An investigation on the feasibility of Shoe Size Recognition Model

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Due Date: May,31, 2020

1 Introduction

1.1 Overview of the Project

Fashion retail is a highly competitive market, where stock management is an significant factor in companies' competitiveness. Precise sales forecasts are therefore important for this environment to succeed. If sales forecasting is unreliable, stock or summary circumstances may arise that directly and instantly affect the competitiveness of the business. If the sales forecast is not correct, situations of stock or overstock can occur that will have a real and tangible impact on the profitability of the business [6]. The effect is not limited to performance in profitability, since an inefficient predictive system can also affect the Quality of Customer Service. For instance , if a customer faces a stock-out situation, he can choose to shop with another distributor[2]. Furthermore, it is also known that a long range of suppliers (such as suppliers of raw materials, manufacturers , distributors and retailers) in the fashion industry are involved in order to place orders before the level of demand for the products is properly understood[3].
Sales predictions are a complex topic given their importance because the quality of a product depends heavily on the personal savor of the customer, which varies widely[7]. Furthermore, the lifecycle is usually very short, replacing new products every new season without any historical sales figures. Fashion collections also consist of a huge number of different products in many different sizes, which are consistent with many different storage units[5]. Precise sales forecasts are therefore essential for planning and business improvement. This paper is focused on the improvement of the stock management by analysing the demands of the customer. To avoid the overstocking and under stocking the company needs to know its customers needs on a deeper level. This work is focused on identifying the shoe size of the customers that visit Takkie Town Store in order to understand what shoe sizes needed to be stock for different types of shoes.

1.2 Objectives of the Project

The objectives of this project is to:

- Develop a Machine Learning Model with trained with still side images of different shoe sizes and shapes.
- The model will convert the length of the shoe in the image, and convert it to standard UK shoe size which customers in South Africa use to identify their personal shoe size.
- The ML model will use the video feed to predict the shoe sizes that entered the store over a given(n) period of time. The data collected, shoe size,timestamp and frequency will be uploaded into a Hadoop File System (HDFS), along with data provided from the retailer such as actual sales and purchase order data
- The data in the HDFS will be used for Business Intelligence (BI) and Analytic. This data can

assist the retailer to get an actual customer profile in terms of the size shoes the customers wear that is visiting the specific store. This will aid in demand forecasting when the retailer replenish their shoes stock levels. Visualisation of the data will be through Reports and Dashboards for user friendly interpretation

1.3 The Need for the Project

With increasing competition, each retailer needs to correctly cope up with the impending demand. The retail firms need to take into account various factors including the lead time and the seasonality of goods. The project is focused on the improvement of the stock management by analysing the demands of the customer. To avoid the overstock-ing and under stocking the company needs to know its customers needs on a deeper level. This work is focused on identifying the shoe size of the customers that visit the Store in order to understand what shoe sizes needed to be stock for different types of shoes.

1.4 Overview of Existing Systems and Technologies

In this section, we review some of the recent video-based recognition methods. In video face recognition, given a test video of a moving face, the first step is to track a set of facial features across all the frames of the video. From the tracked features, one can extract a few key frames that can be used for matching with exemplars in the gallery. Significant work has been done on face tracking using 2D appearance-based models [8]. The 2D approaches; however, do not provide the 3D configuration of the head, and are not robust to large changes in pose or viewpoint. To deal with this problem, several methods have been developed for 3D face tracking. Cascia [4] proposed a cylindrical face model for face tracking. An extension of this work was proposed by Aggarwal [1] that uses a particle filter for state estimation. 3d face recognition system consists some of the use cases that can be implemented in the Shoe Size Recognition Model. But Shoe Size Recognition Model is mainly concerned with Shoe size features, unlike the face recognition system which contains face features.
Main Technologies associated with Shoe Size Recognition Model:

- Keras
- Scikit-learn.
- Tensorflow
- Diagram and design tools (Visio, Nclass, Draw.IO, Microsoft project)
- Video/Camera

1.5 Scope of the Project

Main actor of this system:

- Store manager / Administration staff

Main use cases associated:

- View statistical details

1.6 Deliverance

A Shoe Size Recognition Model. This consists of different classifications and functionalities for various stage. For example sizes of different types(formal,sandal, boots etc.), Since many number of things that are involved, different statistical details will be provided for different shoe type size.

2 Feasibility Study

2.1 Feasibility Financial

The Shoe Size Recognition Model consist of multimedia data transfer, bandwidth required for the operation of this application is very low.
The model will follow the freeware software standards. No cost will be charged from the potential customers. Bug fixes and maintaining tasks will have an associated cost. At the initial stage the potential market space will be the local stores.
Beside the associated cost, there will be many benefits for the customers. Especially the extra effort that is associated stock management will be significantly

reduced while the effort to create descriptive statistical reports will be eliminated, since reports generation is fully automated. From these it's clear that the project is financially feasible.

2.2 Technical Feasibility

The main technologies and tools that are associated with Shoe Size Recognition Model are:

- python
- Google colab
- Airtable
- Keras
- Scikit-learn
- Tensorflow
- Diagram and design tools
    1. Draw.IO,
    2. Visio,

Each of the technologies are freely available and the technical skills required are manageable. Time limitations of the product development and the ease of implementing using these technologies are synchronized.
From these it's clear that the project is technically feasible.

2.3 Resource and Time Feasibility

Resource feasibility Resources that are required for the project includes

- Programming device (Laptop)
- Programming tools (freely available)
- Programming individuals

So it's clear that the project has the required resource feasibility.

2.4 Risk Feasibility

Risk feasibility can be discussed under several contexts.
Risk associated with size:

- Amount of reused software:
  Though the main logics are implemented throughout the project, The model will use some JSP libraries to incorporate additional functionalities such as to support file uploads.
- Number of projected changes to the requirements for the product? Before delivery? After delivery:
  The requirements are clearly identified before the implementation phase. Being a general product (not specific to a single user) the requirements will be changed only if new functionalities are added to the system.

Business impact risks:

- Reasonableness of delivery deadlines:
  Being a 14 weeks project, the project will have several deadlines and deliverables that are scheduled successively. Depending on the coding and designing cost and effort, the deadlines are quite reasonable.
- Amount and quality of product documentation that must be produced and delivered to the customer:
  Customer will be provided with a complete online user manual. As the software is implemented as a freeware and open source system, the code will be available for free.

Customer related risks:
Shoe Size Recognition Model is a general type of product (not designed just for a single store). Before implementing the system in a store, there will be some basic modifications required.
Development environment risks
Is a software project management tool available? Airtable will be used as the main project management tool.

Are tools for analysis and design available? The model will require designing software and Draw.IO (database design) will be used for that.

Process issue risks

Shoe Size Recognition Model will follow the Agile software development process. This provides the flexibility to accommodate changing software requirements of Shoe Size Recognition Model .

Technology risks

Is the technology to be built new? All the technologies are very well established and old enough (but not obsolete).

2.5 Social/Legal Feasibility

Shoe Size Recognition Model uses freely available development tools, and provide the system as an open source system. Only the maintenance cost will be charged from potential customers. JSP Software libraries that are used in this system are free open source libraries. Since this new system eliminates the effort to make statistical distributions, it will have a great impact in a fashion industry.

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