DHAVAL SALWALA

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VISA Type: Stamp 4

SUMMARY

I am working in the position of Senior Research Engineer at IBM Research Ireland on a European Innovation Framework H2020 project on the Renewable Energy Sources (RES) sector.

I am an experienced software professional with 7+ years of diversified industry experience. Led projects on developing ML solutions for multi-modal analytics using Computer Vision and Neuro Symbolic AI. I have worked on Computer Vision problems, multi-modal data analysis, Knowledge Graphs, Complex Event Processing and Deep Learning. Experienced in MLOps / AIOps processes including ML training / serving pipelines, CI/CD pipelines.

Passionate about building computer vision AI tools with research interests in Big Data and Reinforcement Learning (RL).

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.

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)

WORK EXPERIENCE

Jan 2022 – Present   **Research Engineer – ML and Big Data, IBM Research Europe, Ireland - Dublin**

Oct 2019 – Dec 2021   **Research Engineer - Analytics, 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 as a Knowledge Graph, RedisStreams, TensorFlow, PyTorch, OpenCV3

- Designed and implemented Computer Vision Pipeline for Gnosis MEP engine using Python, Redis Streams, Docker. Deployed the pipeline on the Google Cloud instances.
- Modelled data obtained through the CEP pipeline into a Knowledge Graph through Object Detection, Object Tracking, Visual Relationship Models, Scene graphs.
- Performed manipulating, processing, and extracting value from large scale video datasets. Ran Image Processing models to analyse the accuracy and prepared ground data - TensorFlow/Keras.
- Worked alongside Research Fellows, Postdoctoral Researchers and PhD students on design challenges and refining CEP work problems.
- 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.
- Designed a matching engine for video querying that uses an openCypher query to explore Knowledge Graphs.

Urban Accessibility – Crowd4Acess, Citizen Science Ireland.
Tools: Python3, Docker, RedisGraph as a Knowledge Graph, RedisStreams, Qt5, TensorFlow, YOLOv5, Jaegar, OpenCV3, TensorFlow serving

- Created an Urban Access Interface that integrates with Content Analysis Platform GNOSIS to aid visually challenge populace in navigating around the city. Developed a model describing the needs and abilities of people with reduced mobility understanding what makes footpaths accessible.
- Worked with small, medium, and large volumes of datasets, applying ML & DL algorithms towards business problems, and generating insights.
- Mapping the accessibility of cities through Crowdsourcing and Data Analytics. Implemented the task of extracting information to assist the mappers while mapping the urban elements.
- Trained a model to detect tactile surfaces using Yolov5. Implement scene understanding via semantic segmentation using ICNet (Image cascade network) deep learning model.
- Paper on Query Driven Urban Accessibility using complex event processing accepted in ACM Multimedia 2021.

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.

- Worked on projects – ICG Credit Approval System - Citigroup, Eurex Trading Platform - Deutsche Börse Frankfurt, Retail Banking – Barclays.
- 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.
- 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.

TECHNICAL SKILLS

Languages and frameworks	Python3, Java8, R, Node.js, RDF 1.1, SpringBoot, Hibernate, Spark Streaming, MapReduce, Jaegar, MapReduce, SQL, Docker, Kubernetes
Deep Learning libraries and Models	Keras, TensorFlow, NumPy, Pandas, Scikit-learn, Transfer Learning Object Classification, Detection and Tracking.
Graph Databases	Neo4j, RedisGraph - openCypher
Messaging and Streaming	Redis Streams, Spark Streaming, Active MQ, Apache Camel, Google Protocol Buffers
Tools	Nvidia-CUDA, Docker, VSCode, IntelliJ, Git, Jupyter Notebook, R Studio, Tableau, Google Cloud Platform, Jenkins Pipeline

REFERENCES

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