

# SANDESH GHIMIRE

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Google Scholar, ResearchGate, LinkedIn

## Research Interest

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Machine Learning, Deep Learning, Computer Vision, Statistical Inference, Probabilistic Methods, Generalization in Deep Learning, Medical Imaging, Inverse Problems, Electrophysiological Analysis

## Education

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### 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

Oct 2008 - Dec 2012

Institute of Engineering, Tribhuvan University, Kathmandu, Nepal.

Grade: 85.1%

Specialization: Image Processing and Pattern Recognition

**Ranked 1/346 in IOE**

## Work Experience

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### Postdoctoral Research Associate

Sept 2020 - Present

*Supervisor: Profs. Octavia Camps, Jennifer Dy, Dana H. Brooks*

[Department of Electrical and Computer Engineering](#), Northeastern University

- Working at the intersection of machine learning, computer vision and medical imaging

### Graduate Research Assistant

Aug 2015 - Aug 2020

*Supervisor: Prof. Linwei Wang*

[Computational Biomedicine Lab](#), RIT

- Worked on machine learning and statistical inference with applications to medical imaging

### Graduate Research Intern

Jul 2019 - Sept 2019

*Supervisor: Dr. Mehdi Moradi*

[Medical Sieve Radiology Group](#), IBM Research, San Jose

- On improving generalization of convolutional neural networks while classifying medical images from new source

### Electronics/Electrical Engineer

Mar 2014 - June 2015

[Nepal Electricity Authority](#), Central Office, Kathmandu

## Research Themes

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### 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, Learning Theory and Kernel Methods

*Supervised by Prof. Jennifer Dy*

- Trying to understand and improve different aspects of generalization of deep neural networks 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 and RIT. Currently, working on Reflectance Confocal Microscopic image mosaics to identify cancerous regions in skin.

## Deep Generative Modeling and Inference

Supervised by Prof. Linwei Wang

- Worked on generative modeling of spatio-temporal cardiac signals using variational autoencoder and combined statistical inference with deep representation learning.

## 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.

## Semi-supervised Learning, Data Augmentation and Regularization

Mentored and collaborated with Prashanna Kumar Gyawali and Nilesch Kumar with the supervision of Prof. Wang

- Worked on improving semi supervised learning using different smoothness constraints. Worked on learning transformation patterns from data and applying them for data augmentation and transfer learning

## Geometric Deep Learning

Mentored and collaborated with Xiajun Jiang with the supervision of Prof. Wang

- Incorporated geometric information during inference using graph neural networks to improve generalization while solving inverse problem.

## Research Publications

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- 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-10% acceptance)
- 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-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	<b>Ghimire, S.</b> and Wang, L., 2017, September. <i>L0 norm based sparse regularization for non-invasive infarct detection using ECG signal</i> . (Oral Presentation)
CinC 2017	<b>Ghimire, S.</b> ,..., Wang, L., 2017, September. <i>Overcoming barriers to quantification and comparison of electrocardiographic imaging methods: A community-based approach</i> . (Oral Presentation)
NeurIPS Workshop	<b>Ghimire, S.</b> , Dhamala, J., Gyawali, P.K., Sapp, J.L., Horacek, M. and Wang, L., 2018, September. <i>Generative modeling and inverse imaging of cardiac transmembrane potential</i> . (Spotlight talk - 6% acceptance)
Under Review	<b>Ghimire, S.</b> , Gyawali, P.K. and Wang, L., 2020. <i>Reliable Estimation of Kullback-Leibler Divergence by Controlling Discriminator Complexity in the Reproducing Kernel Hilbert Space</i> .

## Presentations

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2019	Improving generalization of deep networks for inverse reconstruction of image sequences [Talk] The 26 <sup>th</sup> International Conference on Information Processing in Medical Imaging (IPMI). (50 <sup>th</sup> 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 <sup>st</sup> 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 <sup>th</sup> Computing in Cardiology Conference. 2018. Maastricht, Netherlands.
2017	A Variational Approach to Sparse Model Error Estimation in Cardiac Electrophysiological Imaging [Poster] The 20 <sup>th</sup> 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 <sup>th</sup> Computing in Cardiology Conference. 2017. Rennes, France.
2017	L0 norm based sparse regularization for non-invasive infarct detection using ECG signal [Talk] The 44 <sup>th</sup> Computing in Cardiology Conference. 2017. Rennes, France.

## Awards and Achievements

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**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

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### Reviewer

**Conference:** ICML 2021, AISTATS 2020, MICCAI {2020, 2019, 2018, 2017}, MIDL 2020, Women in Machine Learning 2018

**Journal:** TPAMI, Medical Image Analysis, Medical Physics Journal, MBEC Journal

### Workgroup Lead

Lead of the workgroup for CEI Pacing Site Localization Challenge 2017 - 2020. [Link](#)

## Technical Strengths

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

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

**Tools:**  $\text{\LaTeX}$ , ParaView, Docker, Git, Conda, Bash, Latex