TANGONET SSUUTIONS

Video Analytics Solutions with Applied Artificial Intelligence, Machine Learning and Computer Vision Technologies

Video analytics and Computer Vision technologies are related fields that involve the analysis, understanding, and extraction of information from video/image content using advanced algorithms and techniques.

By applying Artificial Intelligence and Machine Learning techniques to these areas, meaningful information can be extracted to help businesses make profound changes.

To do that, it's necessary to use specialized expertise, technologies and to build large and diverse datasets for training data models, use existing models or a hybrid between the 2.

At Tangonet Solutions we have applied these techniques to help build analytical data models and extract meaningful insights for diverse use cases. These solutions involve image/video-based and data capture models using different techniques and technologies chosen to meet the needs of the specific use case.

Our expertise in this area is based on delivering solutions in the following areas:

1. Vehicular traffic monitoring, control and violation detection (video). From general movement (velocity detection, Stop light/Stop sign and parking violations) to traffic density analysis, license plate recognition and post processing of fines and KPI analysis using advanced dashboards, we have successfully deployed solutions that increase safety along the roadways. For this use case Computervision and several open-source components were used.

2. **AI-ML Image-Based Food Recognition and Analysis Platform (images)**: The use case objective was to identify the types of prepared food that was presented on an individual's plate, detect (through advanced RGB and Infrared camera technologies) food class, volume, density and other markers to extract a nutrition label, similar to what is found on packaged foods. Additional data points including histograms for pixel by pixel analysis of the food surface.The project was carried out using a hybrid of ML models and AWS-based AI/ML services.

In the first phase of the project (Proof of Concept), the ML/AI algorithms consistently achieved 94%+ accuracy in the recognition of the food type, classes, weight, volume. This was done using a relatively limited dataset.

3. **Mobile (Aerial) Object Detection and Tracking (video and images)**: The use case incorporated machine learning techniques such as computer vision with convolutional neural

networks and RNN-LSTM, running in real-time for monitoring purposes and triggering alarms within seconds upon detecting airborne object intrusions, and to promptly act upon the intelligence regarding RF activity within their property perimeters in areas such as airports, government locations, and prisons. Computervision, AWS and Python among other technologies were used to build this solution.

Technology Solutions and Components Used:

The technology stacks and tools used vary from use case to use case. Our approach to use the best set of tools that aligns with the use case objectives.

• Model Development:

Algorithms: ML algorithms for tasks such as regression, classification, clustering, and inference development. Frameworks and Libraries: Tools used include TensorFlow, PyTorch, OpenCV developing and implementing ML models and Python, Docker, Kubernetes for algorithm development and deployment. Off the shelf video cameras and specialized hardware including single-board computers, RGB and infrared cameras.

• Cloud / DevOps:

A diverse set of tools are used for integrating AI and ML into the development process - using AWS infrastructure as well as services such as Sagemaker, Lambda, Rekognition, Augmented AI built on AWS (EC2, S3, RDS) to provide the infrastructure, using Terraform for automation, for processing thousands of images and videos.

• Data/Data Science:

The role includes data collection and cleaning - identifying and importing relevant data from diverse sources, including databases, APIs, and external datasets, model development and statistical analysis. Data platforms such as Grafana and Splunk in addition to cloud-based data services and languages such as R and Python are used.

Other Use Cases Currently in Progress include:

- Tuna Classification Model (image) to objectify the grading and analysis of Tuna by species and grades as well as other metrics related to quality and health.
- Factory- level analysis/Shop floor activities (video) The use case involves the video analysis of activities carried out by the maintenance team with Time, Manpower Required and Production and various other throughput metrics to be captured.

