Lavsen Dahal

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Education

- **Duke University** — Durham, USA
  PhD in Electrical & Computer Engineering — *Aug 2023 - Present*
- **University of Girona** — Girona, Spain
  Erasmus+ Master's in Medical Imaging and & Applications — *Sep 2017 - Aug 2019*
- **Visvesvaraya National Institute of Technology** — Nagpur, India
  B. Tech in Electrical & Electronics Engineering — *Aug 2010 - June 2014*

Skills Summary

- **Languages**: Python, R Programming, MATLAB
- **Frameworks/Tools**: Pytorch, OpenCV, SLURM, Singularity, Docker

Experience

- **Center for Virtual Imaging Trials, Duke University** — Durham, USA
  Research Associate — *June 2022 - July 2023*
  - **Anthropomorphic Phantoms**: Spearheaded a team in the development of a comprehensive Python-based pipeline for generating anthropomorphic anatomical phantoms from CT images through the use of a semi-supervised deep learning algorithm.
  - **Research Collaboration**: Collaborated with master's students and independent researchers on projects involving diffusion models and Monte Carlo random walk techniques, leading to the creation of simulated models for both the large and small intestines.
- **Nepal Applied Mathematics and Informatics Institute for Research** — Kathmandu, Nepal
  Research Associate — *July 2019 - Aug 2020*
  - **Uncertainty Modelling**: Developed Monte Carlo Dropout for Bayesian Approximation uncertainty estimation in deep learning-based echocardiography image segmentation, automatically filtering out low quality segmentation masks.
  - **Object Detection**: Implemented a vertebrae detector through RCNN, enabling automated Cobb angle measurements for scoliosis diagnosis; co-authored research proceedings for MICCAI workshop.
  - **Bootcamp Workshop**: Co-organized a 2019 AI Winter School in partnership with global universities, providing teaching assistance and designing laboratory curricula for generative models like GANs and auto-encoders.
- **VICOROB, University of Girona** — Girona, Spain
  Research Intern — *Feb 2019 - June 2019*
  - **Image super-resolution**: Designed and implemented the SR-UResNet CNN architecture for enhancing image super-resolution, resulting in superior image quality concerning visual aesthetics, Peak Signal to Noise Ratio (PSNR), and Structural Similarity Index (SSIM) when compared to conventional methods like bicubic interpolation with the dataset of brain MRI images obtained from hospitals in Catalonia, Spain.
- **BioMedIA, Imperial College** — London, UK
  Research Intern — *July 2018 - Oct 2018*
  - **Malignancy Classification**: Leveraged a deep learning algorithm to distinguish between benign and malignant lung cancer through the analysis of low-dose CT scans, utilizing the Lung Nodule Analysis (LUNA) dataset.
- **Kantipur Engineering College** — Lalitpur, Nepal
  Lecturer — *Nov 2016 - Aug 2017*
  - **Classroom Leadership**: Taught Computer Programming and Artificial Intelligence Course; Lab Instructor for C Programming, Operating System, and PROLOG Courses.
  - **Dissertation Committee Member**: Mentored to undergraduate students undertaking senior thesis projects.
- **JSW Steel** — Maharashtra, India
  Project Manager — *May 2014 - June 2016*
  - **Project Management**: Developed a comprehensive project plan, procured equipment, and execution of the electrical infrastructure upgrade for a billet caster steel plant; led a team of technicians, providing guidance and direction during the installation phase.

Honors and Awards

- **Ph.D. Fellowship - 2023**: $500K+ full-ride scholarship awarded to pursue Ph.D. in Electrical and Computer Engineering; Granted by Pratt School of Engineering, Duke University.
- **Erasmus+ Global Scholar - 2017**: €42K full-ride scholarship to pursue master's in medical Imaging & Applications; Commissioned by European Union (EU); Awarded to 22 students in the world for this course.

Academic Projects

- **University of Bourgogne** — Dijon, France
  Image Processing — *Sep 2017 – JAN 2018*
  - **Content Aware Image Resizing using Seam Carving**: Gradient Magnitude was employed to determine pixel energy, while Dynamic Programming was applied to identify and remove low-energy seams.
  - **Automatic segmentation of Prostate gland using Super pixels and Graphcut**: Simple Linear Iterative Clustering (SLIC) was employed to generate superpixels. An energy function, considering regional and boundary information, was utilized for Graphcut.
  - **Lossless and Lossy techniques for data compression**: Lossless algorithms utilized Huffman and arithmetic coding, while a JPEG encoder was employed as a lossy technique.
- **University of Cassino and Southern Lazio** — Cassino, Italy
  Computer Vision — *Feb 2018 – June 2018*
  - **Retinal Vessel Segmentation in Color Fundus Images**: Retinal vessel segmentation was performed on three publicly available datasets, namely DRIVE, STARE, and CHASEDB. The segmentation was achieved through mathematical morphology and thresholding methods, and compared to a Convolutional Neural Network (CNN)-based approach.
- **University of Girona** — Girona, Spain
  Medical Imaging — *Feb 2018 – June 2018*
  - **Probabilistic atlas-based Image Segmentation**: A deformable registration method, B-spline, was employed to register brain MRI images. Subsequently, a probabilistic atlas was generated by registering the reference images and calculating the average volume intensity. The information from the atlas served as the initialization for the Expectation Maximization algorithm.
  - **Tissue Segmentation of Brain MRI images using Deep Learning**: Brain image segmentation into cerebrospinal fluid, gray matter, and white matter performed using 3D U-Net, with pre-processing involving adaptive histogram equalization and histogram matching.

Publications

1. Mouheb, K., Nejad, M., **Dahal, L.**, Samei, E., Segars, W. P., & Lo, J. Y. (2023). Large intestine 3D shape refinement using point diffusion models for digital phantom generation. arXiv (Cornell University) https://doi.org/10.48550/arxiv.2309.08289.
2. Tushar, F. I., **Dahal, L.**, Sotoudeh-Paima, S., Abadi, E., Segars, W. P., Samei, E., & Lo, J. Y. (2023). Data diversity and virtual imaging in AI-based diagnosis: A case study. based on COVID-19. arXiv (Cornell University) https://doi.org/10.48550/arxiv.2308.09730.
3. **Dahal, L.**, Wang, Y., Tushar, F. I., Montero, I., Lafata, K., Abadi, E., Samei, E., Segars, W. P., & Lo, J. Y. (2023). Automatic quality control in computed tomography volumes segmentation using a small set of XCAT as reference images. Medical Imaging 2023: Physics of Medical Imaging https://doi.org/10.1117/12.2654734.
4. **Dahal, L.**, Tushar, F. I., Abadi, E., Fricks, R. B., Mazurowski, M. A., Segars, W. P., Samei, E., & Lo, J. Y. (2022). Virtual versus reality: external validation of COVID-19 classifiers using XCAT phantoms for chest radiography. Medical Imaging 2022: Physics of Medical Imaging https://doi.org/10.1117/12.2612975.
5. Hasan, M. K., Alam, M. A., **Dahal, L.**, Roy, S., Wahid, S. R., Elahi, M. T. E., Martí, R., & Khanal, B. (2022). Challenges of deep learning methods for COVID-19 detection using public datasets. Informatics in Medicine Unlocked, 30, 100945.https://doi.org/10.1016/j.imu.2022.100945.
6. **Dahal, L.**, Kafle, A., & Khanal, B. (2020). Uncertainty estimation in deep 2D echocardiography segmentation. arXiv (Cornell University). https://doi.org/10.48550/arxiv.2005.09349.
7. Hasan, M. K., **Dahal, L.**, Samarakoon, P. N., Tushar, F. I., & Marly, R. M. (2020). DSNet: Automatic dermoscopic skin lesion segmentation. Computers in Biology and Medicine, 120, 103738. https://doi.org/10.1016/j.compbiomed.2020.103738.
8. Khanal, B., **Dahal, L.**, Prabha, A., & Khanal, B. (2020). Automatic Cobb angle detection using vertebra detector and vertebra corners regression. In Lecture Notes in Computer Science (pp. 81–87) https://doi.org/10.1007/978-3-030-39752-4_9.
9. Tushar, F. I., Alyafi, B., Hasan, M. K., & **Dahal, L.** (2019). Brain Tissue Segmentation Using NeuroNet With Different Pre-processing Techniques. IEEE. https://doi.org/10.1109/iciev.2019.8858515 .
10. **Dahal, L.**, Oliver, A. and Llado, X., 2019. Deep Learning Methods for Image Reconstruction MAIA Thesis Proceedings, 2017-19 .