TATHAGATA BANDYOPADHYAY

Munich, Germany

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Profile Summary

Experienced software developer with a passion for research, particularly in the fields of Deep Learning and AI. Seeking a research role related to Generative AI, encompassing either of Large Language Models (LLMs), 2D/3D Computer Vision, Audio Processing or multi-modal AI using Auto-encoders, GANs, or Diffusion Models. Open for collaboration on research projects in the broad domains of Deep Learning and Generative AI.

Education

Technical University of Munich   Oct. 2019 – Mar. 2024
M.Sc. in Informatics | Grade: **1.4** *(in German Scale) | Passed with Distinction*   *Munich, Germany*

KIIT University   Aug. 2013 – May 2017
B.Tech. in Computer Science | Grade: **1.3** *(in German Scale) | Founder's All-rounder Gold Medalist*   *Bhubaneswar, India*

Experience

Siemens (Technology)   Mar. 2023 – Sep. 2024
Working Student Researcher   *Munich, Germany*

- Developed an Intuitive Natural Language Query system for Knowledge Graphs using LLMs.
- Implemented Retrieval Augmented Generation (RAG) on Knowledge Graphs using graph traversal
- Performed Prompt Engineering and In-Context Learning to generate reliable, reproducible and robust answers.
- Developed an automated sentence extraction tool which reduced manual dataset creation effort by roughly 50 percent.
- Utilized Python, LangChain, FastAPI and FLASK for back-end and HTML, CSS, JS and Streamlit for front-end.
- Filed 3 Invention Disclosures (Patents) and published 1 Research Paper.

Technical University of Munich   Apr. 2021 – Sep. 2022
Teaching Assistant (TA) for Introduction to Deep Learning (I2DL IN2346)   *Munich, Germany*

- Designed hands-on exercises for Deep Learning course using PyTorch, NumPy and Python.
- Taught Deep Learning Exercises to more than 1000 international students of TUM.
- Prepared examination questions for Deep Learning and graded student answer papers.

Dell Technologies   Jul. 2017 – Sep. 2019
Software Engineer I   *Bangalore, India*

- Developed an Intelligent Price Recommendation Engine with Statistical Modelling of historical price data.
- Utilized Web Scrapping using Python, Pandas, NumPy and BeautifulSoup to collect and analyse market price.
- Applied Test Driven Development (TDD) and CI-CD pipelines to improve code quality by roughly 45 percent.
- Maintained back-end REST APIs written in C# .Net Framework.
- Followed Agile Software Development with a cross-functional multi-national team of more than 50 members.

Technical Skills

Programming Languages: Python, C#, C++, Java, C, HTML/CSS, JavaScript
Technologies/Frameworks: PyTorch, LangChain, FastAPI, FLASK, Git, .Net, Streamlit
Developer Tools: PyCharm, VS Code, Visual Studio, Docker, MATLAB, Wandb
Topics: Deep Learning, Computer Vision, 3D Reconstruction, Generative AI, LLMs, REST APIs

Projects

Neural Parametric 3D Head Models with 2D GANs | *Python, PyTorch, PyVista, Meshlab, Wandb*   **Dec. 2023**

- Developed a neural parametric head model to reconstruct 3D head geometry from partial point clouds or depth scans.
- Utilized neural network to predict 3D signed distance field as an implicit 3D head representation.
- Implemented differentiable volumetric neural rendering to compute 2D GAN objectives from multi-view normal maps.

Conditional Speech Separation with Transformers | *Python, PyTorch, Librosa, VScode, Wandb*   **Mar. 2022**

- Developed a target speaker extraction system from monaural mixed-speech audio using transformer neural networks.
- Utilized LSTM and 1D CNN for encoding the inputs and generative adversarial objectives to further refine the outputs.
- Used Python and PyTorch for neural networks, VSCode for IDE and Librosa for audio mixing and transformations.

Cover Song Identification using Graph Neural Networks | *Python, PyTorch, PyG, PyCharm, Librosa*   **Sep. 2021**
- Developed a deep learning based system to identify a song from a partial instrumental or humming tunes.
- Implemented Spectrogram based 2D CNN for audio embedding and message passing neural network for metric learning.
- Used Python, PyTorch and PyG for CNNs and Graph Neural Networks and Librosa for audio pre-processing.

Self-Supervised Single View Object Re-Lighting | *Python, PyTorch, PyCharm, PyRender*   **Aug. 2021**
- Implemented a deep learning approach to change the lighting of a 2D image of an object without changing geometry.
- Represented lighting as Spherical Harmonic vectors and utilized 2D CNNs as Albedo, Normal and Lighting decomposer.
- Used self-reconstruction and cross-reconstruction objectives to train the networks in self-supervised setting.

Semi-Supervised Learning using Group Loss | *Python, PyTorch, PyCharm*   **Mar. 2021**
- Designed a semi-supervised image classification algorithm using group loss to consider intra-batch embedding similarity.
- Improved image label guessing and label propagation using group loss based deep metric learning.
- Used Python and PyTorch for implementation and used MixMatch paper from Google Research as baseline.

Publications

- Nilay Tufek, Aparna Saissre, Valentin Philipp Just, Fajar J. Ekputra, **Tathagata Bandyopadhyay**, Marta Sabou, and Allan Hanbury. Validating semantic artifacts with large language models. In *Proceedings of The Semantic Web – 21st International Conference, ESWC 2024*. Springer, ESWC 2024, 2024

- **Tathagata Bandyopadhyay**, Jan Kubicek, Marek Penhaker, Juraj Timkovic, David Oczka, and Ondrej Krejcar. A semi-supervised learning approach for automatic segmentation of retinal lesions using surf blob detector and locally adaptive binarization. In *Proceedings of the 11th ASIAN Conference on Intelligent Information and Database Systems (ACIIDS 2019)*, pages 311–323. Springer, LNCS(LNAI), volume 11432, 2019

- **Tathagata Bandyopadhyay**, Shyamali Mitra, Sreetama Mitra, Luis Miguel Rato, Nibaran Das, and Mrinal Kanti Naskar. A fast algorithm for automatic segmentation of pancreas histological images for glucose intolerance identification. In *Recent Developments in Machine Learning and Data Analytics (IC3 2018)*, pages 307–315. Springer, AISC, volume 740, 2018

- Rajdeep Chatterjee, **Tathagata Bandyopadhyay**, Debarshi Kumar Sanyal, and Dibyajyoti Guha. Comparative analysis of feature extraction techniques in motor-imagery eeg signal classification. In *Proceedings of First International Conference on Smart Systems, Innovations and Computing*, pages 73–83. Springer, SIST, volume 79, 2018

- **Tathagata Bandyopadhyay**, Sreetama Mitra, Shyamali Mitra, Luis Miguel Rato, and Nibaran Das. Analysis of pancreas histological images for glucose intolerance identification using wavelet decomposition. In *Proceedings of the 5th International Conference on Frontiers in Intelligent Computing: Theory and Applications*, pages 653–661. Springer, AISC, volume 515, 2017

- Rajdeep Chatterjee, **Tathagata Bandyopadhyay**, Debarshi Kumar Sanyal, and Dibyajyoti Guha. Dimensionality reduction for eeg signal using fuzzy discernibility matrix. In *Proceedings of the 10th International Conference on Human System Interaction (HSI)*, pages 131–136. IEEE, 2017

- Rajdeep Chatterjee, **Tathagata Bandyopadhyay**, and Debarshi Kumar Sanyal. Effects of wavelets on quality of features in motor-imagery eeg signal classification. In *Proceedings of International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET)*, pages 1346–1350. IEEE, 2016

- Rajdeep Chatterjee and **Tathagata Bandyopadhyay**. Eeg based motor imagery classification using svm and mlp. In *Proceedings of 2nd International Conference on Computational Intelligence and Networks (CINE)*, pages 84–89. IEEE, 2016

Patents

- An LLM based method for contextual dynamic entity extraction from a Natural Language Sentence and linking them to a structured text source. (Submitted)

- A graph traversal method for contextual sub-graph extraction from a knowledge graph for natural language based interactive question answering. (Submitted)

- Simplifying the generation of formal queries from natural language OPC UA queries using Large Language Models. (filed)