HIMANSHU GOYAL

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Education

- **Indian Institute of Technology, Delhi (IIT-Delhi), India** Aug'13 - July'17
  Bachelor of Technology in Textiles; GPA: 3.20 (8.01/10.0)
  Coursework : Intro to CS.(OOPS), Data Struct.&Algo., Linear Algebra & Difrt'l, Machine Learning, System Designing

Technical Proficiency & Publications

- **Technology**: Python, TensorFlow, Pytorch, OpenCV, NumPy, Pandas, Java, Docker, SQL, OpenVino, Angular
- **Theoretical**: Machine-Learning, Computer Vision, Deep-Learning, DS&A, Application Arch. & System Designing
- **Publication**: Jangale, V; Goyal Himanshu et al.; **"Deep Learning based Flare Image Analytics for Emissions Monitoring at the Edge",** 2022 IEEE Int'l Symposium on AdCONIP, Vancouver, BC, Canada, 2022, pp. 269-275
- **Patents**: Co-Inventor of a patent-pending on **Flare Monitoring System and Method** (Application No. US2023/18/114,729) filed on Feb 27, 2023.

Work Experience & Projects

JCI (Acquired FogHorn.io), Data-Scientist-II | ML solutions for Edge/IoT devices *Pune, [Oct'20 - Present]*

- **Flare Stack Monitoring For Gas Volume Estimation**: Predicting the volume of Flared gases in oil refinery stacks via visual monitoring. Real-time reporting of quality of Flaring activity based on volume estimates of Smoke & Flare.
  - Trained **Mask R-CNN** with **Resnet-101/50** as backbone for Mask-segmentation problem on Multi-GPU setup.
  - Trained & Experimented with other Mask-Segmentation models like EfficientDetD7x and DeepLab as part of POC.
  - **Conversion & Optimization** of mask model for running in a computationally deprived, **Non-AVX Intel** system.
  - Published & Presented the ***Paper Titled*** *"Deep Learning based Flare Image Analytics for Emissions Monitoring at the Edge" in* ***IEEE, AdCONIP 2022.*** Filed provisional patent, full patent under filling.
- **Optimal Start For HVAC System**: Start time prediction for BMS to reach desired Air conditions at given time.
  - Worked on continuously-Trained & site condition adaptable ML system to predict HVAC start time for smart BMS.
  - Developed **Energy-Saving-Estimation framework** using various available sensors data from BMS. Worked on **Grafana, InfluxDB, Docker** for exploratory data analysis & visualization.
  - On deployed site, system was expected to have **Saved $1Million** in a year, which is ∼7% of total incurred bill.
- **Selective Target Updation**: Training a DL model only for selective output classes w/o affecting other classes.
  - Developed **new training method** to improve accuracy on subset of output classes & train model on partially labelled dataset. **Modified Focal Loss Definition** such that loss is calculated based only on prediction of specific classes.
  - Tested this technique on Hand Digit Recognition Task & AutoML OD model with COCO rare classes Datasets.
  - Trained model had **20% Gain in mAP** from non-modified model with random weight initialization. But significant drop in Object Detection model precision was observed compare to fully class aware training.
- **Blow out Preventor (BOP) Monitoring**: Real time BOP state prediction for preventing catastrophic failure which otherwise causes large-scale oil spillage, also providing crucial analytical parameter of drilling via video surveillance
  - Trained **EfficientDet-D3 OD** model using various Novel image augmentation technique, optimized model using **OpenVino kit** to run inference in Intel based edge device, Multi Object **Tracking using Kalman Filter** approach.
  - Developed a **Robust Image Augmentation Pipeline**, later integrated across other computer vision projects.
  - Implemented and experimented on **Faster R-CNN** (with Inception & ResNet-50/101 backbone architectures), performing hyper-parameter optimization during **Transfer Learning**.
  - Post-training **Quantization**: using **tensorRT for GPU** inferencing & **OpenVino for CPU** inferencing.
  - Project received **IoT Edge Computing Excellence Award 2021** for implementing edgeAI in remote drilling site.
- **Exploratory Projects**: Various POC projects for process improvement & feasibility testing
  - Developed efficient **GPU Utilization Strategy** which optimizes concurrent usage of GPU by multiple models deployed in Edgeml® docker container.
  - Implemented SoTA **Copy-Paste Augmentation Technique** (ranked #1 in **OD(Object Detection)** task in 2021) to improve accuracy on rare classes. Created **Rule Based Accuracy Matrices** reporting Framework.
  - **CycleGAN** implementation for converting synthetic image to real looking image in unsupervised settings.

TwoPaksh.tech, Founder | Footfall tracking & surveillance system *Pune, [Oct'19-July'20]*

- Created a **Face-recognition** based **IOT surveillance system** to track and authenticate user entry in indoor gated communities. The system ported directly into any IoT camera, and thus did not create any extra hardware costs.
- System utilizes a pre-trained **MTCNN + FaceNet** based architecture to output 128-dimension face-embedding.
- System generated and showcased critical analytics like footfall time heatmap, mood of users, user serving time etc. due to the automation of authentication system.

Citigroup, Technical Analyst | Treasury & Trade Solutions *Pune, [Aug,17 - Oct,19]*

- **SeaShell- Object Storage System**: Developing a low-cost, object-based, file storage and retrieval system used for file archiving. Worked on Java SpringBoot/MVC for Microservices API, Angular for UI and mongoDB for database.
- **Trade Imaging and Messaging System (TRIMS) Recommendation Engine**: Envisioned, developed and deployed a machine-learning powered recommendation system to assist employees doing data entry from trade documents. The solution increased the efficiency for specific fields by up to 75 %.
  - Received **Citi Applause Award** & **Citi Silver Award** recognizing individual contributions for various initiatives.

College Projects | B-Tech thesis, Internship, Personal & Course-Work projects *Delhi, [Aug'13-July'17]*

- **Verboculary:** Developed a vocabulary building Android app. This allowed user to learn words in order of importance for a given exam. Developed the word ranking algorithm by analysing a large corpus of exam related content.
- Automated the process of marking microscopic fibre boundary in a yarn cross-section image via Computer Vision. Implemented CNN model was able to distinguish different kind of fibres, marking boundaries with an R value of .95
- Developed **Transliteration tool** for Vernacular Languages using a Tries based Decision-tree model which converted text from one given language to other trained languages.
- Implemented **ML algos from scratch** i.e. Linear, Logistic Regression, CNN, Bayesian Network etc. Utilized these network for Hand written Digits Recognition task, Text classification Task etc.

Certifications & Recognition

- **Deep Learning Specialization**
  Coursework : Neural-Network & Deep-Learning, Hyper-Parameter Tuning & Regularization, CNN, Sequence Model
- **ML Engineering for Production (MLOps) Specialization**
  Coursework : Data Pipeline, Modeling Pipeline: Model Arch. Searching & Quantization, Model Deployment in Prod
- **Interests**: Gyming, Playing Badminton, Running, Adventure-Sports, Swimming, App Dev., Open-Source contribution