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Education

National University of Sciences and Technology(NUST), Islamabad

Bachelors of Engineering in Software Engineering
2015 - 2019

St. Bonaventure's High School Hyderabad, Sindh

SSC + HSSC
APRIL 2011 - JUNE 2015

Publications

April 2018 - Sami Ur Rehman, Burhan UI Tayyab, Muhammad Ferjad Naeem, Adnan UI Hassan, Faisal Shafait, "A Multi-Faceted OCR Framework for Artificial Urdu News Ticker Text Recognition" 2018 13th IAPR International Workshop on Document Analysis Systems (DAS). IEEE, 2018.

I worked on detection and recognition of Urdu News Tickers in live videos. Urdu OCR has always been a challenge because of the change in shape of Urdu characters in different sentences and since there are not many good Urdu OCRs currently present, we worked on a technique to create new OCR using 1 Dimensional Bidirectional LSTM cells with Tensorflow which we called TLSTM. We were able to surpass the current state of the art results; reaching 96.5% accuracy on Urdu Language. For Urdu Text Detection, we trained a mixture of Urdu and Arabic Images on **EAST Text Detector** (An Efficient and Accurate Scene Text Detector by Xinyu Zhou, Cong Yao, He Wen, Yuzhi Wang, Shuchang Zhou, Weiran He, Jiajun Liang) using transfer learning. We achieved great results on Urdu Text Detection with an accuracy of 92.7%. We then combined both detector and recognizer using Static and Scrolling Tickers combination algorithm. The first of which involves a direct captures of static tickers and the second of which involves correct combination of scrolling tickers.

Experiences and Project

TUKL-NUST R&D Lab | Islamabad, Pakistan | Research Assistant (2017 - 2018)

TUKL-NUST is a research and development center setup by a joint collaboration of TUKL, Germany, and NUST, Pakistan. Initially I went through a quick learning period in the lab and then started contributing in various research and development projects. Following is a roughly reverse chronological overview of my work in the lab, including the work already explained in the publications section.

Detection and Recognition of Urdu News Tickers

Worked on detection and recognition of Urdu News Tickers; Worked on the problem of creating a Urdu OCR using cutting edge deep learning research. My name contribution was working on detection and recognition of Urdu News Tickers and working on Scrolling Ticker Combination Algorithm. We reached an accuracy of 96.5% which was better than the commercial Urdu OCRs. (The code for detection is present at

https://github.com/BurhanUITayyab/EAST_Urdu-Arabic while the code for recognition is present at https://github.com/BurhanUITayyab/TLSTM_NewsTickers).

T-Recs Table Recognition:

Unsupervised Table Recognition is a problem in which we can easily identify the structure of a table without defining the structure of input. For that I have worked on implementation of T-Recs (**The T-Recs Table Recognition and Analysis System by Thomas Kieninger and Andreas Dengel**) due to which I was able to easily identify the structure of the table with great accuracy (96%) without using any learning based technique. This saved a lot of time in table detection.

VisionX (June 2017 - November 2017) | Research Intern

VisionX is a USA based company which provides specialized services on Computer and Deep Learning to Fortune 500 companies. Worked on the algorithm which was used to combine detector and recognizer through a pipeline using ML Analytics (**Static and Scrolling combination algorithm**). Static Combination algorithm checks for changes in next frames of tickers by taking average of nearby pixels. If the overall average is greater than a threshold (which we took as 15%) we take the new ticker as the one to be recognized by OCR. Scrolling Combination algorithm does the same thing as static combination algorithm albeit taking in account of scrolling tickers. To do that, we take scrolling speed and ticker length, and take their ratio to get approximately non overlapping frames, which we then use for OCR.

Gaddr (Social Profile AB) | Stockholm, Sweden (November 2017 - June 2018) | AI Researcher and Developer

Gaddr (Social Profile AB) is a Swedish startup that focuses on unifying all the social media identities at one place. It focuses on collecting and unifying the personas on social media so that user can save his/her time by using all of his/her social media accounts (Facebook, Twitter, Instagram etc) at the same place and instantly.

Clustering different online social media identities

- Worked on clustering different social media identities (e.g. Facebook, Instagram, Snapchat etc) using Deep Learning. I've worked on using different variables (his/her writing styles of posts on a particular social media e.g. Facebook and checking for that style on other social media platforms) for determining various social media accounts of the same person. Other factors were also taken into account e.g. Profile Pictures, His/Her Fashion Styles, Image Aesthetics, Location building based on scenes, Basic Info, Followers/Following etc. I then trained a RNN based on those factors and got a particularly good accuracy (86.7%) and were able to correctly cluster most of the social media identities correctly. This helped Gaddr cluster social media profiles of different people at one place.

UI Generation using GANs (Generative Adversarial Network)

I worked on creating a UI Generator which takes sketched images as an input and gives HTML/Bootstrap code as an output. For this a combination of different neural networks were used, the first of which involved extracting features from image. The features of an image were extracted using VGGNet16. Next LSTMs were used in both encoders and decoders. For markup features, we used word embeddings for input and one hot encoding for output. We reached an accuracy of 76.7% for web based UI Generation. This was an re-implementation of paper Pix2code (**Pix2code: Generating Code from a Graphical User Interface Screenshot by Tony Beltramelli**) with little changes.

Garment Retrieval for determining Fashion Similarity

The project involved retrieving the clothing that is similar to input clothing image. The project was made to cluster the identity of different people based on his/her fashion choices. We used Inception-Resnet v2 to train the images on different classes for Image Classification. We then calculated Center Loss which is the distance of all the images of users and consumers in the same class. That way, we were effectively able to determine the similar garment to a great precision. We were able to achieve a better accuracy (38.5% on Top 20 Retrieval) than state of the art model (DeepFashion; 18% on Top 20 Retrieval)

Personality Analyzer (Big 5) from Text

I worked on a project that determines the personality of a person (Big 5 Analysis) from text. To determine Big 5 values, an emotion of a text (sentence or paragraph) was determined using an open source emotion detector ([DeepMoji; Using millions of emoji occurrences to learn any-domain representations for detecting sentiment, emotion and sarcasm by Bjarke Felbo, Alan Mislove, Anders Søgaard, Iyad Rahwan, Sune Lehmann](#)), then each sentence was classified into certain categories, using a multi-text classifier developed at CERN, magpie <https://github.com/inspirehep/magpie> trained on various different categories. The combination of the categories were then combined with emotion of each sentence to determine the one of the 5 traits of Big 5 Personality Analyzer. It got an amazing combined accuracy of 94.40% on all Big 5 personality traits ([Extraversion, Agreeableness, Conscientiousness, Openness, Neuroticism](#))

Google Summer of Code 2018 | Red Hen Lab | Open Source Developer

I was selected to be a part of Google Summer of Code for the organization Red Hen Lab. My project proposal was Russian Tickertext OCR which involved recognition of Russian News Tickers for low contrast videos and correctly combining the moving tickers. Since Red Hen Lab has a close working relationship with CCEXtractor, I was then required to integrate my working code into the HardSubX part of CCEXtractor in C Language. Google sponsored all the work via GSoc'18 Program. More details could be found here (<https://summerofcode.withgoogle.com/projects/#6418039260577792>)

Oriflame | AI Consultant (Freelance) | May 2019 - September 2019

Oriflame is a multinational company that sells various beauty products. I was hired as an external consultant (freelance) for their specific AI projects, which were -

OriBee: OriBee consist of a generative dashboard, made to increase employee productivity and utilize every data point possible. The dashboard provided valuable analytics to the user according to his/her position by collecting data from various sources. It also had the feature to forecast various variables (Revenue, Sales, Activity etc) based on the past information. The dashboard also showed different layouts (front-ends) according to the users. It also had the ability to determine the activities done by the users during different time-periods and provided analytics about that. It was further integrated with Outlook. It was able to provide the forecasts about the company with an accuracy of 95.0%.

eKYC Validation (Aadhar Card Based): In order to approve a specific person/candidate to be an approved Oriflame Sales Agent, his/her identity needed to be verified by validating the information provided by the applicant with his/her identity card (Aadhar Card). However, with tens of thousands of people signing up with Oriflame, it was a tedious task to be done manually. Therefore, I was tasked to automate the whole process. Since, Aadhar Card, doesn't have a specific format, I created a generic text detector and extractor (OCR), and was able to create a system that extract the specific text from the cards and validate with the information provided by the person automatically. The accuracy of the system was 94.9%.

Others

Large Algorithm Retentive Assistance for Intelligent Blinds (Final Year Project for Undergraduate; March 2018 - April 2019)

I have worked on creating a smart app which helps blind and legally blind people by reading out aloud text from various sources. The app detects all kind of scene-text using a scene-text detector (**EAST**) which is then passed through an OCR which converts the detected text into Machine Readable Text. Finally a TTS (Text-to-Speech) Module is used to convert the text into speech. The app runs without the need of Internet and reads aloud text from various sources i.e books, magazines, billboards, screens etc in real time. The app is the main engine which can be extended for creating smart glasses that reads helps blind and visually impaired people by reading out aloud text from various sources.

Menerva - Smart Bra for Early Detection of Breast Cancer (November 2018 - March 2019)

The project revolves around creating a smart bra that informs its user about the risk of developing breast cancer. The bra has several high-tech sensors attached to it that sends various important readings from the breast region to an app installed on the smartphone via Bluetooth. The sensors include several **thermal sensors** that monitors temperature changes over a circadian cycle in a human being and a **heartbeat sensor** which determines the activity of the person based on her heartbeat (**running/jogging etc**) The app also takes some values from the user manually (**age, race, average blood pressure, periods**). All of these factors combined with temperature changes are used to determine the probability of a risk that a person is going to develop breast cancer using a Machine Learning Model. The device by no means aims to replace the doctor (oncologist) but aims to provide a better assessment than self-examination and to provide assistance to the doctor and increase awareness of breast cancer.

Awards and Accolades:

March 2019 - Winner of Microsoft Imagine Cup Pakistan (North Division)
March 2019 - Winner of Hult Prize at NUST
December 2018 - Winner of Jazz SDG Hackathon 2018 Pakistan.
April 2018 - Winner of Telenor Hackathon 2018 Pakistan.
April 2018 - Accepted for Google Summer of Code 2018 (For Red Hen Lab)
November 2017 - Accepted to be a part time AI Developer at Gaddr (Social Profile AB)

Skills

C, C++: I can program very effectively in C and C++.

Java: I have done various semester projects in Java

Python & MATLAB: Python is my primary choice for developing Machine/Deep Learning application while MATLAB is my primary choice for prototyping machine learning algorithms.

Tensorflow, Keras, Torch, PyTorch: I mainly use Tensorflow in my deep learning projects. I have also worked extensively with Keras, Torch and PyTorch and have fair share of knowledge of it.

Embedded Systems: I have also worked extensively with Raspberry Pi 2 B+ and deployed some of the deep learning algorithms onto it.

OMNet++: Learning and using OMNeT++ for my current course of Distributed Computing.

Server Management: I have managed two multi-GPU servers for about 6 months.

HOBBIES

Reading Novels

Playing with Electronics

Other:

<https://github.com/BurhanUITayyab>