SANDESH GHIMIRE

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DBLP, Google Scholar, ResearchGate, LinkedIn

Research Interest

Machine Learning, Deep Learning, Medical Image Analysis, Computer Vision, Statistical Inference, Probabilistic Methods, Generalization in Deep Learning, Inverse Problems, Computational Cardiac 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

Postdoctoral Research Associate   Sept 2020 - Present
Department of Electrical and Computer Engineering, Northeastern University
Supervisor: Profs. Octavia Camps, Jennifer Dy, Dana H. Brooks
○ Working 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

Graduate 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

Video analysis and Dynamical System
Supervised by Prof. Octavia Camps
○ Currently working on understanding underlying (possibly stochastic) dynamical system behind video generation, so that it could be used for video prediction.

Generalization, Interpretable ML and Kernel Methods
Supervised by Prof. Jennifer Dy
○ Trying to understand and improve different aspects of generalization of deep neural networks and interpretable models using learning theories, functional analysis perspectives and kernel methods.

Medical Image Analysis
Worked with IBM, NEU, RIT and collaborators
○ Worked on different medical image analysis problems using deep learning/ machine learning at IBM, RIT and NEU. Currently, working on Dermoscopy image and Reflectance Confocal Microscopic image mosaics to identify cancerous regions in skin.

Deep Generative Models and Representation Learning

Supervised by Prof. Linwei Wang

- Worked on generative modeling/self-supervised learning of biomedical signals like spatio-temporal cardiac signals and skin images.

Probabilistic Graphical Models and Inference

Supervised by Prof. Linwei Wang

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

Semi-supervised Learning and Geometric Deep Learning

Mentored and collaborated with Prashnna Kumar Gyawali, Xiajun Jiang and Nilesh Kumar with the supervision of Prof. Wang

- Worked on improving semi supervised learning using smoothness constraints, data augmentation, incorporating geometric information using graph neural networks to improve generalization.

Research Publications

NeurIPS 2021	**Ghimire, S.**, Masoomi, Aria and Dy, Jennifer, 2021. *Reliable Estimation of Kullback-Leibler Divergence using Discriminator in the Reproducing Kernel Hilbert Space.* (Spotlight talk! - 3% acceptance rate)
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.*
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*
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 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)
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.*
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)
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)

Presentations

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 26th International Conference on Information Processing in Medical Imaging (IPMI). (50th 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 21st 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 45th Computing in Cardiology Conference. 2018. Maastricht, Netherlands.

2017 A Variational Approach to Sparse Model Error Estimation in Cardiac Electrophysiological Imaging
[**Poster**] The 20th 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 44th Computing in Cardiology Conference. 2017. Rennes, France.

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

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 Merit Scholarship 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

Reviewer

Conference: Neurips 2021, ICML 2021, AISTATS 2020, MICCAI {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

Workgroup Lead

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