



**INFORMATICS
INSTITUTE OF
TECHNOLOGY**

INFORMATICS INSTITUTE OF TECHNOLOGY

In Collaboration with

UNIVERSITY OF WESTMINSTER

**iSegmentor - Automating Generative Adversarial Networks using
Neural Architecture Search for Semantic Image Segmentation**

A dissertation by

Ms. Vayangi Vishmi Vishara Ganepola

Supervised by

Mr. Torin Wirasingha

Submitted in partial fulfilment of the requirements for the BEng (Hons) Software
Engineering degree at the University of Westminster.

May 2021

© The copyright for this project and all its associated products resides with Informatics
Institute of Technology

Abstract

Semantic image segmentation is a crucial task in various fields that use computer-vision based applications. Generative Adversarial Networks (GANs) are attracting widespread interest in the data science community for their prowess in image feature recognition due to their adversarial nature of training. Neural Architecture Search (NAS) is known as the process of obtaining a neural architectural schema that performs the best for a particular task. NAS has been applied in GANs, and it achieved striking success compared to human-designed architectures in conditional and unconditional image generation and GAN-compression. The research was inspired by the success of NAS applied in GANs.

This research project proposes a novel framework for NAS in GANs for semantic image segmentation called iSegmentor. After extensive research on related works, the architecture of the Pix2Pix GAN variant was selected for the proposed approach. The architecture of the Pix2Pix GAN consists of a U-Net as the Generator and a patchGAN classifier as the Discriminator. The NAS component is searched for U-Net architectures using PASCAL VOC 2012 dataset. The NAS component is adapted from using the NAS-Unet research proposed by Weng et al. in 2019. The NAS searched architecture was used as the Generator of the proposed GAN by transferring the searched architecture from the PASCAL VOC 2012 dataset to the Cityscapes dataset. To determine the success of the proposed approach, quantitative analysis was performed with Mean Pixel Accuracy (MPA) and mean Intersection over Union (mIoU) metrics. Several experiments were done on the Cityscape validation set and achieved 81.73 MPA and 71.91 mIoU. Generalisation of the proposed approach was tested with CamVid dataset and achieved 80.41 MPA and 70.63 mIoU. The proposed approach outperformed several NAS in semantic segmentation approaches and GANs in semantic segmentation approaches. This study is a preliminary attempt to apply NAS for semantic segmentation using GANs. Further, this research has raised many possible areas in need of further investigation.

Subject Descriptors:

Image Processing and Computer Vision, Semantic Segmentation

Keywords:

Neural Architecture Search, Generative Adversarial Networks, Semantic Segmentation