SANDESH GHIMIRE

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Google Scholar, Semantic Scholar, DBLP, ResearchGate, LinkedIn

Research Interest

Machine Learning, Deep Learning, Computer Vision, Medical Imaging, Generative Models, Learning Theory, Robustness, Statistical Inference, Probabilistic Methods, Computational Physiology

Education

PhD in Computing and Information Sciences Aug 2015 - Aug 2020
Rochester Institute of Technology, NY *GPA: 3.9/4*
Advisor: Prof. Linwei Wang, Lab: Computational Biomedicine Lab

B.E. in Electronics and Communication Engineering Nov 2008 - Oct 2012
Institute of Engineering, Tribhuvan University, Kathmandu, Nepal. *Grade: 85.1%*
Specialization: Image Processing and Pattern Recognition *Ranked 1/346 in IOE*

Work Experience

Senior Engineer/Researcher Feb 2023 - Present
Camera Algorithms, Qualcomm Inc.
Supervisor: Hau Hwang
- Developing efficient computer vision and machine learning algorithms for small device cameras.

Postdoctoral Research Associate Sept 2020 - Feb 2023
Department of Electrical and Computer Engineering, Northeastern University
Supervisor: Profs. Octavia Camps, Jennifer Dy, Dana H. Brooks
- Worked at the intersection of machine learning, computer vision and medical imaging

Graduate Research Assistant Aug 2015 - Aug 2020
Computational Biomedicine Lab, Rochester Institute of Technology
Supervisor: Prof. Linwei Wang
- Worked on machine learning and statistical inference with applications to medical imaging

Research Intern Jul 2019 - Sept 2019
Medical Sieve Radiology Group, IBM Research, San Jose
Supervisor: Dr. Mehdi Moradi
- On improving generalization of convolutional neural networks while classifying medical images

Electronics/Electrical Engineer Mar 2014 - June 2015
Nepal Electricity Authority, Central Office, Kathmandu

Research Themes

Computer Vision, Video Analysis and Dynamical System
Northeastern U, Qualcomm
- Worked on image and video understanding from dynamical system perspective, image processing, denoising, tracking, detection problems.

Theoretical Machine Learning
RIT, Northeastern U
- Worked on theoretical machine learning projects like learning theory, generalization bounds, kernel methods, RKHS, measure theoretic approaches, sampling complexity and statistical estimation.

Medical Imaging and Biomedical Signal Processing
IBM, Northeastern U, RIT, MSKCC

- Worked on different image analysis and biomedical problems using deep learning/ machine learning on cardiac signals, skin datasets, X-ray images.

Generative Models
RIT, Northeastern U

- Worked on generative models like VAE, GANs, Diffusion models and applied on standard datasets as well as non-standard data like spatio-temporal cardiac signals and skin images.

Probabilistic Graphical Models and Inference
RIT

- Integrated multiple sources of knowledge and data using PGM framework and proposed several inference strategies to solve the inverse problem of electrophysiological imaging.

Miscellaneous
RIT, Northeastern U

- Worked on semi supervised learning, geometric deep learning, uncertainty estimation, and interpretability of deep learning models.

Research Publications

ICML 2023	Comas, A., Du, Y., Fernandez, C., **Ghimire, S.** , Sznaier, M., Tenenbaum, J.B. and Camps, O., 2023. *Inferring Relational Potentials in Interacting Systems*. International Conference in Machine Learning (Oral Presentation!)
JMI	Applegate, M.B., Kose, K., **Ghimire, S.**, Rajadhyaksha, M. and Dy, J., 2023. *Self-supervised denoising of Nyquist-sampled volumetric images via deep learning*. Journal of Medical Imaging, 10(2), p.024005.
L4DC 2023	Comas, A., **Ghimire, S.**, Fernandez, C., Li, H., Sznaier, M. and Camps, O., 2023. *Learning Object-Centric Dynamic Modes from Video and Emerging Properties*
NeurIPS 2021	**Ghimire, S.**, Masoomi, A. and Dy, J. , 2021. *Reliable Estimation of Kullback-Leibler Divergence using Discriminator in the Reproducing Kernel Hilbert Space.* (Spotlight talk! - 3% acceptance rate) Link to the talk
NeurIPS Workshop 2021	Torop, M., **Ghimire, S.**, Liu, W., Brooks, D.H., Camps, O., Rajadhyaksha, M., Dy, J. , and Kose, K., 2021. *Unsupervised Approaches for Out-Of-Distribution Dermoscopic Lesion Detection.*
ArXiv	Ghimire, S., Liu, J., Comas, A., Hill, D., Masoomi, A., Camps, O. and Dy, J., 2023. *Geometry of Score Based Generative Model*
ArXiv	Hill, D., Masoomi, A., Ghimire, S., Torop, M. and Dy, J., 2022. *Boundary-Aware Uncertainty for Feature Attribution Explainers*
SPIE	Torop, M., Liu, W., Brooks, D.H., Camps, O., Rajadhyaksha, M., Dy, J. , Kose, K., and **Ghimire, S.** 2021. *Unsupervised representation learning for detecting out of distribution samples in dermoscopy images of eight types of skin lesions.*
ICDM 2020	Gyawali, P.K., **Ghimire, S.** and Wang, L., 2020. *Enhancing Mixup-based Semi-Supervised Learning with Explicit Lipschitz Regularization*
MICCAI 2020	Jiang, X., **Ghimire, S.**, Dhamala, J., Li, Z., Gyawali, P.K. and Wang, L., 2019, October. *Learning Geometry-Dependent and Physics-Based Inverse Image Reconstruction.*
MICCAI 2020	Gyawali, P.K., **Ghimire, S.**, Bajracharya, P., and Wang, L., 2019, October. *Semi-supervised Medical Image Classification with Global Latent Mixing.*
TMI 2019	**Ghimire, S.**, Sapp, J.L., Horáček, B.M. and Wang, L., 2019. *Noninvasive Reconstruction of Transmural Transmembrane Potential With Simultaneous Estimation of Prior Model Error*.
IPMI 2019	**Ghimire, S.**, Gyawali, P.K., Dhamala, J., Sapp, J.L., Horacek, M. and Wang, L., 2019, June. *Improving generalization of deep networks for inverse reconstruction of image sequences.* (Oral presentation - 10% acceptance) IPMI Scholarship Award!

MICCAI Workshop MLMI — **Ghimire, S.**, Kashyap, S., Wu, J. T., Karargyris, A., Moradi, M.,2020. *Learning Invariant Feature Representation to Improve Generalization across Chest X-ray Datasets*

MICCAI 2019 — Gyawali, P.K., Li, Z., **Ghimire, S.** and Wang, L., 2019. *Semi-supervised Learning by Disentangling and Self-ensembling over Stochastic Latent Space*.

MICCAI 2019 — Dhamala, J., **Ghimire, S.**, Sapp, J.L., Horáček, B.M. and Wang, L., 2019, October. *Bayesian Optimization on Large Graphs via a Graph Convolutional Generative Model: Application in Cardiac Model Personalization*.

ICDM 2019 — Gyawali, P.K., Li, Z., Knight, C., **Ghimire, S.**, Horacek, B.M., Sapp, J. and Wang, L., 2019. *Improving Disentangled Representation Learning with the Beta Bernoulli Process*. (Oral presentation)

CinC 2018 — **Ghimire, S.** and Wang, L., 2018, September. *Deep Generative Model and Analysis of Cardiac Transmembrane Potential* (Oral Presentation)

MICCAI 2018 — Dhamala, J., **Ghimire, S.**, Sapp, J.L., Horáček, B.M. and Wang, L., 2018, October. *High Dimensional Bayesian Optimization of Personalized Cardiac Model Parameters via an Embedded Generative Model*. (Oral presentation - 4% acceptance)

MICCAI 2018 — **Ghimire, S.**, Dhamala, J., Gyawali, P.K., Sapp, J.L., Horacek, M. and Wang, L., 2018, September.*Generative modeling and inverse imaging of cardiac transmembrane potential.*

EP Europace 2018 — Cluitmans, M.J.M., **Ghimire, S.**, Dhamala, J., Coll-Font, J., Tate, J.D., Giffard-Roisin, S., Svehlikova, J., Doessel, O., Guillem, M.S., Brooks, D.H. and Macleod, R.S., 2018. *P1125: Noninvasive localization of premature ventricular complexes: a research community based approach.*

NeurIPS Workshop — **Ghimire, S.**, Dhamala, J., Gyawali, P.K., Sapp, J.L., Horacek, M. and Wang, L., 2018, September.*Generative modeling and inverse imaging of cardiac transmembrane potential.* (Spotlight talk - 6% acceptance)

MICCAI 2017 — **Ghimire, S.**, Sapp, J.L., Horacek, M. and Wang, L., 2017, September. *A variational approach to sparse model error estimation in cardiac electrophysiological imaging.*

CinC 2017 — **Ghimire, S.** and Wang, L., 2017, September. *L0 norm based sparse regularization for non-invasive infarct detection using ECG signal.* (Oral Presentation)

CinC 2017 — **Ghimire, S.**,..., Wang, L., 2017, September. *Overcoming barriers to quantification and comparison of electrocardiographic imaging methods: A community-based approach.* (Oral Presentation)

Presentations

2021 — Reliable Estimation of Kullback-Leibler Divergence using Discriminator in the Reproducing Kernel Hilbert Space.
[**Talk**] Neural Information Processing Systems 2021. Link

2021 — Mathematics for Machine Learning
[**Talk**] Third Nepal Winter School in AI. Link

2021 — On Generalization and Smoothness in Deep Learning
[**Talk**] Spiral Seminar Series. Northeastern University.

2019 — Improving generalization of deep networks for inverse reconstruction of image sequences
[**Talk**] The 26^{th} International Conference on Information Processing in Medical Imaging (IPMI). (50^{th} Anniversary) 2019. Hong Kong.
[**Talk**] IBM Research, Almaden, San Jose. 2019.
[**Poster**] AI@GCCIS Symposium. 2018. RIT
[**Poster**] Computing Weekend Research Showcase, 2018, RIT

2018 Generative Modeling and Inverse Imaging of Cardiac Transmembrane Potential
[**Poster**] The 21^{st} International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2018. Granada, Spain.
[**Spotlight Talk**] NeurIPS Workshop on Machine Learning for Health (ML4H), 2018

2018 Deep Generative Model and Analysis of Cardiac Transmembrane Potentials
[**Talk**] The 45^{th} Computing in Cardiology Conference. 2018. Maastricht, Netherlands.

2017 A Variational Approach to Sparse Model Error Estimation in Cardiac Electrophysiological Imaging
[**Poster**] The 20^{th} International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2017. Quebec City, Quebec, Canada.
[**Poster**] GCCIS Research Showcase 2017. RIT
[**Poster**] Graduate Research Showcase 2017. RIT

2017 Overcoming Barriers to Quantification and Comparison of Electrocardiographic Imaging Methods: A Community-based Approach.
[**Talk**] The 44^{th} Computing in Cardiology Conference. 2017. Rennes, France.

2017 L0 norm based sparse regularization for non-invasive infarct detection using ECG signal
[**Talk**] The 44^{th} Computing in Cardiology Conference. 2017. Rennes, France.

Mentoring Experience

Armand Comas — With Octavia's supervision, I worked closely with Armand on video interpretability, especially introducing Koopman perspectives to interpret and manipulate dynamic components of a video (see this paper), and Energy-based models.

Jinyang Liu — I worked closely working with Jinyang on medical image remosaicing and Diffusion-based generative models under the supervision of Octavia.

Max Torop — With Jennifer's supervision, I mentored and worked closely with Max on self supervised learning and out-of-distribution detection topics with the application to medical image analysis. See this paper.

Aria Masoomi — I worked closely working with Aria on generalization, kernel methods and interpretable methods under the supervision of Jennifer.

Davin Hill — I mentored and closely worked with Davin on uncertainty and interpretability of deep learning models with the supervision of Jennifer.

Morgan Kohler — With Octavia's supervision, I worked closely with Morgan mentoring him on the project related to disentanglement and interpretability of video.

Xiajun Jiang — With Linwei's supervision, I mentored and worked with Xiajun on applying graph neural networks to solve inverse problems and electrophysiological imaging. See this paper

Pradeep Bajracharya — With Linwei's supervision, I mentored and worked with Pradeep on Bayesian neural networks and uncertainty quantification.

Nilesh Kumar — With Linwei's supervision, I mentored and worked with Nilesh on learning transformations from data and applying them for data augmentation.

Awards and Achievements

IPMI Scholarship for junior scientists - awarded to 10 authors at IPMI 2019 conference.

GCCIS Travel Grant by Golisano College of Computing and Information Sciences to present research work at MICCAI 2017

RIT PhD Scholarship/Assistantship 2015-2020. Financial Support for PhD study at RIT.

Prof. F.N. Trofimenkoff Academic Achievement Award for graduating at the top of class (1/346) in B.E. Electronics and Communication, Institute of Engineering.

The College Fellowship (2008-2012) by Institute of Engineering, Central Campus, Pulchowk based on academic merit and performance.

Undergraduate Scholarship (2008-2012) by Institute of Engineering to support tuition during the undergraduate studies at Central Campus, Pulchowk. Rank: 10/12000 in the entrance exam.

Golden Jubilee Scholarship Award 2008 by Government of India based on academic excellence

Mahatma Gandhi Scholarship Award 2006 by Government of India based on academic excellence

Professional Services

Associate Editor of Journal, Feb-Dec 2022

Signal, Image and Video Processing. Link

Reviewer

Conference: ICLR 2023, ICML 2022, CVPR 2022, ICLR 2021, Neurips 2021, ICML 2021, AISTATS 2020, MICCAI {2022, 2021, 2020, 2019, 2018, 2017}, MIDL 2020, Women in Machine Learning 2018

Journal: IEEE Transactions on Pattern Analysis and Machine Intelligence, Medical Image Analysis, Medical Physics Journal, Frontiers in Physiology

Organizer / Workgroup Lead

Organization program committee member of the Third Winter School in AI in Kathmandu. Link

Lead of the workgroup for CEI Pacing Site Localization Challenge 2017 - 2020. Link

Technical Strengths

Language/Platforms: Python, PyTorch, MATLAB, C/C++

Libraries/Packages: Scikit-learn, SciPy, Pandas, NumPy, GPyTorch, PyTorch Geometric, Matlab CVX

Tools: LaTeX, ParaView, Docker, Git, Conda, Bash