INTRODUCTION

The development of technology in the current digital era has made significant progress, which has an impact on increasing sophistication in various aspects of life. Currently, companies are striving for excellence to compete in an increasingly globalized marketplace. Graphic design has a very important role in marketing strategies for many companies, one of which is in the field of advertising. In the field of advertising, companies use advertising posters to promote a product. The poster acts as a medium to convey information to the audience [1]. Advertising posters are often considered a simple promotional medium. However, graphic designers need a lot of time to complete many poster designs.

There are several important aspects in creating a poster design, one of which is the layout [2]. The arrangement of information in a poster can influence the reader to navigate the message that the poster will convey. A cluttered layout makes it difficult for readers to navigate the information [2]. Therefore, the placement of poster components such as images, titles, subtitles, or other components is very important to be considered by graphic designers because it can affect the layout of a poster. A good layout will draw the audience's attention to the important information in a poster. However, manually placing the poster components takes a considerable amount of time. This poses a challenge for graphic designers to produce attractive poster layouts in large quantities. Therefore, this limitation requires a solution that can automate the layout design process.

Some companies that require advertising posters for promotion will need a system that can automate the layout design process, especially in terms of component placement. This system is used to produce large quantities of posters efficiently. In recent years, a growing number of generative modeling-based methods have become a solution to this challenge**.** Generative models such as Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs) have successfully generated diverse and high-quality layouts [3], [4], [5], [6]. LayoutVAE and LayoutGAN are the main methods that utilize GAN and VAE to produce a graphic layout or scene [3], [4], [6]. LayoutGAN is the first approach that applies a generative model (GAN) to generate a layout [3]. The LayoutVAE method proposes an autoregressive method based on Conditional VAE by using Long Short-Term Memory (LSTM) to collect information related to the predicted bounding box [4]. LSTM cannot model the relationships of all components explicitly, so LayoutVAE has difficulty generating layouts with many components. In addition, the method used in the content-aware layout generator utilizes GAN to model complex layout distributions and proposes a semantic embedding network to encode multi-modal contents and structural/categorical attributes in the design [5]. Although these approaches are successful in producing realistic layouts, the methods used have limitations in modeling the spatial relationships between components contained in a graphic design layout. This causes the method to be unable to place components in the layout based on spatial relationship information between components in the design.

The Neural Design Network (NDN) method is one of the successful methods in generating layouts in graphic design by placing components according to component labels and relationships

between components in graphic design layouts [7]. The NDN method represents the position relationship of components in a graph and uses a Graph Neural Network based on Conditional VAE to generate a layout [8]. The first step in the NDN method is to build a complete graph to represent the relationships between all the components in the layout. The distribution of relationships between these components is studied using VAE based on Graph Convolutional Network (GCN) [9]. The relationship labels between the components are extracted using heuristic rules to learn the layout distribution. This makes NDN susceptible to ambiguity in learning the layout distribution, hindering the model's performance in generating accurate layouts [9].

In addition to successfully generating layouts in graphic design, another generative model-based method was used to control the position of objects in a natural scene image [10], [11]. To generate a layout in a nature scene image, the graph can be used as a scene description to control the composition of the resulting image [11]. Previous research proposed a scene graph to describe the relationship between objects in the scene where nodes represent objects in the scene and edges represent spatial relationships between objects [10], [11]. The SG2IM method successfully performs layout generation for natural scene images by processing the scene graph as input [10]. In addition, the SGTransformer method is also successful in generating a scene layout based on the generalization ability of the transformer to process the scene graph through a multi-head attention mechanism [11]. By using a scene graph as input, both methods can generate a scene layout that contains many objects and relationships between objects [10]. Both approaches have been successful in organizing the position of objects in the scene layout but are still not widely explored for layout in graphic design.

This research aims to produce a layout generator system that focuses on the placement of components in the poster layout. The placement of these components will be organized by a layout graph. Layout graphs are used to explicitly describe the necessary components and positional relationships between components contained in a poster layout. Nodes represent the necessary components while edges represent the spatial relationship between components [7]. This research uses the SGTransformer method which will be trained on the advertising poster dataset. SGTransformer has a good ability to understand the structure and geometric relationships in the graph so that it can produce a structured layout [11]. The method generates a layout by calculating the attention on neighboring nodes and edge features in the graph.

Our contribution to this research is to collect advertising poster datasets from social media. Then, the dataset is used to train the SGTransformer model which was previously only used on natural scene image datasets [11]. In previous research, the SGTransformer method was trained so that it could produce the layout of a natural scene image based on the input scene graph**.** In this research, we focus on the method to produce layouts in graphic design specifically for advertising poster layouts so that we conduct SGTransformer training on the dataset that we have collected. This research consists of five stages, namely, data preparation, data preprocessing, building layout graphs, model training, and evaluation. The training stage is carried out to train the model used to produce a layout that can be organized using a layout graph. In the end, it will be evaluated how

well the SGTransformer model performs in placing components to produce a structured and quality poster layout. The SGTransformer model evaluation results will be compared with SG2IM [10] to see how well the SGTransformer model performs in generating layouts.