A Appendix

A.1 Effects of Ranks of Shared/Unshared Bases

Figure 5 shows test errors on CIFAR-100 as parameters and FLOPs are increased by varying the number of shared/non-shared filter basis elements of networks. In general, the higher performance is expected with the more parameters. We observe that this presumption is true for shared basis elements. For instance, when the number of shared basis elements s is varied from 8 to 32, the test error sharply decreases from 23.1% to 21.7%. However, non-shared basis elements manifest counter-intuitive results. Although a small number of non-shared basis elements (e.g., $u = 1$) are clearly beneficial to the performance, the higher u's do not always lead to the higher performance. For instance, when $u = 4$, both ResNet34-S16Uu and ResNet34-S32Uu show the worst performance. This result demonstrates the difficulty of training networks with larger parameters. Further study is required for this problem.

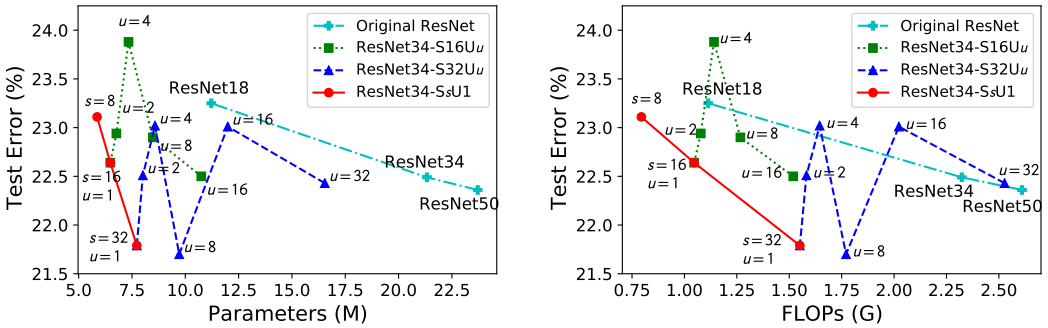

Figure 5: Testing errors vs. the number of parameters and FLOPs on CIFAR-100. The number of shared basis elements (s), and non-shared basis elements (u) are varied. Using more shared basis elements results in better performance. In contrast, using more non-shared elements does not always improve performance, implying the difficulty of training networks with larger parameters.

Checklist

1. For all authors...
   (a) Do the main claims made in the abstract and introduction accurately reflect the paper's contributions and scope? [Yes] See Abstract, Introduction
   (b) Did you describe the limitations of your work? [Yes] In Introduction, we state that we are not pushing the state-of-the-art performance and show the effectiveness of our work only using widely-used models as base models.
   (c) Did you discuss any potential negative societal impacts of your work? [No] Our work is about efficient CNN architecture and it contributes to saving energy consumption. We authors believe that our work does not have negative societal impacts that need to be discussed.
   (d) Have you read the ethics review guidelines and ensured that your paper conforms to them? [Yes]
2. If you are including theoretical results...
   (a) Did you state the full set of assumptions of all theoretical results? [Yes] See Sections 3.1 and 3.2
   (b) Did you include complete proofs of all theoretical results? [Yes] See Section 3.2
3. If you ran experiments...
   (a) Did you include the code, data, and instructions needed to reproduce the main experimental results (either in the supplemental material or as a URL)? [Yes] See supplementary code
   (b) Did you specify all the training details (e.g., data splits, hyperparameters, how they were chosen)? [Yes] See Section 4
   (c) Did you report error bars (e.g., with respect to the random seed after running experiments multiple times)? [No] We mostly use large datasets including ImageNet and MS COCO. It would be too computationally expensive to include error bars.
   (d) Did you include the total amount of compute and the type of resources used (e.g., type of GPUs, internal cluster, or cloud provider)? [No] [Yes] In Section 4, we discuss the type of resources used (PCs with either four 2080Ti GPUs or two 3090 GPUs). Since we are using very typical computing resources and training settings, it seems not worth to mention the amount of compute used and CO2 emissions.
4. If you are using existing assets (e.g., code, data, models) or curating/releasing new assets...
   (a) If your work uses existing assets, did you cite the creators? [N/A]
   (b) Did you mention the license of the assets? [N/A]
   (c) Did you include any new assets either in the supplemental material or as a URL? [N/A]
   (d) Did you discuss whether and how consent was obtained from people whose data you're using/curating? [N/A]
   (e) Did you discuss whether the data you are using/curating contains personally identifiable information or offensive content? [N/A]
5. If you used crowdsourcing or conducted research with human subjects...
   (a) Did you include the full text of instructions given to participants and screenshots, if applicable? [N/A]
   (b) Did you describe any potential participant risks, with links to Institutional Review Board (IRB) approvals, if applicable? [N/A]
   (c) Did you include the estimated hourly wage paid to participants and the total amount spent on participant compensation? [N/A]