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, U^2-Net) | Model Quantization | Real-time Mobile Vision

EDUCATION

Shahjalal University of Science & Technology (SUST), Sylhet, Bangladesh — Jan 2013 – Sep 2017
Bachelor of Science in Computer Science & Engineering — CGPA: 3.54/4.00

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

Developed a deep feed-forward neural network for recommendation systems, learning nonlinear user and item factors concurrently. Tested on Jester, Movielens, and Yahoo Music datasets, achieving lower RMSE than existing models.

RESEARCH & PROFESSIONAL EXPERIENCE

BrainCraft Ltd. — Dhaka, Bangladesh
Senior Software Engineer (Computer Vision & ML) — Jul 2019 – Present

- **Developed and deployed deep learning–based vision systems** using PyTorch for image segmentation and classification, optimizing models for accuracy and efficiency.
- **Trained and quantized U^2-Net models** on large-scale custom datasets (40K+ images), achieving over 40% improvement in hair-edge segmentation and enabling real-time mobile deployment via ONNX optimization.
- **Integrated ML pipelines into mobile applications**, leveraging OpenGL-ES and MediaCodec (Android) and Metal (iOS) for GPU-accelerated video and image processing, including C++ -based background matting algorithms optimized for **real-time performance and resource efficiency**.

iHealthScreen Bangladesh Ltd. — Dhaka, Bangladesh
Software Engineer (Biomedical Image Processing) — 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). [Link]
- 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.

SELECTED PROJECTS

Generalized Retinal Vessel Segmentation (Research Project)
Deep Learning Researcher (Python, PyTorch, Computer Vision, CNNs)
github.com/tapos-datta/Retinal_Vessel_Segmentation

- Developed a robust, generalized semantic segmentation model using an **Enhanced U^2-Net (U^2-Net-E)** architecture, integrating a proprietary **'hybrid' pre-processing module** to effectively mitigate domain shift across varied imaging modalities.
- 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 deployed model to a peak test performance of **Dice Coefficient** 0.8208.

HumanSegmentation (Open Source Project)
Lead Developer (Python, PyTorch, Computer Vision)
github.com/tapos-datta/HumanSegmentation

- Trained and adapted a **U^2-Net Lite** model, based on the original **U^2-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)

- 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**, enabling smoother real-time video processing.

Video Editor (OpenGL & GPU Optimization)
Android Developer (OpenGL, MediaCodec, ExoPlayer)

- 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)

- 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.

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; developed a deep feed-forward neural network for recommendation systems, learning nonlinear user and item factors concurrently. Evaluated on Jester, Movielens, and Yahoo Music datasets. [Link]

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. [Link]

- 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. [Link]

- B Purkaystha, T Datta, MS Islam, "Layered Representation of Bengali Texts in Reduced Dimension Using Deep Feedforward 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. [Link]

SKILLS

- **Programming:** Python, C++, Kotlin, Swift, GLSL
- **Frameworks & Tools:** PyTorch, OpenCV, ONNX, TensorFlow, OpenGL-ES, Qt5, Git
- **Specialization:** CNN & Deep Neural Networks, 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, leveraging **OpenGL-ES, MediaCodec, and GPU-accelerated pipelines** to enhance performance, filtering, and video/audio processing.

REFERENCES

Available upon request.