Visual Recognition

VisRec JSR

Expert Group - Introduction

Zoran Severac - DeepNetts

    Researcher at AI Lab, Dept for Software Eng, Univ of Belgrade, Serbia

    Founder of Java Neural Network Open Source Project

    Java Champion, NetBeans Dream Team

Sandhya Kapoor - IBM

    Senior Technologist - IBM Cognitive Computing
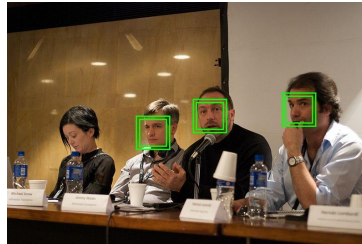
    AI and Deep Learning

Frank Greco - Crossroads Technologies

    Java Champion, NYJavaSIG Chairman

    Enterprise and Cloud Architect

Summary Statement

To simplify and standardize Java APIs for detecting, recognizing and annotating images.

Importance of Machine Learning

Forbes: Machine Learning Is Revolutionizing Sales and Marketing

- 76% of companies say they are targeting higher sales growth with machine learning
- At least 40% of companies surveyed are already using machine learning to improve sales and marketing performance
- 38% credited machine learning for improvements in sales performance metrics

Machine Learning is generating growth and driving innovation

Visual Recognition

retail experience

medical imaging

Why image recognition is about to transform business

satellite imagery

self-driving cars
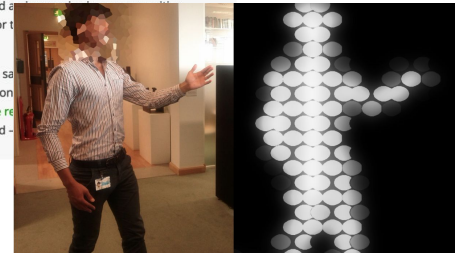
augmented reality/vision

Why is this important for Java?

- Machine Learning is a huge industry trend

- Wide business implications for all applications across devices for many years

- Visual Recognition (VisRec) is an important subset of ML

- Java needs to play a major role in both VisRec and ML

What do Java Developers Need?

- A standard, easy-to-use and flexible set of high-level VisRec APIs

- Well-defined APIs essential for robust system architecture

- Ease of development and portability

- High-level abstractions for sustainable development of products and protect developers from lower-level changes (with hooks allowing lower-level access)

- Building *custom* Image Classifiers (not just using pre-trained Classifiers)

Existing Solutions?

- Existing Frameworks, Packages and Libraries
  - OpenCV, BoofCV, OpenIMAJ, ImageJ, DeepLearning4J, Weka, RapidMiner, etc...
- Existing Services and Engines
  - IBM Visual Recognition (Watson)
  - Google Cloud Vision (TensorFlow)
  - AWS Rekognition (Deep Learning)
  - Microsoft Computer Vision

Issues with Existing Offerings

- Wide, disparate collection of open-source and proprietary ML engines, toolkits and packages

- Using different image classes, different algorithms and implementations, very often with native dependencies

- Each has its own set of APIs

- Reduced Portability for Image Recognition Apps

- Reduced Portability for lower-level Bitmap, Image, etc, pixel-level manipulation

- Some Toolkits are very complex for Average Java Developer

Our Plan

- Technical Strategy

Classification, ML Workflow and Evaluation **Machine Learning Layer**

Detection   Recognition   Annotation **Visual Task Layer**

Implementation of the high level visual recognition tasks **Implementation layer**

- Transparency
  - Github Repo - https://github.com/sevarac/VisualRecognitionApi
  - Email list - https://groups.google.com/forum/#!forum/visrec-jsr
  - Wiki - https://github.com/sevarac/VisualRecognitionApi/wiki

Example usage

Building an image classifier

```java
ImageClassifier imageClassifier = new Dl4jImageClassifier();
Properties prop = new Properties();
prop.put("imagesPath", "/home/zoran/animals");
prop.put("imageWidth", "100");
prop.put("imageHeight", "100");
imageClassifier.buildClassifier(prop);
```

Using the image classifier

```java
ImageRecognitionResults results = imageClassifier.classify(new File("00060.png"));

for(ImageRecognitionResult result : results) {
    System.out.println(result);
}
```

Status of Implementations

- Reference Implementations - DeepLearning4J, DeepNetts

- Working Implementations - Watson Visual Recognition Service

Interfaces	Classifier, Detector, Recognizer, Annotator
Abstract classes	ImageRecognitionProvider
Utility	ImageFactory

Tentative Schedule

JSR submittal	March 2017
Early Draft Review	August 2017
Public Draft Review	November 2017
Proposed Final Draft	March 2018
Final Approval Ballot	April 2018

Sponsors and Advisors

IBM

Ed Burns - Oracle

Guillaume LaForge - Google

Jim Weaver - Pivotal