NEHA DAS

AI Resident, Facebook

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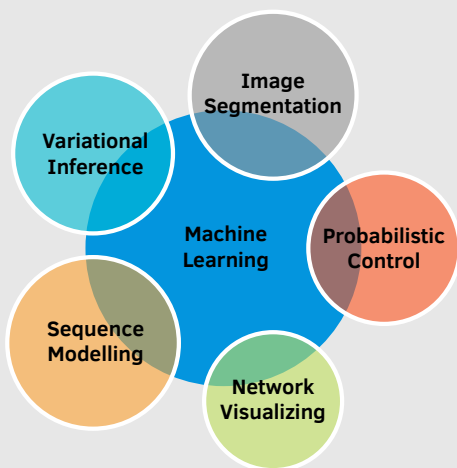✉ neha191091@gmail.com

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Technical Skills ———

Research Experience and Interests

Programming

Python • Tensorflow • Pytorch

C • C++

Javascript • Django(Python) • Docker

OpenCV • MATLAB • Simulink

Education

Oct 2016 – Sep 2019	**MSc. Informatics** *Grade - 1.2, Passed with High Distinction*	Technical University of Munich
Aug 2009 – May 2013	**BTech. Software Engineering** *Avg. - 75.48, First Division with Distinction*	Delhi Technological University

Research

Sep 2019 – Present **AI Residency Project** Facebook AI Research

Representation Learning for Controlling Armed Robots

The aim of this work is to learn a latent dynamics model of of an armed robot for interaction with and manipulation of a held object/tool given visual and pro-prioceptive input. We postulate that a helpful step towards this is to explicitly model the object dynamics and its relationship with the interacting arm.

- **Tools**: Python, PyTorch, Visdom

Apr 2019 – Sep 2019 **Internship Project** Volkswagen Group AI Research

Combining Probabilistic Movement Primitives

- Learning a smooth interpolation of two or more probabilistic movement primitives for feasible trajectory generation.
- **Tools**: Python, Tensorflow, Matplotlib

Nov 2018 – Apr 2019 **Master's Thesis** TUM, Volkswagen Group AI Research

Learning state-space models of camera based drones for intrinsically motivated control

This work deals with the implementation and extension of Deep Variational Bayes Filter to incorporate high-dimensional image data. This includes

- Analysis of issues arising in some of the current architectures for modeling high-dimensional sequential data.
- Developing a systematic approach towards dealing with the above issues
- Evaluation of the resultant architecture on three distinct dynamical systems both in terms of predictive quality as well as for empowerment-based control.
- **Tools**: Python, Tensorflow, OpenCV, Matplotlib

June 2017 – May 2018 **Inter Disciplinary Project** Chair for CAMP@TUM

3D Human Body Segmentation

This work was part of a collaborative effort to provide a virtual view into a patient's body for assistance during diagnosis and surgical procedures. My contributions included:

- Devising and implementing a fast segmentation architecture for a 3D model of the human body constructed using KinectFusion SLAM from depth maps. The segmentation architecture was based on U-Net with Depthwise Separable Convolutions for added speed (50% increase over normal CNNs).
- Preparation of a synthetic dataset of Depth-Segmentation Map pairs using the Blender software and python scripts. The segmentation model was trained on synthetic data and tuned to work for real depth images.
- Implementation of the inference pipeline in C++ for integration with the rest of the project.
- **Tools**: Python, C++, Tensorflow, OpenCV, Matplotlib, Blender

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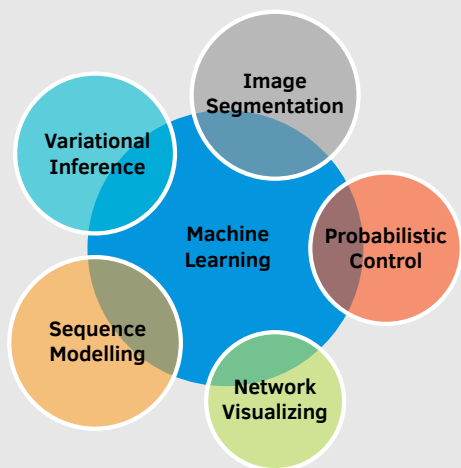
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Oct 2017 - Mar 2018

Advanced Practical Course   Computer Vision Group@TUM
Neural Network Visualization using Guided Backpropagation

In a team of two:
- Implemented Guided Backpropagation for visualization of the internals of a neural network. This was used to analyze and hypothesize about the workings of a neural network that used for protein structure prediction.
- Implemented a web interface that predicts the tertiary structure of a given protein.
- **Tools**: Python, PyTorch, Flask, Matplotlib

Oct 2017 - Feb 2018

Lecture Project   Chair of Computer Graphics@TUM
Iterative Closest Point Analysis

In a team of two:
- Implemented and analyzed several variants of the Iterative Closest Point algorithm, comparing them on the basis of execution speed and quality of the result.
- **Tools**: C++, OpenCV

June 2017 - Oct 2017

Advanced Practical Course   TUM, Volkswagen Group AI Research
Modelling a dynamical system using Inverse Autoregressive Flow

In a team of three:
- Proposed and implemented Inverse Autoregressive Flows for determining the state space (latents) in a dynamical system model.
- Obtained comparative results to the (then) state of the art on Pendulum data with reduced sampling complexity.
- **Tools**: Python, Tensorflow, Matplotlib

Apr 2017 - June 2017

Advanced Practical Course   TUM, Volkswagen Group AI Research
Reimplementation of Importance Weighted Autoencoders (IWAE

- Reimplemented IWAE and trained the architecture on MNIST.
- Presented a theoretical and a comparitive analysis of the technique.
- **Tools**: Python, Tensorflow, Matplotlib

June 2017 - Oct 2017

Lecture Project   Computer Vision Group@TUM
Synthesis of Depth images from RGB images

In a team of four:
- Implementation of an architecture that learns a supervised pixel to pixel mapping from an RGB image to its corresponding depth image.
- **Tools**: Python, PyTorch

Publications & Technical Reports

Nov 2019 $\beta-$DVBF: Learning State-Space Models for Control from High Dimensional Observations. ↗

July 2018   Development of a system that allows for the semantic segmentation of a 3D model of a human body into its constituent parts ↗

Jun 2018   Seminar Report: Deep Learning Sequence Modelling (Natural Language Processing) ↗

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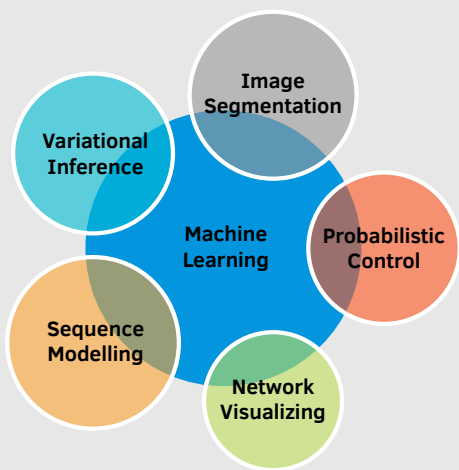
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Additional Experience

June 2018 - Aug 2018	**Intern, Master's Thesis Student**	Volkswagen Group AI Research

- Setup the inference model for unsupervised control in an embedded system (Jetson TX1) using Tensorflow C APIs.
- Wrote a module for retrieving and appropriately formatting data from the IMX219 cameras attached to the Jetson Module using Video4Linux APIs

June 2017 - Mar 2018	**Working Student**	Chair of Robotics and Embedded Systems, TUM

- Modelled various example Cyber Physical Systems using MATLAB and Simulink for class tutorials.
- Set up a website for one of the projects for the Chair (Django-python, Bootstrap CSS).

Oct 2014 - Sep 2016	**Software Developer**	Epic Systems

- Developed front-end (Javascript, CSS) and back-end (CSharp, Cache) code for Web-based applications.

July 2013 - Sep 2014	**Software Developer in Test**	McAfee

- Debugged and Fixed critical issues including operating system crashes, performed white box testing for critical issues,
- Created a framework in C++ for stress testing the product