

## ❖ Project Goal and Objectives

### ▪ Motivation

Our team's motivation for creating this application is to gain experience and understanding of big data analytics through image processing and recognition algorithms. We intend to apply the techniques learned throughout the semester in order to correctly identify new images supplied by the user. These techniques are expected to include a visual question answering API (Clarifai), a machine learning approach (Apache Spark), and a deep learning approach (Tensor Flow).

### ▪ Significance/Uniqueness

This application will be unique because it will expand upon projects done in image recognition and deep learning to include images of Kansas City. It will also provide an app for a user in which they use their phone's camera to capture images of monuments and ask for an identification of them. As far as we know, this has not been done. It is significant because it could improve the experience of tourists and residents alike to help them discover KC. It could be expanded to include any city. It also will explore machine and deep learning, which are at the leading edge of technical innovation [1].

### ▪ Objectives

Our objective is to create an Android application in which a user can capture an image of a fountain or public artwork in Kansas City. Some possible training images are available at the City of Fountains website [2]. The app will be able to answer questions such as "What is this?", "Who is the artist?", "What does the piece represent?", etc. The user will then have an interactive experience that helps them learn about things they see around them in real time. We also intend to compare the accuracy and time efficiency of the different image recognition techniques: Clarifai, Spark, and Tensor Flow.

### ▪ System Features

The system will include an Android application that will enable the user to take a picture on their phone. The intended targets for this app are fountains, sculptures, and perhaps buildings around Kansas City. The app will identify the image, possibly using the phone's GPS to improve accuracy, and answer a user's questions about the object. Some built-in answers might be the name, date, and artist or architect of the object, but the system may also be able to answer some on the fly questions about the object itself (e.g. how many floors is the building). The user may be able to save these answers to tag their photo.

## ❖ Related Work

There have been several apps created that use image recognition, though we don't believe there is one for local monument identification. Some examples include Leafsnap, an iPhone app for identifying plants (which also uses GPS to improve accuracy); Meal Snap, another iPhone app that identifies foods and gives their caloric content; ArtMatch, which identifies well-known artworks from an Art.com database; Skin of Mine, which looks at and identifies potential issues with moles and freckles; as well as several different apps for comparison shopping if items and text translation [3]. In 2005, the International Conference on Computer Vision held a "Where am I?" contest in which projects identified untagged images and their locations [e.g. 4]. Lastly, work was done to identify an artist based on a visual analysis of a painting's brushstrokes [5].

The biggest app is the one developed by Google, the Google Arts & Culture. It collaborates with over 1200 international museums, galleries and institutions from 70 countries to make their exhibits available for anyone. [6]

## ❖ Backup Project

The system will identify a dog breed by its pictures. This also includes mixed breed dogs, which will also contain some character of the pure breed. This will help the shelter mark the dog breeds for adoption (since they don't do DNA test on each dog for breed identification). The deep learning system can make better identifications than humans based on appearance, and this will help the shelters make a consistent dog breed guess.

## ❖ References

1. LeCun, Yann, Yoshua Bengio, and Geoffrey Hinton. "Deep learning." Nature 521.7553 (2015): 436-444.
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3. Leckart, Steven. "What is That? Let Your Smartphone Take a Look." The New York Times. August 31, 2011. Accessed January 29, 2017 at <http://www.nytimes.com/2011/09/01/technology/personaltech/mobile-apps-make-it-easy-to-point-and-identify.html>
4. <http://dmartinec.altervista.org/demolCCVC05/results.html>
5. Johnson, C.R., Hendricks, E., Berezhnoy, I., Brevdo, E., Hughes, S., Daubechies, I. Li, J., Postma, E., and Wang, J.Z. "Image Processing for Artist Identification." IEEE Signal Processing Magazine (July 2008): 37-48.
6. [https://play.google.com/store/apps/details?id=com.google.android.apps.cultural&hl=zh\\_TW](https://play.google.com/store/apps/details?id=com.google.android.apps.cultural&hl=zh_TW)