

Tapos Datta

Senior Software Engineer (R&D), BrainCraft Ltd., Dhaka, Bangladesh
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RESEARCH INTERESTS

Computer Vision | Biomedical Image Analysis | Deep Learning | Segmentation Networks (U-Net, U²-Net) | Model Quantization | Real-time Mobile Vision

EDUCATION

Bachelor of Science in Computer Science & Engineering

Shahjalal University of Science & Technology (SUST), Sylhet, Bangladesh

Jan 2013 – Sep 2017

CGPA: 3.54 / 4.00

Thesis: Generalized Product Recommendation Using Nonlinear User and Item Factorization via Modified Artificial Neural Network

- Developed a deep feed-forward neural network to model nonlinear relationships between users and items for recommendation tasks.
- Evaluated the approach on Jester, MovieLens, and Yahoo Music datasets, achieving improved RMSE over baseline methods.

Relevant Coursework: Machine Learning, Computer Graphics, Probability & Statistics, Linear Algebra

PUBLICATIONS

Journal Papers:

- B Purkaystha, T Datta, MS Islam, “Rating prediction for recommendation: Constructing user profiles and item characteristics using backpropagation,” *Applied Soft Computing*, Elsevier, Volume 75, February 2019, Pages 310–322. Derived from B.Sc. thesis, proposes a deep feed-forward neural network for recommendation systems, learning nonlinear user and item factors concurrently. Evaluated on Jester, Movielens, and Yahoo Music datasets. [Paper]

Conference Papers:

- B Purkaystha, T Datta, MS Islam, “Product recommendation: A deep learning factorization method using separate learners” *20th International Conference on Computer and Information Technology (ICCIT)*, IEEE, Dhaka, Bangladesh, 22–24 December 2017. Partial work from B.Sc. thesis; reported best results on the Jester dataset. [Paper]
- B Purkaystha, T Datta, MS Islam, “Bengali Handwritten Character Recognition using Deep Convolutional Neural Network,” *20th International Conference on Computer and Information Technology (ICCIT)*, IEEE, Dhaka, Bangladesh, 22–24 December 2017. Developed a CNN-based model for handwritten Bengali character recognition, achieving up to 98.66% accuracy on numerals and 89.93% overall on BanglaLekha-Isolated dataset. [Paper]
- B Purkaystha, T Datta, MS Islam, “Layered Representation of Bengali Texts in Reduced Dimension Using Deep Feed-forward Neural Network for Categorization,” *21st International Conference on Computer and Information Technology (ICCIT)*, IEEE, Dhaka, Bangladesh, 21–23 December 2018. Developed a deep feedforward neural network for Bengali text categorization using denoising autoencoder-based feature reduction, achieving 94.05% accuracy on 12 categories. [Paper]

SELECTED PROJECTS

Generalized Retinal Vessel Segmentation (Research Project)

Deep Learning Researcher (Python, PyTorch, Computer Vision, CNNs) [Code] [Demo]

- Designed a robust, generalized semantic segmentation model using an **Enhanced U²-Net (U²-Net-E)** architecture, integrating a proprietary **‘hybrid’ pre-processing module** to mitigate domain shift across varied imaging modalities effectively.
- Implemented a specialized **patch-based training strategy** across a unified cohort of four diverse public datasets (DRIVE, HRF, CHASE_DB1, STARE) to ensure high resilience to pathology and high-resolution imaging challenges.
- Achieved strong generalization with a **Generalized Dice Coefficient of 0.8062** and **Sensitivity of 0.8868** on a balanced test set, optimizing the final model deployed to a peak test performance of **Dice Coefficient 0.8208**.

Human Segmentation (Open Source Project)

Lead Developer (Python, PyTorch, Computer Vision) [Code]

- Trained and adapted a **U²-Net Lite** model, based on the original **U²-Net** architecture, for human segmentation on the **P3M-10K** dataset, aiming to accurately separate human figures from diverse backgrounds in images and videos.
- Implemented a complete PyTorch-based training pipeline including data preprocessing, augmentation, and validation.

Real-time Background Removal App*ML Developer (Android + PyTorch Mobile)* [Project]

- Integrated a PyTorch-based segmentation model for background matting into Android, optimizing it for real-time performance on mobile GPUs using ONNX conversion.
- Improved latency and efficiency by 30% through model quantization and optimized I/O threading, allowing smoother real-time video processing.

Video Editor (OpenGL & GPU Optimization)*Android Developer (OpenGL, MediaCodec, ExoPlayer)* [Project]

- Implemented GPU-based video filter and rendering pipelines using OpenGL-ES and MediaCodec APIs.
- Designed shader modules for blending and transitions, achieving efficient real-time video processing.
- Reduced memory overhead by 25% via asynchronous frame buffering and optimized texture handling.

FacePal (Academic Project) [Code]

- Designed and implemented a real-time face detection and recognition client-server system using OpenCV and JavaFX.
- Applied eigenvector-based feature extraction for accurate identity recognition and logging.
- Integrated IP-camera support for remote live video streaming and automated entrant record maintenance.

RESEARCH & PROFESSIONAL EXPERIENCE

BrainCraft Ltd.*Senior Software Engineer (Computer Vision & ML)*

Dhaka, Bangladesh

Jul 2019 – Present

- **Architect and deploy deep learning-based vision systems** using PyTorch for image segmentation and classification, optimizing models for accuracy and efficiency.
- Investigated and optimized U²-Net architectures for **high-precision hair-edge segmentation**, achieving a 40% improvement in accuracy on custom datasets of 40K+ images.
- Researched and implemented GPU-accelerated **background matting algorithms** using C++, leveraging OpenGL-ES (Android) and Metal (iOS) to ensure resource efficiency during real-time video inference.

iHealthScreen Bangladesh Ltd.*Software Engineer (Biomedical Image Processing)*

Dhaka, Bangladesh

Oct 2017 – May 2019

- Developed *Retinal Pathology Progression Analysis*, a semi-automatic desktop application for vessel segmentation and AMD detection using classical image processing and machine learning techniques, implemented in C++ (Qt5, OpenCV). [Project]
- Applied **gradient magnitude profiling** on OCT images to detect retinal layers and analyze optic disc localization.
- Contributed to pattern recognition models in collaboration with clinical partners for diagnostic support tools.

SKILLS

- **Programming:** Python, C++, Kotlin, Swift, GLSL
- **Frameworks & Tools:** PyTorch, OpenCV, ONNX, TensorFlow, OpenGL-ES, Qt5, Git
- **Core Areas:** Deep Learning, Image Analysis, Model Quantization, Edge-Aware Filtering
- **Soft Skills:** Research-driven, Problem Solver, Team Collaboration, Technical Documentation

AWARDS & ACHIEVEMENTS

- **Outstanding Performance Award, BrainCraft Ltd.** Dhaka, Bangladesh
Recognized for innovative contributions to ML-powered mobile app features. 2024
- **Open-Source Contributions: Real-Time Video Processing Libraries**
Contributed to two Android open-source projects, Mp4Composer-android and LiTr, using OpenGL-ES, MediaCodec, and GPU-accelerated pipelines to enhance performance, filtering, and video/audio processing.

REFERENCES

Available upon request.