Projects

Academic

1. HUMAN ACTIVITY RECOGNITION

Objective: Developed human activity recognizer to interpret the gestures or movements of the human body via sensors and to determine human activity or action.

Description: The accuracy achieved in the project is 95% operating ensemble models. The Human Activity Recognition dataset was built from the recordings of 30 study participants performing activities of daily living (ADL) while carrying a waist-mounted smartphone with embedded inertial sensors. The objective is to classify activities into one of the six activities performed.

Technology used: Python, MLFLow, Scikit-Learn, Seaborn, Matplotlib, Tensorflow, Keras, Streamlit

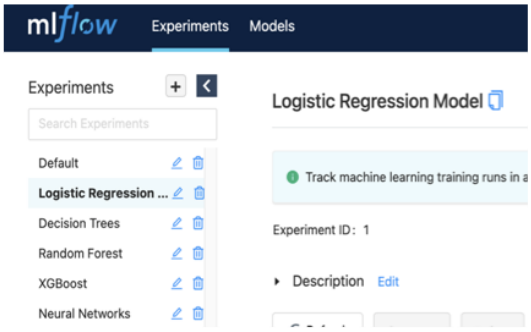
Models Developed: Deep Neural Networks(ANN), K Nearest Neighbors, Decision Tree, SVM,Gradient Boosting Classifier (Xgboost) and Logistic Classifier, and Random Forest.

Results:

For Tracking and Logging Model Parameters: MLFlow

Simplifies end-to-end machine learning lifecycle.

Name	Value
test_accuracy_score	0.957
test_f1_score	0.955
test_log_loss	0.245
test_precision_score	0.957
test_recall_score	0.957
test_roc_auc_score	0.995
test_score	0.957



2. PNEUMONIA DETECTION FROM CHEST X-RAYS

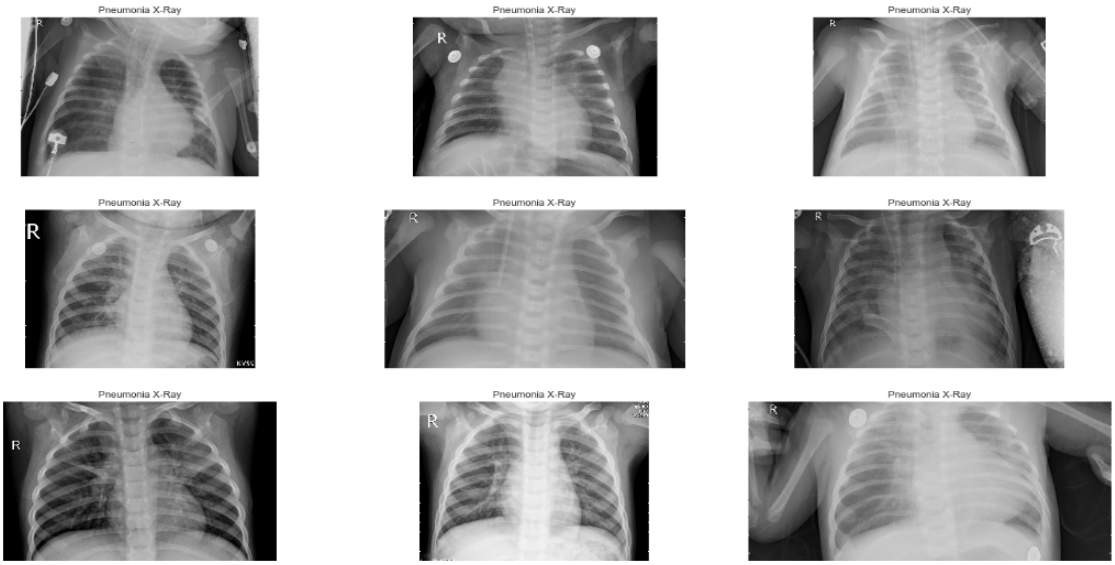
   Objective: Developed a model using neural networks to assist the radiologist to classify the chest X-ray for the presence and absence of Pneumonia.

   Description: Evaluated F-1 score was 76% in finding the presence of Pneumonia, prepared FDA validation plan with results and Indications for use. The dataset is organized into 3 folders (train, test, val) and contains subfolders for each image category (Pneumonia/Normal). There are 5,863 X-Ray images (JPEG) and 2 categories (Pneumonia/Normal)

   Technology used: Python, Scikit-Learn, Seaborn, Matplotlib, Tensorflow, Keras,

   Models Developed: Deep Neural Networks(ANN),with8-layer convolutional neural network achieving F-1 score of 76%

   Results:



3. Wiki Traffic Forecast

   Objective: The main objective of this project is to analyze and predict the future web traffic of the target website by using the past and current traffic on the target website

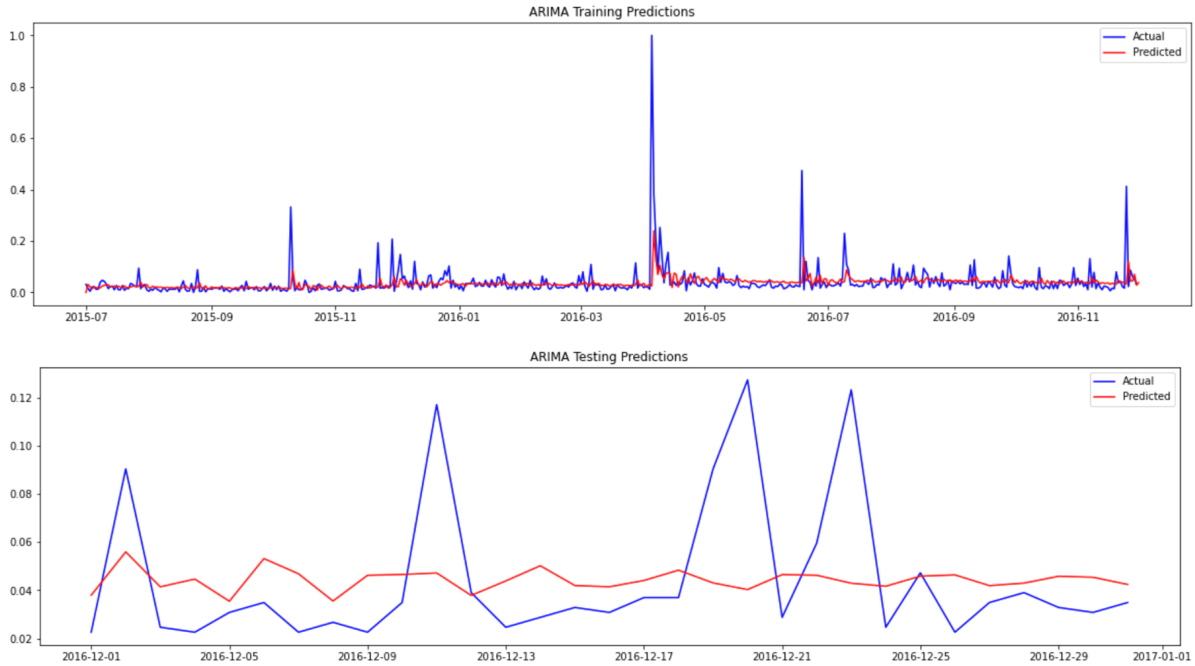
   Description: Dataset consists of about 145k rows each of which represents a different Wikipedia page and it has 551 columns, except for the first column, each column represents a date, and that particular Wikipedia page receives daily visitors. We believe

that the usage of Forecast methods Simple median model, Regression models, AdaBoostRegressor, ARIMA model, Facebook prophet model work best for this time series forecast.

Technology Used: Pandas, Numpy, Matplotlib, Seaborn, Scipy, Sklearn, and Statsmodels.

Models Used: AdaBoostRegressor, ARIMA model, Facebook prophet model.

Results:



4. Anomaly-based network intrusion detection system

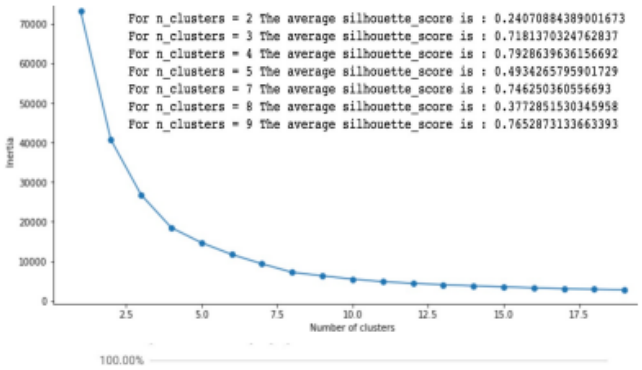
Objective: To address the drawbacks of traditional Intrusion Detection Systems (IDSs) monitoring systems that detects suspicious activities and generates alerts when they are detected using unsupervised machine learning.

Description: Anomaly Based IDS detects all the 0-Day attacks. Anomaly are divided into three main categories such as: Point anomaly- User to Root (U2R) and Remote to Local (R2L). For preprocessing I have done- Scaling data,Removing true labels, difficulty level from data, and encoding attacks. Best F-Scores can be obtained by using K = 8 (KMeans) and eps = 0.8 with ms = 650 (DBSCAN). The respective F-Scores are 84.6% and 69.2%

Technology Used: Pandas, Numpy, Matplotlib, Seaborn, Scipy, Sklearn, and Statsmodels.

Models Used: Clustering- K-Means (centroid-based): Uses number of clusters “k”, DBSCAN (density-based)- Uses specified epsilon (esp) and minimum samples (ms).

Results:

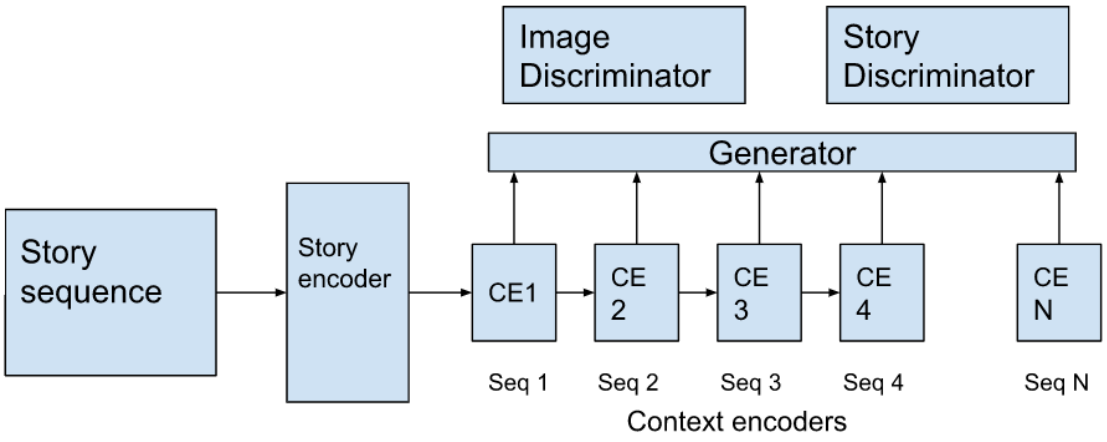


5. Story Visualizer

Objective: Given a multi-sentence paragraph, the story is visualized by generating a sequence of images, one for each sentence. In contrast to video generation, story visualization focuses less on the continuity in generated images (frames), but more on the global consistency across dynamic scenes and characters -- a challenge that has not been addressed by any single-image or video generation methods.

Description:

To implement this project we plan to execute the following framework:



Models Used: Diffusion Models, GANS and GRU's.

Preliminary Results:

the tree is very unusual , with its roots exposed .
the trunk was really wide , as much as 12 feet !
you can see how big these roots are - pretty amazing !

Professional

6. SMART MIRROR

Objective: Designed a prototype device that functions as a mirror with the additional capability of displaying multimedia data, such as text,images, and videos, and interacting with contextual information, such as weather data, seamlessly as part of daily routine.

Description: Our product, the Smart Mirror, seeks to fill the need for a customizable, passive display of information in the home, to host everyday information from the time to appointment reminders. Powered by a Raspberry Pi microcontroller and displayed on a used computer monitor, the Mirror is a simple and inexpensive means of displaying information.Integrated the mirror with virtual 3D try-on technology enables customers to try on products using camera equipped devices such as mobile phones with the help of Augmented Reality and python

Technologies Used: Python, Google API's(Weather,Time, and Maps), OpenCV, Raspberry PI, Numpy.

Results:

7. PORTFOLIO VALUE AT RISK (VAR) PREDICTION

Objective:Implemented and deployed a time series solution to evaluate portfolio VAR under different scenarios, built Deep Learning model which outperformed the historical methods leveraged by the client, resulting in a 10% reduction in average time to estimate VAR per portfolio

Models Used: GANS, LSTM, and RNN

8. STRUCTURAL DAMAGE DETECTION

Objective: Established AI-powered pipeline platform to detect and localize structural damage by analyzing 1000's of real-time drone captures. Performed end-to-end application development- Image & Video Acquisition, Classification Filter, Damage Detection, Reporting

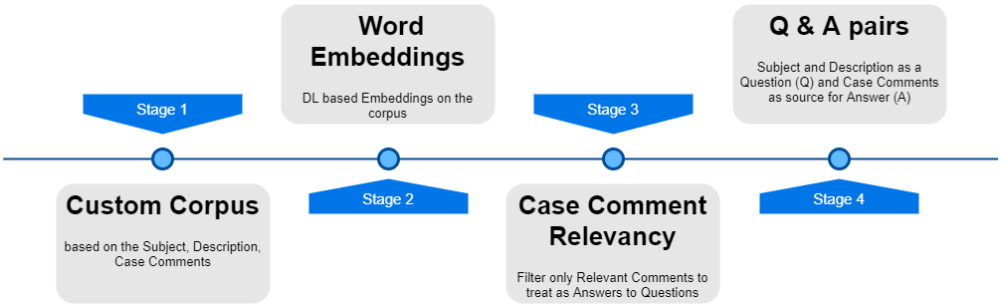
Models Used: Densenet 101, CNN, Supervisely(Annotation)
Link to portal we built- https://t2d2.ai/

9. QUESTION AND ANSWERING SYSTEM

Objective: Built a large-scale custom corpus of 164 million tokens using NLTK and scikit-learn to implement Seq2Seq models, resulting in a 54 percent reduction of manual SME effort for Qualcomm L1/L2 customer service. Tuned the model to fit for Up to 22,000 Vocabulary size, I/O text length increased to 100, and Word embeddings are built on custom corpus of Subject-Description-Case Comments.

Models Used: Built Seq2Seq models, models with attention, try to use BERT or ERNIE 2.0 to encode question and answer system

Working:



10. INVOICE SPLITTING BOT

Objective:Customized solution to split invoices based on attributes extracted from the invoice. This solution can be implemented on both image and text invoices.

Description:

- Invoice Number Extraction: Extract Invoice numbers from invoices using customized key-value pairs leveraging complex regular expressions. The invoice number provides essential information regarding the frequency of each invoice number in the input invoice document.
- Page Numbers Extraction: Extract page numbers from the text present in the invoice. Page number improves the process as it helps to reorder and sort the invoices in ascending page number order for multi-paged invoices. Therefore, the output of multi-paged invoices will be in the same order as the original document.
- Similarity Check: Compares two sequential pages in the document and calculates a similarity score. Based on the threshold set, bot groups or splits the pages in the invoice. The similarity score is calibrated using SSIM (Structural Similarity Index) and Mean Squared Error (MSE) between two images.