Riddhish Bhalodia

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EDUCATION

University of Utah   Salt Lake City, USA
Ph.D. in Computing, Imaging Track, GPA: 3.98/4.00   2016 –2022(expected)
Advisor: Dr Ross Whitaker, Dr Shireen Elhabian

Indian Institute of Technology   Mumbai, India
B.Tech in Electrical Engineering (Minor: Systems and Controls), GPA: 8.19/10   2012–2016

RESEARCH AREAS

Medical & Computer Vision, Probabilistic Models, Statistical Shape Modeling, Machine & Deep Learning

EXPERIENCE

NVIDIA, Applied Research Intern   Summer 2020
 – Disease Localization using Medical Reports
 – Devised a novel method using cross-attention that utilizes the medical reports to improves the localization of pneumonia, and at the same time performing attribute level characterization.

Google Summer of Code   Summer 2016
 – Design of Image De-noising Filters for Diffusion Data at Diffusion Imaging in Python (DIPY)
 – Designed adaptive non-local means denoising filter and non-local PCA denoising filter for DIPY, a python package for diffusion MRI. Additionally developed a brain extraction module using template based registration.

Wipro Technologies, Intern at Chief Technical Office   Summer 2015
 – Haptics for Virtual Shopper
 – Designed a prototype of haptic glove and the corresponding graphical interface for interacting with objects in a virtual reality based online retail platforms

SKILLS

- **Proficient :**   Python, Pytorch, MATLAB
- **Intermediate :**   C++, Tensorflow, VTK, LibIGL
- **Novice :**   ITK, d3js, three.js

MAJOR PROJECTS

- **Self-Supervised Landmark Discovery (2020-2021)** Proposed a neural network architecture to discover anatomically relevant landmarks via self-supervision on image registration [1], [4].

- **Supervised neural network models for statistical shape modeling (2018-2021)** Framework for correspondence-based shape representation directly from CT/MRI images that significantly improves computational time and mitigates segmentation and pre-processing effort [11], [8], [9].

- **Cooperative autoencoders for population-driven regularization (2019-2022)** Cooperative autoencoders are jointly trained with a primary network to reconstruct an intermediate input/feature, providing regularization by enforcing the features to lie near a low-dimensional manifold [12], [6].

- **Framework for Regularization of Variational Autoencoders via Implicit Priors (2019-2020)** Investigated the effect of VAE regularization on representation and generation, and proposed a decoupling of representation and generation spaces using an invertible network. Showcased improved generation while retaining the representation facilitated by any given regularization [5].
- **Shape and Image Modeling Tools (2016-2022)** Continued software contributions towards mesh and image computational tools (ITK & VTK), and visualization framework using libIGL for the ShapeWorks shape modeling package.
- **Laproscopy Dehazing (2016-2017)** Proposed a probabilistic framework for dehazing, despeckling, and denoising images obtained during laparoscopic surgery [10].

Major Publications

[1] **R. Bhalodia**, S. Elhabian, L. Kavan, and R. Whitaker, "Leveraging unsupervised image registration for discovery of landmark shape descriptor", *Medical Image Analysis*, vol. 73, p. 102 157, 2021.

[2] **R. Bhalodia**, A. Hatamizadeh, L. Tam, Z. Xu, X. Wang, E. Turkbey, and D. Xu, "Improving pneumonia localization via cross-attention on medical images and reports", in *International Conference on Medical Image Computing and Computer-Assisted Intervention*, Springer, 2021, pp. 571–581.

[3] **R. Bhalodia**, L. A. Dvoracek, A. M. Ayyash, L. Kavan, R. Whitaker, and J. A. Goldstein, "Quantifying the severity of metopic craniosynostosis: A pilot study application of machine learning in craniofacial surgery", *The Journal of craniofacial surgery*, vol. 31, no. 3, p. 697, 2020.

[4] **R. Bhalodia**, L. Kavan, and R. T. Whitaker, "Self-supervised discovery of anatomical shape landmarks", in *International Conference on Medical Image Computing and Computer-Assisted Intervention*, Springer, 2020, pp. 627–638.

[5] **R. Bhalodia**, I. Lee, and S. Elhabian, "Dpvaes: Fixing sample generation for regularized vaes", in *Proceedings of the Asian Conference on Computer Vision*, 2020.

[6] **R. Bhalodia**, S. Y. Elhabian, L. Kavan, and R. T. Whitaker, "A cooperative autoencoder for population-based regularization of cnn image registration", in *International Conference on Medical Image Computing and Computer-Assisted Intervention*, Springer, 2019, pp. 391–400.

[7] **R. Bhalodia**, A. Subramanian, A. Morris, J. Cates, R. Whitaker, E. Kholmovski, N. Marrouche, and S. Elhabian, "Does alignment in statistical shape modeling of left atrium appendage impact stroke prediction?", in *2019 Computing in Cardiology (CinC)*, IEEE, 2019, Page–1.

[8] **R. Bhalodia**, S. Y. Elhabian, L. Kavan, and R. T. Whitaker, "Deepssm: A deep learning framework for statistical shape modeling from raw images", in *International Workshop on Shape in Medical Imaging*, Springer, 2018, pp. 244–257.

[9] **R. Bhalodia**, A. Goparaju, T. Sodergren, A. Morris, E. Kholmovski, N. Marrouche, J. Cates, R. Whitaker, and S. Elhabian, "Deep learning for end-to-end atrial fibrillation recurrence estimation", in *2018 Computing in Cardiology Conference (CinC)*, IEEE, vol. 45, 2018, pp. 1–4.

[10] A. Kotwal*, **R. Bhalodia***, and S. P. Awate, "Joint desmoking and denoising of laparoscopy images", in *2016 IEEE 13th International Symposium on Biomedical Imaging (ISBI)*, IEEE, 2016, pp. 1050–1054.

Preprints

[11] **R. Bhalodia**, S. Elhabian, J. Adams, W. Tao, L. Kavan, and R. Whitaker, "Deepssm: A blueprint for image-to-shape deep learning models", *arXiv*, 2021.

[12] **R. Bhalodia**, S. Elhabian, L. Kavan, and R. Whitaker, "Coopsubnet: Cooperating subnetwork for data-driven regularization of deep networks under limited training budgets", *arXiv*, 2019.

Teaching

- *Machine Learning - Spring 2018*, **Graduate Teaching Mentor** at University of Utah
- *Image Processing - Fall 2017*, **Graduate Teaching Mentor** at University of Utah

Services

- Reviewer for *Trans. In Medical Imag.* (TMI) - 2020, *Int. Symposium on Biomedical Imag.* (ISBI) - 2022
- Speaker and workshop volunteer for *ShapeWorks* at *Summer Biomechanics, Bioengineering, and Biotransport Conference* (SB3C) - 2021.
- Workshop teaching assistant at *Image Based Biomedical Modeling (IBBM)* summer course 2018

Awards

- Secured **All India Rank (AIR) 65 in IIT-JEE** among 1.1 million candidates   *2012*
- Represented India in 12th Asian Pysics Olympiad, Israel   *2011*
- Awarded KVPY Scholarship by Dept. of Science and Technology, Govt. of India.   *2011*

Coursework

3D Computer Vision, Image Processing, Advanced Image Processing, Machine Learning, Probabilistic Modeling and Bayesian Estimation, Intro To Optimization, Physics Based Animation