CISC-372 Project Proposal

Shoulder Implant X-Ray Manufacturer Classification

Shanglin Mo		shanglin.mo@queensu.ca
Simon Zhou		simon.zhou@queensu.ca

Background & Motivation:
Shoulder replacement surgery, also called total shoulder replacement, is a common and complex surgery in Orthopaedics discipline. It involves replacing a dead shoulder joint with an artificial implant. In the market, there are many artificial implant manufacturers and each of them may produce different implants with different structures compared to other providers. The problem arises in the following particular situation: suppose a patient has some problems with the shoulder implant accessories and the manufacturer of that implant may be unknown to either the patient or the doctor. Correct identification of the manufacturer is the key prior to the treatment.

Problem Description:
The key problem/scenario is described in the previous part. The goal for this project is given an X-ray image of a shoulder implant, the model will tell us what manufacturer that shoulder implant belongs to. We are going to use the Convolutional Neural Network for this task. In particular, we will try some modified-CNN like ResNet and VGG-16.

General Solution:
In this dataset, there are 4 different manufacturers: Cofield, Depuy, Tornier and Zimmer. Hence, this task is a multi-class classification problem where the model will return one of these four categories as the result. There are many machine learning algorithms for classification problems, for example: KNN, Logistic regression, Tree-based model and Neural Network. We will try some non-neural network models and focus on the Neural Network model.

Potential Dataset:
We found this dataset via UCI Machine Learning Repository. The dataset contains 597 images with each image is 8-bit grayscale and with various dimensions in JPEG format. There are 83 images from Cofield, 294 images from Depuy, 71 images from Tornier and 149 images from Zimmer. Each image has a name which indicates its category. The performance metric we are going to use is accuracy because in the real-life scenario, the patient will get the correct treatment if and only if the doctor could correctly identify the manufacturer of the shoulder implant. Moreover, efficiency is also very important in terms of the model running time. Therefore, accuracy and efficiency are important in this task.