Visual Analytics

Machine learning for computer vision white paper

S-BigAnalytics™ is a collection of machine learning apps by Sensor Analytics Australia/

Machine learning augments computer vision, in particular unsupervised machine learning, by lowering the human operator dependency for video analytics (VA). The green rectangles, that appear during object/facial recognition, are no longer necessary as the work normally assigned to human operators is taken over by the computer algorithm. This added machine autonomy opens up new application pathways and provides a very cost effective platform.

Machine learning for analysing video or image repositories is made available in a simple to use GUI. It's an Apache Spark™ and Apache Zeppelin based framework, setup within a virtual machine and accessible through a standard web browser. This simple interface hides the true power and complexity of framework while delivering remarkable results effortlessly. Behind the GUI is a big data framework, which can fully utilise a single powerful server or a number of server nodes in a cloud. This two-way scalability allows processing of long videos and very large image repositories for power users.

Use Case

This application takes away the human eyeball requirement for finding atypical events (anomalies). Work that can takes hours if not days can be batched to this app for processing and results obtained in a matter of minutes in most cases. On a personal computer this app can analyse 1000 images in approx. 15 seconds. For millions of images or batches of long videos, the app can be vertically or horizontally scaled-up in a single super-server or multi-node cloud with Spark clustering for faster turn around.

Technical Information

SAA's VA algorithm in a nutshell starts with conventional dimensionality reduction of the surveillance video frames. The reduced images are converted into Graph Neuron (GN) patterns. These GN patterns are then analysed with K-Means (a variation to K-NN approach published earlier) to effect Hierarchical GN style (conflict-free) pattern association. The resulting episodic associative memory is used for VA, including just-in-time analysis.

Basic VA application comprises a S-BigVA™ dApp, an open source framework, provisioned as a single VirtualBox *ready-to-use* appliance by SAA, and a GUI. The later is provided by user's own web browser. An appliance is called a unit server as each instance of this virtual machine constitutes a compute unit for the S-BigVA™ decentralised application. These compute units can be pooled together in a *Serverless P2P* network, so as to seamlessly increase storage and processing-power as more compute units get added to this cloud.