S^2NAS: NEURAL ARCHITECTURE SEARCH FOR AUTOMATING ARCHITECTURE ENGINEERING OF SUPERVISED AND SEMI-SUPERVISED GENERATIVE ADVERSARIAL NETWORKS

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Abstract

Generative Adversarial Networks of GANs are a Machine Learning Framework that have been rising in popularity in the research domain due to its vast generation capabilities. This allows the generative models to learn a particular type of data to be generated depending on the dataset it is given. Many applications rose from this concept as researches found new ways to generate new data for many different applications and harness the power of GANs to make applications can even baffle end users. With the growing number of applications and implementations of GANs, many researchers started conducting studies to construct GANs and find new ways of optimizing them. While many researchers have greatly succeeded in their research aims regardless of whether it is to optimize a network, adjust it to new datasets, increase efficiency or compress them to work on smaller hardware, all these scenarios require a large amount of domain expertise considering how complex the architectures of GAN models are.

Neural Architecture Search or NAS is a method that has brought on a considerable amount of success in automating the architecture generation or designing of Artificial Neural Networks. Their most wide known area of success is in the computer vision fields of image classification and image segmentation. Rather than handcrafting a GAN network and the applying various methods for optimizing and compressing GANs, a more promising way of constructing more robust GANs is to automate the entire designing process as proven by benchmark results. This gave way to a new direction of applying NAS for optimizing Neural Networks. Without the need for a very large amount of domain expertise, employing pre-constructed search spaces, search algorithms and performance estimation strategies with the help of powerful GPUs are able to produce GAN models that are either competitive or better than manually constructed GANs in a shorter time period.

After preliminary studies of applying NAS to GANs proved that the domain is complex to experiment in but yielded results worthy of the efforts of a conducted research, a lot of attention turned towards finding faster, robust and more efficient

methods for using NAS for automating architecture generation of GANs. S^{2}NAS presents a novel NAS method that incorporate the use of labeled data to construct powerful GANs which possess the capabilities of supervised and semi-supervised image generation. Equipped with an interactive front-end, S^{2}NAS provides an open-source platform targeted at a wide audience where developers can contribute to the NAS codebase to discover novel GAN architectures, while developers can harness this power from the leaderboard where discovered GANs are uploaded to. NAS for GANs is a domain where prior expertise is required to make contributions or understand the technical aspects. However, as documentation to the technicality of the system is provided beginners too can make use of it. Additionally, the GAN architecture developed using S^{2}NAS was efficient in its supervised and semi-supervised image generation, proving that there is a lot more to be discovered using this system in the NAS for GANs domain.

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Automating Neural Network Architecture Generation

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