

# A "Smart" Way to Design Future Smartphones

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## 1. Introduction

The mobile phone industry is one of the most innovative and rapidly developing field within Information and communications technology (ICT). Technical change and new product proliferation have made this industry extremely dynamic, even if market shares are highly concentrated in the hands of very few companies [1]. To make profits and improve their competitiveness in the market, these manufacturers keep renewing their design of the mobile phones and launch new versions of smartphones frequently. However, most modern smartphones follow Apple's iPhone design, which can generally be described as a large screen, a notch, and no headphone jack. In this project, we are going to design a smartphone appearance using deep learning techniques to see if these models can generate some surprisingly creative designs and break the "traditional" design.

There have been some related works done previously that use deep learning methods to design transitional items, such as chairs. The chair project [2] by Philipp Schmitt is a similar work focusing on designing a chair by deep learning models. In this project, a DCGAN [3] using 600 training images was trained and produced hundred of designs. Then, designers were presented with those generated chairs and tried to draw sketches based on them. The final results were miniature prototypes of four chairs and they looked creative and realistic at the same time. Figure 1 is an example of AI design.



Figure 1. Chair Design

## 2. Motivation

For this recent decade, smartphone technologies have become so embedded in people's life that we would have trouble doing virtually anything for one day without them. Besides sending messages and making phone calls, smartphones nowadays can play music, take photos, keep track of schedules and appointments, and anything that you can think of. The appearance of smartphones has also dramatically changed throughout the past twenty years. Before the 2010s, most smartphones have explicit number buttons for people to type. However, with the introduction of iPhone to the mobile phone's market, there are no longer any number buttons on the phones; what's remaining is a home button and a screen. Everything is no longer physical, but in digital mode. Furthermore, the development of smartphones is extremely fast. Apple releases a new version of iPhone almost annually, with a slightly different design choice each time. Now, iPhone 11 has been released!



Figure 2. Smart phones [4]

Due to smartphones' rapid spread and transformation in the digital market, many scientists and industry experts are predicting what mobile phones will look like in future years and decades. Some scientists predict that holographic displays and flexible frames would appear for future phones [5], and others believe that phones would have bigger screens. Similarly, our group is interested in exploring the design choice of future phones using the deep learning tools, given the mobile phones' design and appearance in

the past decade. By applying deep generative models and neural networks, we would like to know in advance how the mobile phone are designed in the future, not only in years, but also in decades. This would be an interesting project to explore; and we could compare our predicted models and the real smartphones to see whether our prediction is accurate when it's released.

### 3. Evaluation

The ideal result for this project will be an image of a smartphone from the future designed by the Deep Learning model. It should look different from existing smartphones in some ways while still look like a smartphone. Since the dataset is limited and the quality of training samples is not guaranteed, the criteria above should be fair enough for this project. There's no standard to define the success of the project, but hopefully, the result can be entertaining and enlightening for smartphone designers and users at the same time.

## 4. Resources

### 4.1. Dataset

The dataset this paper will use will be collected by authors using python scripts. Those python scripts are supposed to find images for all smart phones from all different companies worldwide since the invention of smartphones.

### 4.2. Computational Environment

Pytorch [6] will be used as the computational tools for this project as it provides convenient ways to construct models for deep learning easily. For the hardware, only one AMD's GPU is available, which may not help much without CUDA [7]. As a result, Google Colab might be preferred as it provides free cloud GPUs for the heavy computation.

## 5. Contributions

Tz-Ruei Liu and Kyle Wang plans to collect images for smartphones through web scraping. Zhilin Wang will be responsible of generating new models based on existing models using different types of deep learning tools.

All three members will explore the body of work, including feature engineering, model implementation, as well as optimization. We will also divide the report evenly among group members.

## References

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