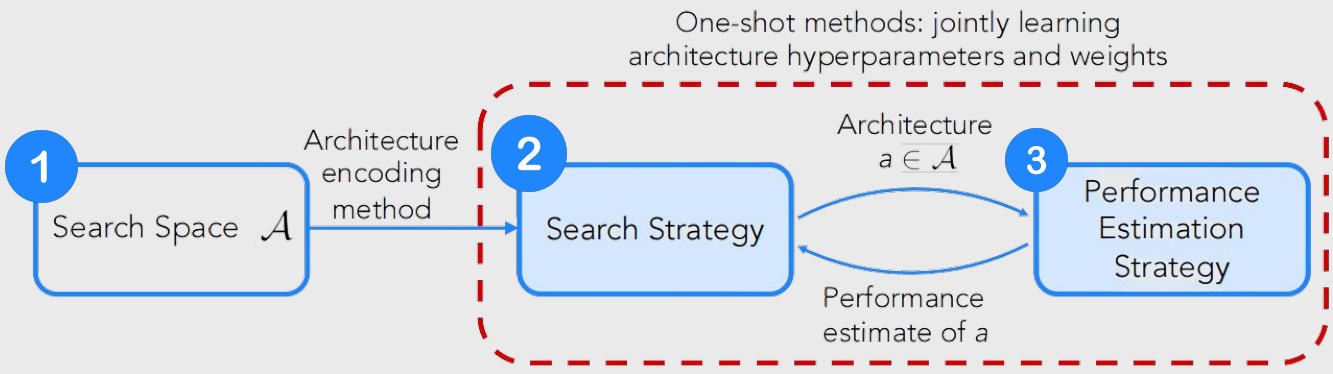
Instead of training and evaluating each candidate architecture from scratch, we focus on gradient-based zero-shot NAS, where architectures are assessed using proxy metrics derived from a shared supernet, significantly reducing computational cost.

Why ?

- Manual design of hybrid CNN–Transformer architectures is complex and expertise-dependent.
- Conventional NAS is computationally expensive and difficult to scale.
- Zero-shot NAS enables fast and low-cost evaluation of architectures.
- Hybrid architectures show strong potential in medical image analysis, yet remain underexplored in NAS research.

Overview

We propose a gradient-based zero-shot NAS pipeline over a hybrid CNN–Transformer search space, building upon and extending ideas from BossNAS, BossNAS++, ElasticViT, and HCT-Net.



Description

1. Hybrid Search Space Design

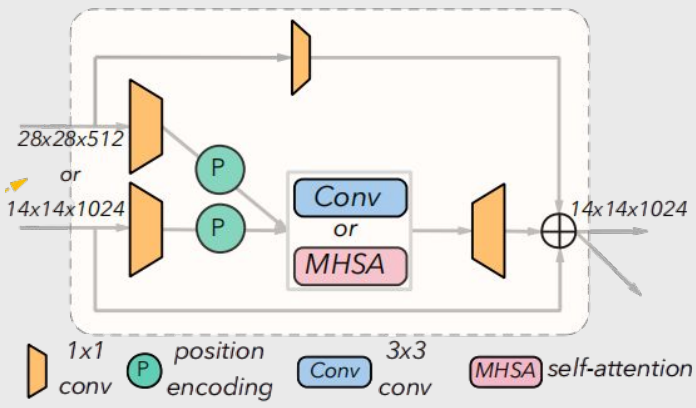
- Construct a block-level and layer-level search space
- Combine convolutional operators and self-attention modules
- Enable flexible CNN–Transformer composition

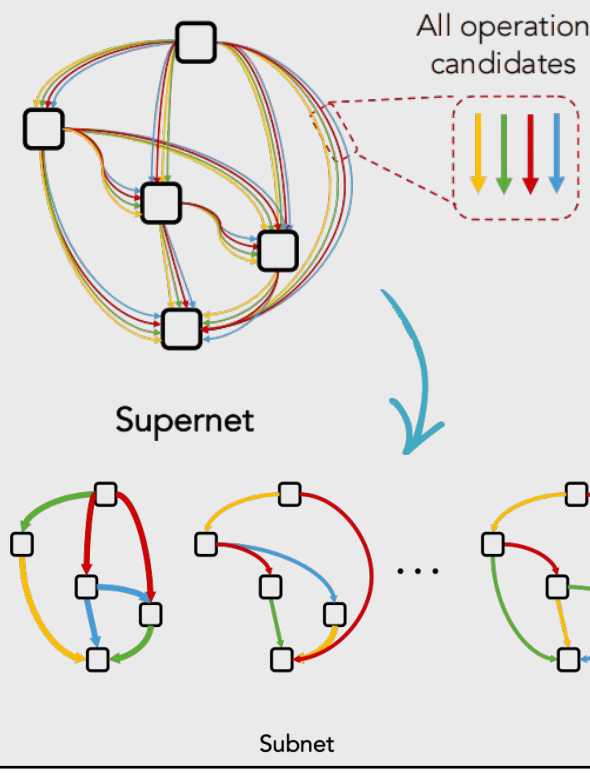
2. Zero-Shot Gradient-Based NAS

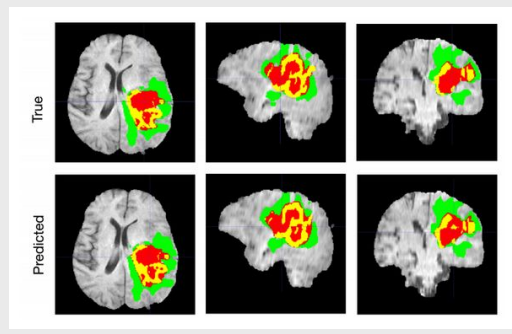
- Train a shared-weight supernet
- Evaluate candidate architectures using zero-shot metrics
- Avoid full training during search

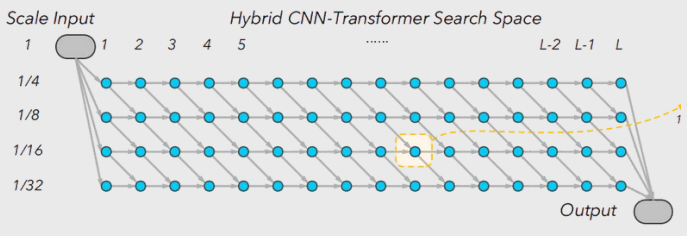
3. Evaluation & Application

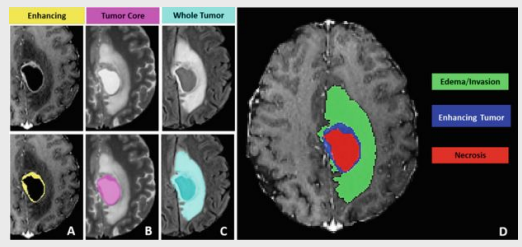
- Compare searched architectures with existing NAS baselines
- Validate performance on medical imaging benchmarks
- Analyze accuracy, complexity, and search efficiency











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