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 - May. 2018*

- Implemented object detection and tacker methods to count and classify anomalies
- 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

Probability Distribution Modelling of Velocity Fields using GAN

- Estimated probability distribution over velocity fields generated by a simple 2D plume fluid simulation (incompressible flow). The velocity fields of simple 2D fluid simulation were generated using mantaflow (http://mantaflow.com/) software
- Modeled a simple Generative Adversarial Network (GAN) to learn the probability distribution. After that, the generator architecture was modified to address the checkerboard problem, included divergence-free condition.

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 ★★★☆☆	Theano ★★★★☆	
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