DHAVAL SALWALA

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VISA Type: Stamp 4

SUMMARY

I am working as a Research Assistant at the Data Science Institute, NUI Galway, Ireland. I am researching in the field of real-time video analytics and pattern detection for Multimedia Data Streams. I am an experienced software professional with 6+ years of diversified industry experience. I am an experienced Python developer with strong analytical and programming skills. I have well versed in Computer Vision, Knowledge Graphs, Complex Event Processing, Deep Learning. Hands-on with Kubernetes/Docker and ML libraries viz. NumPy, Pandas, Scikit-learn, TensorFlow. Familiar with GPU programming using Nvidia CUDA library.

EDUCATION

Sep 2018 – Aug 2019 **MSc. Computer Science – Data Analytics**
National University of Ireland, Galway, Ireland

Result: 1.1 (First Class Honours)
Modules: Natural Language Processing, Machine Learning, Deep Learning, Data Visualization, Data Analytics – Hadoop Map-Reduce, Statistical Modelling, Game Theory, Linked Data and Knowledge Graphs.

June 2008 - May 2012 **Bachelor of Engineering - Information Technology**
Gujarat Technological University, Ahmedabad, India

Result: 7.98/10 (First Class with Distinction)
Modules: Object Oriented Programming, Data Structures, Algorithms, Operating System, Advanced Java.

MASTER'S THESIS: An Evaluation of Multi-Agent Deep Reinforcement Learning Algorithms in the Pursuit-Evasion Environment
Project Info: https://dhavalsalwala.github.io/thesis/postgraduate/

- Employ Deep Reinforcement Learning (RL) to study the behaviour of multiple agents in a Pursuit Evasion environment. Agents share experiences and knowledge among them to try and beat the other agents.
- Studied and analysed a multi-agent version of three RL algorithms: Deep Q networks (DQN), Reinforce and Advantage Actor-Critic (A2C).
- The architecture uses a convolutional neural network with a central policy in a de-centralised parameter sharing across multiple agents.
- Evaluation results reveal that the multi-agent version of Reinforce and Actor-Critic has a better convergence rate in capturing the spatial correlation of the domain. Multi-agent DQN did not perform well owing to the nonstationarity of the environment.

ACADEMIC PROJECTS:

Real-time Face Recognition using Triplet Loss function and One-Shot Learning:

- In classical Deep Learning, a convolutional network would need large training datasets to be able to identify the features and classify faces. One-Shot learning overcomes this problem by learning a distance function between images rather than explicitly classifying them based on the features.
- Built a LeNet5 based deep convolutional network in Tensorflow2.0 with a triplet loss function.
- The model was trained on 10,000 images of the VGG-Face dataset.
- It uses Euclidean distance to find the distance similarity between image embeddings.

Text Classification using an ensemble of various models.

- Designed machine learning pipeline for text classification of newgroups data.
- Data pre-processing included stemming, lemmatization, stop-word elimination, cosine similarity, vector space modelling. A series of models were applied to build a stacking ensemble framework. Used Random Forests at level 1, SVM at level 2 and XGBoost as the final classifier.

WORK EXPERIENCE

Oct 2019 – Present **Research Assistant, Data Science Institute, NUI Galway, Galway**

Gnosis MEP [gnosis-mep.org]: Open-source platform for real-time Spatiotemporal video pattern detection.

Technologies: Python3, Docker, RedisGraph, RedisStreams, Node.js, TensorFlow, DNN Image models, OpenCV

- Designed and implemented Computer Vision Pipeline for Gnosis MEP engine in Python, Redis Streams, Docker.
- Assisted in scientific research for building Complex Event Patterns (CEP) in Data Streams. Worked on individual problem sets.
- Worked alongside Research Fellows, Postdoctoral Researchers and PhD students on design challenges and refining CEP work problems.
- Collected and studied large scale video datasets. Performed manipulating, processing, and extracting value from these datasets. Ran Image Processing models to analyse the accuracy and prepared ground data - TensorFlow/Keras.
- Adopted efficient microservices architecture to execute ML pipeline on the streaming multi-modal data.
- Designed benchmarking platform for a CEP Pipeline that includes Object Detection, Object Tracking and Annotation via Jaegar/Python.
- Modelled data obtained through the CEP pipeline into a Knowledge Graph through spatiotemporal relationships.
- Designed a matching engine for video querying that uses an openCypher query to explore Knowledge Graphs.
- Paper on Query Driven Urban Accessibility using complex event processing accepted in ACM Multimedia 2021.
- Assistant Chair and co-organiser for the 27th AIAI Irish Conference on Artificial Intelligence and Cognitive Science, Galway, Ireland, December 5-6, 2019.

Dec 2012 – Aug 2018 **Senior Software Developer, Tata Consultancy Services (TCS), Pune - India**

Technologies: Java8, Python3, Spring Boot, Hibernate, Apache Qpid, Jboss7, PostgreSQL, Google Protocol Buffers.

Eurex Advanced Risk Protection (ARP) – Deutsche Börse Group, Frankfrut.

- Member of the Design Team that created technology stack for a risk interface application that monitors risk exposure in real-time for Eurex Exchange T7.
- Led a team of associates to critical deliveries. Leveraged strong expertise in solving and identifying bugs while working with production support.
- Worked closely with Business Analysts in mapping the business requirement with the Physical Data Model.
- Developed AMQP interfaces to different cross-platform business entities and facilitated data exchange using Google Protocol Buffer (GPB).
- Architect a state-of-the-art Cash Payment System (CPS) for Eurex Trading Platform T7. It offers a high degree of flexibility in terms of processing trades, payment locations, message formats and cross-currencies transactions. Created chained transaction handling using Spring Transaction Management.
- Developed SWIFT message simulator in Spring Boot that performs load testing on thousands of concurrent payment instructions.

ICG Credit Approval System – Citigroup Corporation, NJ USA.

- Gained functional knowledge while working with legal, compliance and lending team on credit approval workflows and lending practices.
- Optimized Citigroup's Risk Management Business workflow using TIBCO iProcess and Spring Scheduler.
- Enhanced UI response rate and operational efficiency of the platform by eliminating legacy codebase.
- Working on Design Patterns, Unit Testing, Refactoring, Code structuring.

TECHNICAL SKILLS

Languages and frameworks	Python3, Java8, R, Node.js, RDF 1.1, SpringBoot, Hibernate, Spark Streaming, Big Data / Hadoop basics
Deep Learning libraries and Models	Keras, TensorFlow, NumPy, Pandas, Scikit-learn Object Classification Models (Resnet, VGGNet, Mobilenet etc.) Object Detection Models (YOLO, Faster RCNN etc.)
Graph Databases	Neo4j, RedisGraph - openCypher
Messaging and Streaming	Redis Streams, Spark Streaming, Active MQ, Apache Camel
Tools	Nvidia-CUDA, Docker, VSCode, IntelliJ, Git, Jupyter Notebook, Tableau, Google Cloud Platform

PUBLICATIONS

- Dhaval Salwala, Piyush Yadav, Venkatesh G Munirathnam, Suzanne Little, Noel E O'Connor, Edward Curry. 2021. UrbanAccess: Query Driven Urban Analytics Platform for Detecting Complex Accessibility Event Patterns using Tactile Surfaces. In Proceedings of the 1st International Workshop on Multimedia Computing for Urban Data (UrbanMM '21), ACM multimedia.

- Piyush Yadav, Dhaval Salwala, Felipe Arruda Pontes, Praneet Dhingra, and Edward Curry. 2021. Query-Driven Video Event Processing for the Internet of Multimedia Things. In Proceedings of the VLDB Endowment (VLDB) 14(12). ACM, Copenhagen, Denmark.

- Yadav, Piyush, Dhaval Salwala and Edward Curry. "Knowledge Graph Driven Approach to Represent Video Streams for Spatiotemporal Event Pattern Matching in Complex Event Processing System". In International Journal of Semantic Computing, 2020. (In Press)

ACHIEVEMENTS

- Copernicus Hackathon Ireland 2019 Winner: Proposed idea to improve the accuracy and precision of real-time air quality data. Data taken from Sentinel 5p satellite.
- Received a 'Star of the Month' award for flawless delivery of a critical requirement – Tata Consultancy Services.

REFERENCES

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