Kishan Sharma

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Education

M.Sc in Computational Science and Engineering — *Munich, Germany*

Technical University of Muinch, Germany — *Oct. 2016 - Exp. Dec. 2018*

Cumulative Grade : 1.7

Bachelor of Technology in Mechanical Engineering — *Jodhpur, India*

Indian Institute of Technology Jodhpur, Rajasthan — *July. 2011 - Apr.2015*

Cumulative Grade : 7.9/10

Work Experience

PreciBake GmbH — *Munich, Germany*

Working Student at Machine Learning & Computer Vision Department — *Aug. 2017 - Jun. 2018*

- Implemented multiple object detection and tacker methods to count and classify bad products
- Modeled and performed Deep Learning approaches (RNN, CNN) to monitor baking processes including thickness of product and baking time estimation and classification
- Südback 2017: Collected, Cleaned and Pre-processed data for product placed inside and outside of the oven and further trained deep learning models for recipe prediction for smart ovens

AeroSpace Department, IISC Bangalore — *Bangalore, India*

Project Assistant at Flow Physics Computation & Analysis Lab — *May. 2016 - July. 2016*

- Implemented N.Sugimoto's paper on Thermoacoustic-wave equation for gas in channel and a tube subject to temperature gradient under supervision of Dr. Arnab Samanta
- Developed and executed scripts for numerical solution of approximated Thermoacoustic wave equation in MATLAB

Havells India Limited — *Noida, India*

Graduate Engineer Trainee at Center of Research & Innovation — *June. 2015 - Feb. 2016*

- Initiated and incorporated CFD analysis of ceiling fan in product development cycle and performed CFD analysis of various ceiling fan using Spalart-Allmaras turbulence model
- Generated detailed manufacturing-ready drawings (geometric tolerances, surface finish, etc.), assembly drawings, 3D CAD model etc

Projects

Master Thesis: Image-based count & Size Determination of Fly Larvae with Deep Learning — *ETH Zurich, Switzerland*

Supervisor : Prof. Dr Laura Leal-Taixe, Dr. Jan Dirk Wegner — *Jun. 2018 - PRESENT*

- This thesis aims to develop complete solution of automation of most laborious part of Bio-waste conversion by counting and estimating size of insect larvae. Collected and Prepared pixel-wise annotated labeled image dataset of fly larvae in MS-COCO style dataset format
- Detection based Approach : Implemented and compared state of the art Object detection algorithms, Faster RCNN, Mask RCNN, YOLO and SSD for given objective
- Histogram based Approach 1: Implementing fixed bin length and width ResNet-50 based regression model which predicts Histogram between larvae size and count (ResNet-50)
- Histogram based Approach 2 : Developing supervised and unsupervised learnable histogram layer based model (linear basis function); Novel learnable histogram layer model based on hierarchical basis function

PRAKTIKUM : Machine Learning For Medical Imaging

Detection and Tracking of Surgical Equipments — *Oct. 2017 - Feb. 2018*

- Implemented U-Net and FCN architecture in Tensorflow for simultaneously detecting and estimating Laparoscopy surgical equipment pose using probability maps (joint locations) for EndoVis challenge dataset
- Achieved state of the art results for U-Net multiple tool pose estimation

SEMINAR : Deep Generative Models

Autoencoding beyond Pixels using Learned Similarity metric

- Submitted a comprehensive report by Analysing , implementing and constructively criticizing the proposed methodology in the paper
- Presented the paper explaining the proposed technique and fundamentals of Autoencoder, VAE, GAN and compared the results

Object Pose Estimation Model Based Tracking

- Model Preparation: Associated the texture information with the 3D model using SIFT features in MATLAB
- Estimated pose using PnP and implemented RANSAC and refined the pose using Levenberg Mardquardt algorithm
- Performed tracking of the camera in respect to given 3D model for given sequence of images

Random Forest: Object Classification & Detection

- Extracted HOG descriptors of images using OpenCV library for training Binary Decision tree and Random Forest to classify images in C++
- Generated bounding boxes and used sliding window to classify contents within each bounding box, filtered out bounding boxes with low confidence using non maximal suppression
- Evaluated detection result by using metric used in pascal visual object challenge metric and plotted PR curve

CNN: Object Classification & Pose Estimation

- Implemented a batch generator forming triplet batches consisting of real images and synthetic rendered sample, using the quaternion similarity
- Constructed CNN closely following the LeNet architecture, implemented loss function as addition of triplet and pairs loss and trained network using Adam optimizer using Tensorflow
- Implemented KNN search to evaluate the network, visualized feature descriptors in 3D space and plotted confusion matrix

Mining Massive Yelp Dataset

- **Restaurant Recommendation:** Detected Duplicate reviews using Locality Sensitive Hashing with Cosine Similarity and removed them and preprocessed dataset; Performed latent factor matrix factorisation using Alternating Optimisation and Gradient Descent for the recommendation of restaurant and compared their results.
- **Restaurant Review Classification:** Used HMM as a probabilistic generative model for text data; Trained two HMM for classifying a review into 1-star or 5-star using Baum-welch algorithm
- **Restaurant Ranking:** Performed topic specific page rank on a directed weighted graph of restaurants; calculated standard page rank scores
- **Clustering Users:** Performed spectral clustering on an undirected weighted graph of users based on reviews; Qualitatively evaluated results using ratio cut and normalized cut

Image based Plant Disease Detection using Deep Learning

- Performed classification task on the Plant Village Dataset to identify 26 diseases; Modified Network architecture and used transfer learning to train ResNet-18, DenseNet, AlexNet and VGG-Net
- Achieved state of the art accuracies for DenseNet in test results

Case Study-Bundesliga League Game Outcome Prediction

- Extracted expressive features such as Total goal score, current trend, goal scored and conceded etc. using past 5 Bundesliga season data
- Approach I -Implemented Logistic multinomial regression using R library GlMNET to predict the outcome and final team ranking for 5th season using the past 4 season data
- Approach II - Modeled input features by using Poisson regression to predict goal scored by home and away teams and thus inferring the outcome and 5th season team standings

Image Classification-CIFAR-10

- Performed linear classification with Softmax loss and optimized the loss function with SGD, Improved classification performance by training linear classifiers on features computed from the raw pixels
- Applied fully connected neural network of arbitrary depth for image classification on CIFAR-10 dataset & Trained the network by using Adam update rule for optimization and introduced dropout and Batch Normalization
- Implemented and trained 3 layer convolutional network with drop out and batch normalization using Pytorch

Semantic Segmentation using Transfer learning

- Performed semantic segmentation by doing transfer learning using Resnet18 pretrained ConvNet, modified last layers to perform segmentation and fine tuned some layers while keeping early layers fixed
- Trained the model by fine tuning last layers while keeping early layers fixed, Used CUDA libraries in PyTorch to decrease the training time

Binary Segmentation -Gaussian Mixture Model Estimation

- Modeled densities of fore and background pixels based on their intensity by estimating 2 mixture of gaussians
- Applied estimated models to input image and segmented foreground and background regions in C++ using OpenCV

Technical Skills

Programming Language	**CPP** ★★★★☆ **Python** ★★★★★ **Matlab** ★★★☆☆ **R** ★★☆☆☆
Deep Learning FrameWork	**PyTorch** ★★★★☆ **TensorFlow** ★★★☆☆
IT-Knowledge	**MS Office** ★★★★★ **Latex** ★★★★☆ **Windows** ★★★★☆ **Linux** ★★★★★

Extracurricular Activity

- Awarded Erasmus Scholarship for Swiss-European Mobility Program for ETH Zurich Exchange student
- Won 2nd Prize at Microsoft Student AI Lab Competition by building Emotional trainer bot for Asperger syndrome patients
- Integral Part of Dance club, IIT Jodhpur for 4 years, mentored the club for 2 years

Munich, 27th August 2018