Sagar Jha

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Education

- **Thapar Institute of Engineering and Technology, Patiala** CGPA: 9.73/10
  Bachelor of Engineering - Computer Science and Engineering *July 2020 - June 2023*
  Courses: *Computer Vision, Reinforcement Learning and Conversational AI, Machine Learning, Edge AI & Robotics (NVIDIA), Operating Systems, Data Structures, Artificial Intelligence, Networks, Databases, Quantum Computing, Theory of Computation.*

- **Indo-Swiss Training Centre, CSIR-CSIO, Chandigarh** ***(a national lab for research)*** Gold Medal
  Advanced Diploma - Mechatronics and Industrial Automation *Aug 2012 - July 2016*
  Courses: *Network & Circuits, Electronics, Transducers & Signal Conditioning, Embedded Systems, Digital Circuits, Control Engineering, Instrument Science, Electronic Devices & Circuits*

Professional Experience

- **JPMorgan Chase & Co.** Bangalore, India
  Software Engineer (Technology Stack: Python, React, Java, Q, kdb+) *Jan 2023 - Present*
  - Working in the Analytics team, I work on JPM's suite of **trading algorithms** to extract meaningful Alerts from **time-series** data and produce 400K+ real-time trading signals using KDB+ and also produce 3000+ trading signals via Chatbots per day that mine trader discussions using NLU.
  - Developed **Natural Language Understanding**-based chatbot that helps traders query our market database using plain English and uses ML algorithms for intent classification and text mining on traders' conversations.
  - Developed strategic analytic layer integrating **Python, Java, KDB and React** for surveillance **analytics**, facilitation of **strategy generation**, and back-testing. Also, it analyzes data generated from both pre & post-trades.

- **FANUC India Pvt. Ltd** Gurgaon, India
  Engineer, Turnkey Solutions, Robots PROJECTS *Aug 2016 - July 2020*
  - Responsible for Logic Development, Robot Teaching, and Cycle-time prove out for the projects. Developed **Vision Based** (product identification and location) systems for the identification of objects in real-time and implement decisions.
  - **Complex work areas** were Visual Tracking - *picking objects on the fly*, Bin-Picking, Vision with Forged components, Synchronous Robot-Link - *multiple robots in Master-slave configuration & doing motion based on single 3D-data.*
  - Worked on more than 25 major projects in the entire India. **Major Works**: 2D-iRVision, 3D-Vision, COBOT, Ladling, LUL. Among few members in entire team in India to be trained on **Paint & Foundry Robots.**

Research Experience

- **MITACS Globalink Research Internship - Mount Royal University** Calgary, Canada
  Research Intern — Mentor: Prof. Yasaman Amannejad *June 2022 - Aug 2022*
  - Worked on **Distributed Machine Learning** approaches (Federated and Split Learning). **Split learning** is a new technique developed at the **MIT Media Lab's Camera Culture group** that allows for participating entities to train machine learning models **without sharing any raw data**.
  - **SplitFed Approach:** Federated learning (FL) and split learning (SL) are two popular distributed machine learning approaches. Developed a novel distributed architecture for SplitFed Learning (SFL) using both the benefits of Split and Federated learning. It is faster than SL by performing parallel processing across clients.
  - **Threading and MPI:** Developed an implementation of Split Learning using Multi-threading; also used mpi4py to develop a distributed version of split learning to train the neural network using heterogeneous devices in distributed fashion without sharing raw data.
  - **Server-Client:** Developed a way to implement the same on server-client scenario using zeroMQ, where the server is hosted on **GCP** and client from anywhere can connect and train a split learning model without sharing any raw data.
  - **Experiments:** Tested on different Homogeneous and Heterogeneous hardware such as an EDGE device (Pi and Jetson) - ranging from a small end GPU device to the big high end servers.
  - **Configurations:** Implemented different configurations of Split learning such as **without label sharing** and **vertically partitioned data.**

- **Visual Information Processing and Learning Lab (VIPL) - UCAS** Remote
  Research Intern — Mentor: Dr. Abhijit Das *Sep 2021 - Dec 2022*
  - Developed JTCNet a **Joint transformer and CNN-based architecture** for predicting HR & Blood volume pulse (BVP) signals based on facial videos.
  - Uses Vision Transformer which decomposes the video into small patches and seperately applies temporal and spatial attention.
  - This approach uses both the benefits of CNN and Transformer to extract features and uses it to predict Heart rate.
  - In particular, the proposed method is a hybrid of Transformer and Convolutional Network (JTCNet), where convolution is expected to capture local facial details and Transformer is expected to capture long-range spatial correlations. Therefore, the learned features can complement each other well.

- **Thapar Institute of Engineering and Technology - TIET** Patiala, India
  Research Student — Mentor: Dr. Joohi Chauhan and Dr. Jatin Bedi *Jan 2022 - Dec 2022*
  - **Developed XAMINE - X-ray Multi-class Inspection using Neural Networks:** A fast inference framework for detecting prohibited items in X-ray images using deep learning models (SSD, YOLO-v3/v4/v5/v7).
  - **Pipeline Creation:** Implemented an efficient pipeline that filters positive and negative samples early, passing only relevant images for object detection to locate prohibited items.
  - **Optimized Backend:** Utilized SSD-Mobilenet for high inference rate and **mAP above 90%**, resulting in a user-friendly GUI tool for security checkpoints.

- **Tech-in-Farm - IIT Kharagpur** Remote
  Computer Vision Intern (Volunteer Work) *Nov 2021 - Feb 2022*
  - Developed a CV-based system using **quadcopter live feeds** to detect crops and monitor intruder activity. Implemented DL models (YOLOv4/v5, SSD, MobileNet, VGG16) for crop detection, plant disease, pest, and nutrition monitoring.
  - Created a crop dataset of local Indian crops, training models for accurate detection and health assessment.

Publications

- S. Kansal, **S. Jha**, P.Samal. "DL-DARE: Deep Learning-based Different Activity Recognition for the Human-Robot Interaction Environment". ***NEURAL COMPUTING AND APPLICATIONS.*** NCAA-D-22-03054. Link
- P. Samal, **S. Jha**, R. K. Goyal. "CPU Burst-Time Prediction using Machine Learning". ***IEEE Delhi Section International Conference on Electrical, Electronics and Computer Engineering (DELCON-2022).*** Link

Papers under review

- A. Das, **S. Jha**, P.Samal, H. Lu, H. Han, A. Dantcheva. "JTCNet: Joint Transformer and CNN Network for Remote Heart Rate Estimation". ***IEEE TRANSACTIONS ON BIOMETRICS, BEHAVIOR, AND IDENTITY SCIENCE.***
- P. Kaushik, S. Dhiman, **S. Jha**, P.Samal. "XaMINe: X-ray Multiclass Detection of Prohibited Items using Neural Networks". ***EXPERT SYSTEMS WITH APPLICATIONS.*** ESWA-D-23-01068

Projects

- **Intelligent Market Insights and NLP-driven Trader Assistance (Statistics, ML Algorithms)**:
  - **Personalized Trading Insights:** Engineered a **high-frequency trading alert system** that leverages real-time data analysis on trades and market trends to deliver targeted, actionable insights, **optimizing decision-making** for traders.
  - **NLU Chatbot Development:** Developed an NLP-driven chatbot for traders to **query complex data in natural language**, analyzing trader intent and extracting relevant signals from news, reports, and discussions.
  - **Technical Implementation:** Leveraged advanced ML algorithms for data classification, optimizing models for **precision and speed** in live trading. Designed **adaptive feedback loops** to refine insights, balancing high performance with interpretability.
  - **Impact:** Accelerated data analysis, significantly improving trading efficiency and contributing to decisions that led to **billions of dollars** in captured trade orders.
- **Automated Cloud-Backup System (Python, Google Drive API)**: Github
  - **Implementation:** Developed a Python tool using the Google Drive API for automatic backups from local to cloud storage. Features **automatic cloud authentication** on startup, preserves the original directory structure and **prevents redundancy**. It logs all backup activity and acts as a fail-safe for data, complementing version control systems.
  - **Impact:** Reduced manual backup **efforts by 90%**, improved data accessibility, and minimized storage redundancy, enhancing operational efficiency in data management.
- **DL Optimization and Deployment (TensorRT, Triton Server, Deepstream, Pytorch, Tensorflow)**:
  - **Optimization:** Implemented methods - **Layer & Tensor Fusion**, **Precision Calibration** and **Kernel Auto Tuning** to convert a trained neural network to an optimized one. Executed the optimized version on hardware and different types of domains such as pose-estimation, redaction, segmentation and many more. Performed real-time inference and fine tuned to different **quantization** approaches.
  - **Deployment:** Implemented the optimized weights on **Triton** Inference Server and also on **Deepstream** for better video inferencing. Checked video outputs on different Real Time Streaming Protocols **(RTSP)**.

Skills Summary

- **Languages**: Python, C++, JS, Matlab, Q, Java
- **Frameworks**: Pytorch, Scikit, TensorFlow, Keras, Django, NodeJS, mpi4py, kdb+
- **Tools**: TensorRT, PostgreSQL, MySQL, SQLite, Pandas, Numpy, zeroMQ

Achievements

- Received a funded research offer for 6 month intern at **INRIA** *(French National Institute for Research in Computer Science and Automation)*, Sophia Antipolis, France.
- Selected in the prestigious **MITACS Globalink Research Internship 2022** at *Mount Royal University, Canada.*
- Awarded **TIET Merit Scholarship 2021 & 2022** with **full tution-fee waiver** based on academic performance.
- Awarded **Director's Gold Medal** in *Advanced Diploma* from renowned research labs in India (CSIR-CSIO).
- Awarded **full tution-fee waiver** based on academic performance at **both Diploma & Bachelor's level**.
- Ranked **4th for Mitsubishi Electric Cup** a *National Level Competition.*
- Trained on **Advanced Vision and Collaborative Systems** at FANUC CORPORATION, Japan.