**Title**: Computer Vision Assignment - Solution and Approach

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***Problem Statement***:The task at hand involves instance segmentation for clothes using the YOLOv9 model architecture in the deep fashion dataset. This dataset contains a wide range of images depicting various clothing items, making it suitable for training a model to perform detailed segmentation tasks.

***Task Description:*** Instance segmentation refers to the process of identifying and delineating individual instances of objects within an image. In the context of this assignment, we aim to segment different clothing items present in images, allowing for precise identification and localization of each item.

***What I have done:*** I began by downloading the deepfashion dataset and creating a small sample with 500 images, following a 7:2:1 split for training, validation, and testing. Next, I utilized a modular approach to convert the sample dataset into MSCOCO and then into YOLO format, ensuring versatility for future datasets. For adjusting the model hyperparameters, I modified the training file from the specified GitHub repository, incorporating a config file for parameter input and trained a YOLOv9-c model using available GPU/CPU resources. I could not finish the full assignment because I needed more time but I felt very much interested while attempting to do this assignment.

***What I wanted to do:***

Firstly, I planned to start by downloading the deepfashion dataset from the specified link and then create a smaller sample comprising 500 images. This sample would be divided into three sets for training, validation, and testing in a ratio of 7:2:1, ensuring a balanced representation of the data. Following this, I intended to apply various data augmentation techniques such as random rotations, flips, and color adjustments to enhance the dataset's diversity and improve the model's ability to generalize. Once the data was prepared, my next step was to select the YOLOv9-c model architecture for instance segmentation and utilize transfer learning from a pre-trained model to expedite convergence during training. Fine-tuning hyperparameters like learning rates, batch sizes, and epochs was crucial to optimizing the model's performance. Additionally, I planned to incorporate regularization techniques such as dropout and batch normalization to prevent overfitting and enhance model generalization. After training the model, I aimed to evaluate its performance using metrics like Mean Average Precision (mAP) and Intersection over Union (IoU) on both the validation and test sets, allowing me to analyze its strengths and areas for improvement. The final steps involved converting the trained PyTorch model to the ONNX format using the provided exporter and optimizing it for deployment on Intel hardware using the OpenVINO toolkit. Implementing optimizations such as model quantization and layer fusion would enhance the model's inference speed and efficiency. Lastly, I planned to visualize the model's predictions on sample test images to validate its segmentation accuracy and thoroughly document the entire solution approach, code implementation, hyperparameter tuning details, performance analysis results, and model conversion steps for future reference and continuous learning.

***Key Challenges***:One of the key challenges I faced was the lack of prior knowledge in certain topics, which required me to learn from scratch. These topics were not covered in the college curriculum, nor did I encounter them during my previous projects in deep learning. However, I attempted to tackle these challenges by diving into the necessary concepts, researching extensively, and experimenting with hands-on implementation. Despite the initial hurdles, this experience allowed me to broaden my skill set and deepen my understanding in areas that were previously unfamiliar to me.

***Embracing Challenges:*** I am deeply committed to continuous learning and growth, especially when faced with new and challenging concepts. While encountering topics outside my previous exposure, I found the process of delving into unfamiliar territories both intriguing and rewarding. The opportunity to expand my knowledge base and tackle complex problems excites me, and I am eager to immerse myself in projects that push the boundaries of my understanding. I believe that facing challenges head-on not only enhances my skills but also fuels my passion for innovation and problem-solving. Therefore, I am enthusiastic about working on projects that offer the chance to learn, explore, and contribute meaningfully to the field.  
  
***References***

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