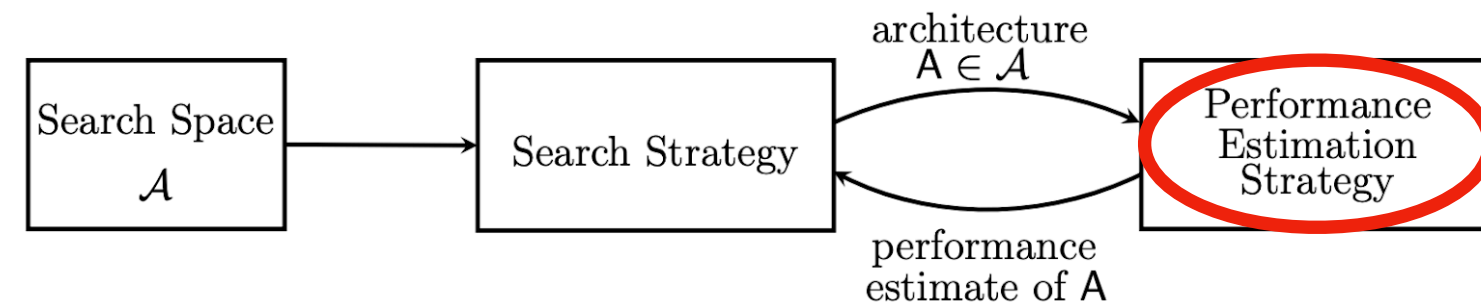


Zen-NAS Ability & Applicability Evaluation

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Introduction

Network Architecture Search (NAS) is to automatically design a network architecture that achieves the best result given the certain task.



“**Enormous computational cost**” is the core problem faced in NAS.

Motivation

Zen-NAS is a **training-free** method with high accuracy on ImageNet and low computational cost compared to state-of-the-art performance.

NAS	Method	Top-1 (%)	GPU Day
TE-NAS [7]	ZS	74.1	0.2
OFANet [5]	PS	80.1	51.6
EfficientNet-B7 [50]	Scaling	84.4	3800†
Zen-NAS	ZS	83.6	0.5

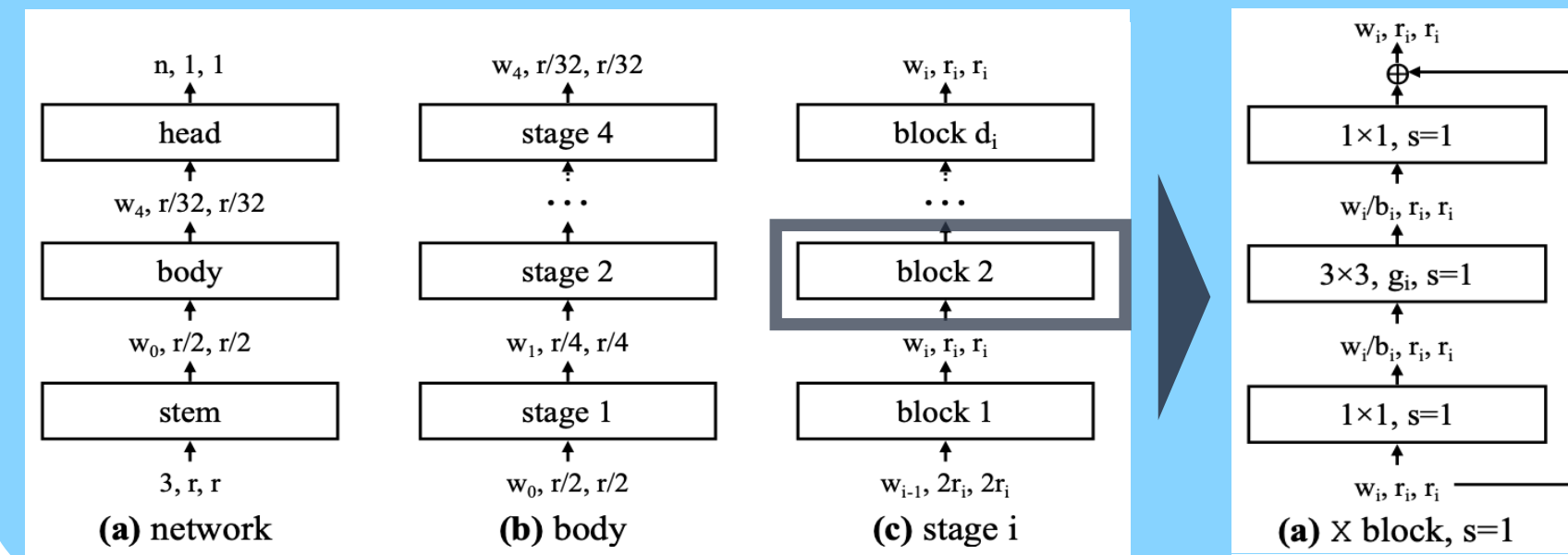
Whether Zen-NAS method could be applied in different search spaces would be helpful in NAS research.

Reference

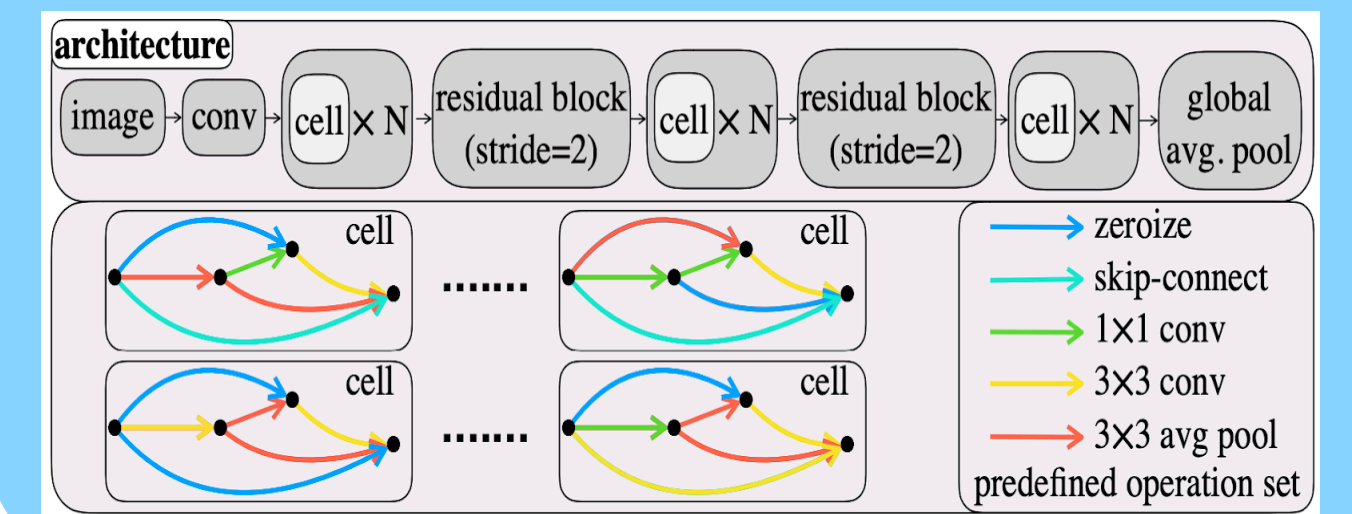
- [1] Zen-NAS: A Zero-Shot NAS for High-Performance Deep Image Recognition (ICCV 2021)
- [2] Designing Network Design Spaces (ICLR 2020)
- [3] NAS-BENCH-201: EXTENDING THE SCOPE OF REPRODUCIBLE NEURAL ARCHITECTURE SEARCH (ICLR 2020)

Background

Zen-NAS evaluates the architecture by computing **zen-score**[1]. The search space of Zen-NAS is **RegNet**[2]:

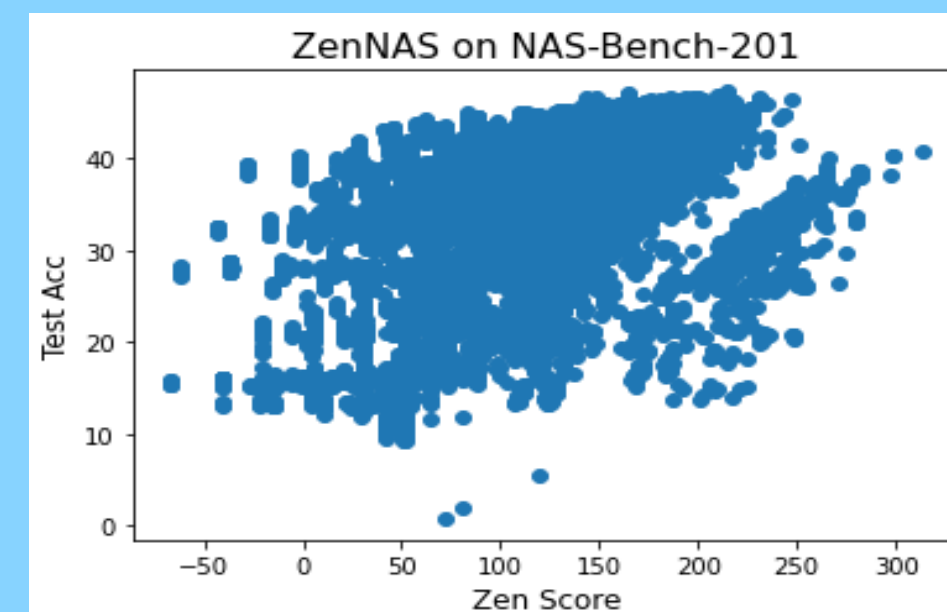


To examine Zen-NAS applicability, we applied it on **NAS-Bench-201** search space[3], which is one of the most popular benchmark in recent NAS study:



Hypotheses & Experiments

The accuracy, however, drop when testing on ImageNet dataset.

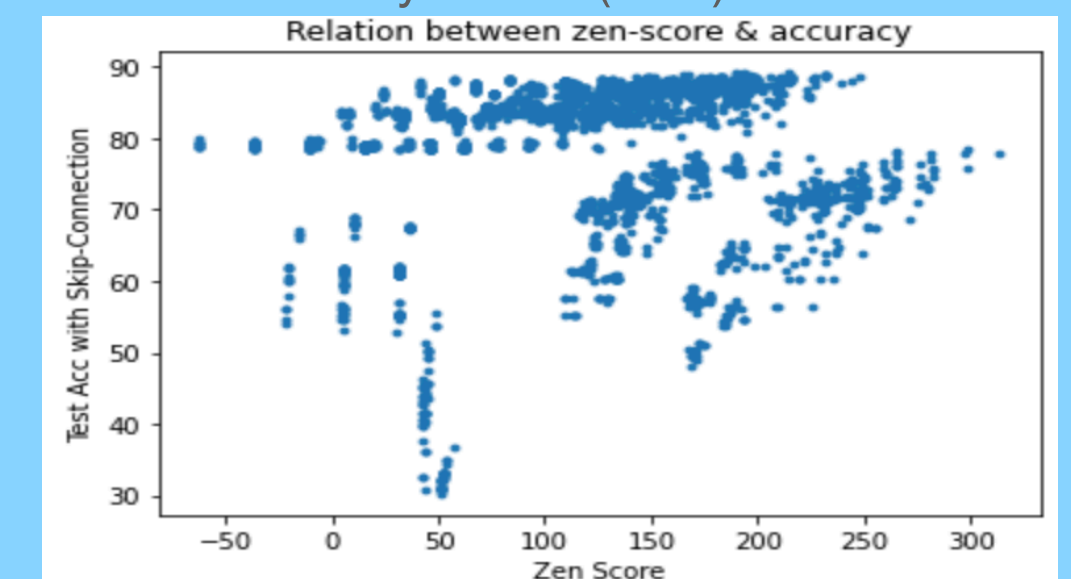


The main differences between RegNet & NAS-Bench-201:

RegNet	NAS-Bench-201
Channel width is a parameter	Fixed channel width
Consist of residual blocks	Based on cell operations
Larger search space (3×10^8)	Smaller search space (15625)

We verify the first hypothesis by checking the skip-connection:

- Average accuracy raises:**
train accuracy: 77.64 --> 80.40
test accuracy: 75.98 --> 78.40
- The **correlation** between zen-score and accuracy is **low** (0.16)



Our future work is to find out in what condition zen-score works well to take advantages of training-free NAS.

Based on the observation, we produce three hypotheses:

- The **skip-connection** operation in NAS-Bench-201 cell is indispensable.
- Zen-NAS only works in **ResNet-like** search space.
- Channel width should be a parameter in search space.