



# NEHA DAS

Doctoral Candidate,  
TU Munich

1525 8398 578

ei.tum.de/itr/das/

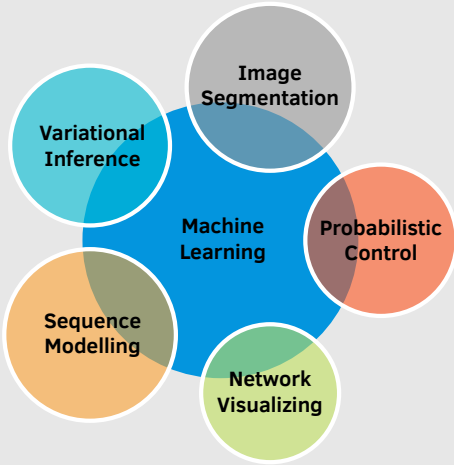
neha.das@tum.de

/in/neha191091

neha191091

## Technical Skills

### Research Experience and Interests



### Programming

Python • Tensorflow • Pytorch

C • C++

Javascript • Django(Python) • Docker

OpenCV • MATLAB • Simulink

## Education

Oct 2020 - Present	<b>Doctoral Candidate</b> Supervised by Prof. Sandra Hirche	Chair of Information Oriented Control, TUM
Working on User-adaptive data-driven control with performance guarantees with application in medical technologies.		
Oct 2016 - Sep 2019	<b>MSc. Informatics</b> <i>Grade - 1.2 (1-Highest, 4-Lowest), Passed with High Distinction (Top 9.4 percentile)</i>	Technical University of Munich
Aug 2009 - May 2013	<b>BTech. Software Engineering</b> <i>Avg. - 75.48, First Division with Distinction</i>	Delhi Technological University

## Publications & Technical Reports

Nov 2020	S. Bechtel, N. Das and F. Meier, "Learning Extended Body Schemas from Visual Keypoints for Object Manipulation." <i>2020 arXiv preprint arXiv:2011.03882.</i> <a href="#">↗</a>
Nov 2020	N. Das, S. Bechtel, T. Davchev, D. Jayaraman, A. Rai and F. Meier, "Model-Based Inverse Reinforcement Learning from Visual Demonstrations," <i>2020 Conference on Robot Learning (CoRL)</i> <a href="#">↗</a>
Oct 2020	K. Morse, N. Das, Y. Lin, A. S. Wang, A. Rai and F. Meier, "Learning State-Dependent Losses for Inverse Dynamics Learning," <i>2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)</i> <a href="#">↗</a>
Nov 2019	N. Das, M. Karl, P. Becker-Ehmck and P. van der Smagt, "Beta DVBF: Learning State-Space Models for Control from High Dimensional Observations." <i>2019 arXiv preprint arXiv:1911.00756.</i> <a href="#">↗</a>
July 2018	Development of a system that allows for the semantic segmentation of a 3D model of a human body into its constituent parts <a href="#">↗</a>
Jun 2018	Seminar Report: Deep Learning Sequence Modelling (Natural Language Processing) <a href="#">↗</a>

## Past Projects

Sep 2019 - Sep 2020	<b>AI Residency Projects</b> As an AI Resident, I contributed towards several projects:	Facebook AI Research
<ul style="list-style-type: none"> <li>• <b>Representation learning for manipulating a robotic arm:</b> We learned an extended body schema of an armed robot for interaction with and manipulation of a held object/tool given visual and proprioceptive input.</li> <li>• <b>Model-Based Inverse Reinforcement Learning:</b> We developed an inverse reinforcement learning scheme that, inspired from meta-learning approaches uses a gradient based update for more effectively learning behaviour from visual demonstrations.</li> <li>• <b>Learning state-dependent losses for inverse-dynamics learning:</b> This work aimed to show that meta-learning an appropriate loss function for learning the inverse-dynamics model of a robotic arm works better than conventionally learning the model using a fixed loss.</li> <li>• <b>Tools:</b> Python, PyTorch, Visdom</li> </ul>		
Apr 2019 - Sep 2019	<b>Internship Project</b> <i>Combining Probabilistic Movement Primitives</i>	Volkswagen Group AI Research
<ul style="list-style-type: none"> <li>• Learning a smooth interpolation of two or more probabilistic movement primitives for feasible trajectory generation.</li> <li>• <b>Tools:</b> Python, Tensorflow, Matplotlib</li> </ul>		



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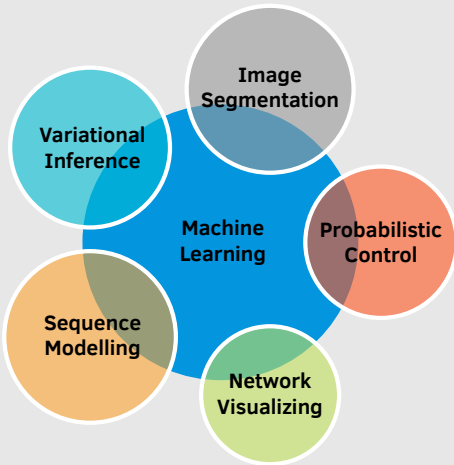
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Javascript • Django(Python) • Docker

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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 3 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

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



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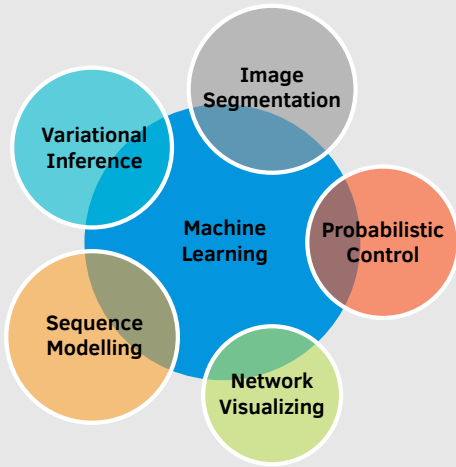
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Apr 2017 -  
June 2017

#### 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 comparative 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

## 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