OMAR ABID

DATA SCIENTIST | Machine Learning | Computer Vision

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SUMMARY

I obtained my BSc degree in Biophysics and then went on to pursue a MSc in Computer Science specializing in Computer Vision. Through my training I've acquired knowledge and experience in the domains of machine learning with a focus on computer vision from both a computational and neuroscience perspective. My research background has allowed me to take a methodological approach to solving problems and this has allowed me to work with a high degree of productivity. I am a highly motivated individual looking to build my career while continuing to learn and deliver projects with value.

EDUCATION

Master of Science: (MSc) Computer Science 2018
York University — Toronto, ON, Canada
Area of Focus: Active and Attentive Vision in Computational Neuroscience.

Bachelor of Science (H.BSc) H. Biophysics 2014
York University – Toronto, ON, Canada

TECHNICAL SKILLS

Machine Learning
Regression, Classification, Clustering, PCA, Deep Neural Networks (DNN), Bayes Networks, SVMs, Decision Trees
Languages
Python, C++, Java, PHP, Android, Matlab, R
Frameworks
Machine Learning: Tensorflow, PyTorch, Scikit learn, Numpy, Pandas
Computer Vision: OpenCV, ROS
Cloud Services: AWS, Google Cloud, IBM Blockchain Platform, IBM Watson
Relevant Technologies
Hardware: Raspberry Pi, Arduino, DHT 22/11 Sensor, PIR Motion sensor.
Algorithms: SLAM, R-CNN, LSTM

EXPERIENCE

Data Scientist at Watopedia (DIFC, Dubai, U.A.E) April 2018 - Present
Key role and responsibilities of developing a variety of software algorithms for the security, aviation and government sectors. The result of the work showed an initial proof of concept system with real time performance on par with state-of-the art approaches when tested side by side on established computer vision datasets. Some of the most recent examples of the projects worked on are the following:

Facial Recognition with Online Learning:
Facial recognition is a challenging problem that is susceptible to identity misclassification due to differences in lighting conditions and face pose. Here, the company required the development of a robust system that could address these challenges while also learning new face identities in real time. The project included the use of:

- A Machine Learning pipeline for separating the different stages of facial recognition to allow for real time performance.
- Training and testing a variety of different models to find points of failure and to iteratively improve the system. Including, but not limited to SVMs and Deep Neural Networks.
- A data processing pipeline to segment faces for online inference and training.
- Integration of a SQL database for data storage
- Testing accuracy > 90% with a system latency of < 50 ms.

Autonomous Event Driven General Surveillance System:
The aim of this project was to develop an autonomous A.I. based system for the detection of threats such as suspicious behavior and undesirable object identification in a security critical application. Using an event driven approach given a set of pre-defined conditions, the system was capable of the following:

- Detection of a variety of common objects such as people, cars and suitcases.
- Implementation of analytic features including object segmentation by number of objects, color, location and time of detection.
- Implementation of online tracking of objects using a tracking by detection approach. Compared tracking algorithms such as an Adaptive Kalman Filter (AKF) and a CNN-Tracker.
- Rule based event triggers implemented with an API to existing Video Management Systems (VMS) for real time notification of threats.

Undesirable Object Recognition System:
While the above project was aimed at general surveillance, a second specialized system was developed for detection of undesirable objects such as Weapons. Some of the roles included:

- Extensive data collection, cleaning, data augmentation and additional pre-processing.
- Development of a data processing pipeline.
- Parallel training of a variety of deep neural networks. Manipulation of optimizers – (such as ADAM and SGD) and hyperparameter tuning to maximize recognition accuracy and minimize loss function.
- Accuracy of >90% on testing set.

Vehicle and License Plate Recognition System:
As part of one of our security solutions, the company was interested in designing an in-house vehicle and license plate recognition system – on par with existing commercial systems. However, even the most advanced solutions suffer from a bottleneck of License Plate Detection as we often need to train a Neural Network or a related algorithm by region. Here, some of the contributions were:

- Development of a novel processing pipeline using selective search for robust License Plate detection irrespective of region.
- Using a combination of low level computer vision techniques – Edge Detectors, Blob Analysis, kNN in conjunction with conventional machine learning approaches – LSTM and DNN for real time Optical Character Recognition (OCR) of License Plates.

Graduate Research & Teaching Assistant at York University (Toronto) 2013 – 2018

Graduate Research Assistant (May 2015 – August 2018):

- Worked on Computer Vision and Artificial Intelligence research at Tsotsos's Active and Attentive Vision Lab. Improvement of TarzaNN – a neural network simulator implemented in C++.
- Topics: Computer Vision, Convolutional Neural Networks, Computational Neuroscience

Teaching Assistant (January 2016 – April 2017):
Invigilate and grade exams and labs for first to third year undergraduate computer science students. Worked with robotics, mobile app development and software design. Invigilated the following courses:

- EECS 1570: *Introduction to Computing*
- EECS 3311: *Software Design*
- EECS 3101: *Programming Language Fundamentals*

Electrophysiology Lab (October 2013 – April 2014):
R. Lew's Electrophysiology Lab: Design and development of an electronic circuit for current-voltage measurements of *Neurospora crassa* hyphae.
Attention Learning Lab (April 2013 – August 2014):
T. Womelsdorf's Attention Learning Lab: Statistical EEG Data analysis of Macaque Monkeys for neural population decoding. Analyzed with Matlab's Statistics and Machine Learning Toolbox.
Software Developer Associate (November 2012 – April 2013):
Design and implement software interface and communication systems for York University's Rover Team using C++ and Python.

PUBLICATIONS

Sengupta, R., Abid, O., Bachoo, A., & Tsotsos, J. (2017). Attentional blink as a product of attentional control signals: A computational investigation. Journal of Vision, 17(10), 1197-1197.