HARSHIT GUPTA

harshit.gupta.cor@gmail.com
BM 4.134, EPFL, Lausanne CH-1015, Switzerland
Homepage ◇ Google Scholar

CURRENT RESEARCH FOCUS

My research is aimed at designing mathematically backed deep-learning algorithms for solving inverse problems in imaging. I am interested in the modalities of Cryo Electron Microscopy (Cryo-EM), Computational Tomography (CT), and Magnetic Resonance Imaging (MRI).

EDUCATION

July 2015 - September 2020 **École polytechnique fédérale de Lausanne (EPFL), Switzerland**
Ph.D. in Electrical Engineering
Thesis: "From Classical to Unsupervised-Deep-Learning Methods for Solving Inverse Problems in Imaging".
Advisor: Prof. Michael Unser

July 2011 - May 2015 **Indian Institute of Technology (IIT), Guwahati, India**
B. Tech in Electronics and Communications Engineering

RESEARCH EXPERIENCES

July 2014 - May 2015 **Indian Institute of Technology (IIT), Guwahati, India**
Bachelor Thesis Project
Topic: "Blind Image Quality Assessment"
Advisor: Prof. Kannan Karthik

May 2014 - July 2014 **École polytechnique fédérale de Lausanne (EPFL), Switzerland**
Research Internship
Topic: "Interpolation using Derivatives"
Advisor: Prof. Michael Unser

May 2013 - July 2013 **Indian Institute of Science (IISc), Bangalore, India**
Research Internship
Topic: "Building a MATLAB GUI on Optic Disk Localization using ℓ_1-minimization"
Advisor: Prof. Chandra Sekhar Seelamantula

PUBLICATIONS

Preprints

8. **Gupta H**[*], McCann M T[*], Donati L, Unser M, "CryoGAN: A New Reconstruction Paradigm for Single-particle Cryo-EM Via Deep Adversarial Learning," bioRxiv 2020.03.20.001016, March 2020. [*] *Co-first authors.* [PDF]

7. Jin K H[*], **Gupta H**[*], Yerly J, Stuber M, Unser M, "Time-Dependent Deep Image Prior for Dynamic MRI," IEEE Transactions on Medical Imaging, in Revision. [*] *Co-first authors.* [PDF]

Journals

6. Aziznejad S, **Gupta H**, Campos J, Unser M, "Deep Neural Networks with Trainable Activations and Controlled Lipschitz Constant," IEEE Transactions on Signal Processing, vol. 68, pp. 4688 - 4699, August 2020. [PDF]

5. Yang F, Pham T, **Gupta H**, Unser M, Ma J, "Deep-learning projector for optical diffraction tomography," Optics Express, vol. 28(3), pp. 3905-3921, February 2020. [PDF]

4. Debarre T, Fageot J, **Gupta H**, Unser M, "B-spline-based exact discretization of continuous-domain inverse problems with generalized TV regularization," IEEE Transactions on Information Theory, vol. 65(7), pp.4457-4470, March 2019. [PDF]

3. **Gupta H**, Jin K H, Nguyen H Q, McCann M T, Unser M, "CNN-based projected gradient descent for consistent CT image reconstruction," IEEE Transactions on Medical Imaging, vol. 37(6), pp. 1440-1453, May 2018. [PDF]

2. **Gupta H**, Fageot J, Unser M, "Continuous-domain solutions of linear inverse problems with Tikhonov versus generalized TV regularization," IEEE Transactions on Signal Processing, vol. 66(17), pp. 4670-4684, July 2018. [PDF]

1. Unser M, Fageot J, **Gupta H**, "Representer Theorems for Sparsity-Promoting ℓ_1 Regularization," IEEE Transactions on Information Theory, vol. 62(9), pp. 5167-5180, August 2016. [PDF]

Conference and Workshop Proceedings

4. **Gupta H**, Phan T H, Yoo J, Unser M, "Multi-CryoGAN: Reconstruction of continuous conformations in Cryo-EM using Generative Adversarial Networks," Proc. European Conference on Computer Vision Workshops (ECCVW 2020) (Online, August 23-28), in press. [PDF]

3. Debarre T, Fageot J, **Gupta H**, Unser M, "Solving Continuous-domain Problems Exactly with Multiresolution B-splines," Proc. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2019) (Brighton, UK, May 12-17), pp. 5122-5126. [PDF]

2. **Gupta H**, Schmitter D, Uhlmann V, Unser M, "General surface energy for spinal cord and aorta segmentation," IEEE Proc. International Symposium on Biomedical Imaging (ISBI 2017), (Sydney, Australia, April 18-21), pp. 319-322. [PDF]

1. Uhlmann V, Fageot J, **Gupta H**, Unser M, "Statistical optimality of Hermite splines," Proc. International Conference on Sampling Theory and Applications (SampTA 2015), (Washington, DC, US, May 25-29), pp. 226-230. [PDF]

TEACHING EXPERIENCES

September 2015 - August 2020 **Teaching Assistant at EPFL**
Image Processing I - Autumn 2015, 2016, 2017, 2018, 2019
Image Processing II - Spring 2016, 2017, 2018, 2019, 2020

September 2019 - February 2019 **Supervisor for Master Semester Project**
Student: Huy Thong, EPFL
Topic: "Reconstructing multiple-conformations of particles in Cryo-Electron Microscopy with deep learning"

January 2019 - June 2019 **Co-supervisor for Master Semester Project**
Student: Huy Thong, EPFL
Topic: "Implementing Deep-learning-based iterative algorithm to solve inverse problem of MRI"

January 2019 - June 2019 **Supervisor for Master Semester Project**
Student: Joaquim Campos, EPFL
Topic: "Learning Spline-based activations for very deep learning"

September 2018 - February 2019 **Co-supervisor for Master Thesis**
Student: Matthieu Broisin, EPFL in collaboration with MIT, USA
Topic: "Segmentation of images using a Deep-Learning-based approach"

April 2017 - Septmeber 2017 **Co-supervisor for Master Thesis**
Student: Thomas Debarre, ENS Paris Saclay, Cachan, France
Topic: "B-spline-based exact discretization of continuous-domain inverse problems with generalized TV regularization"

TECHNICAL STRENGTHS

Programming Languages	Python, Matlab, Java, C, C++
Libraries	PyTorch, MatConvNet
Softwares	ImageJ, Fiji, Chimera

HONOURS

- Selected for II round of Texas Instruments Innovation Challenge: India Analog Design Contest 2014.
- Selected in national Top-30 in Manthan, CAG, 2014, among more than 150 teams.
- Placed among top 0.5% in 2011 IIT-Joint Entrance Exam (to enroll in undergraduate program) given by 500,000 students.
- Placed among National Top 1% in National Standard Examination in Physics, 2010-11, organized by Indian Association of Physics Teachers.
- Secured AIR-171 in National Level Science Talent Search Examination, 2009.
- Secured 3^{rd} position in SBM Inter School Science and Environment Quiz, 2008.
- Awarded the Talent Scholarship Award by Saraswati Siksha Sansthan, 2008.