

DEEPAK K. GUPTA

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Research experience of 2+ years in deep learning and computer vision, 5+ years in mathematical modeling and optimization, with a diverse technical background spanning across engineering physics, mathematics and machine learning. My research interest lies in bridging physics-based approaches and deep learning methods to design highly-reliable prediction models for real-world problems.

EDUCATION

Delft University of Technology, The Netherlands Shell-NWO Computational Sciences for Energy Research (CSER) Programme PhD in Computational Science	<i>Sep 2013 - Aug 2017</i>
Indian Institute of Technology (ISM) Dhanbad, India Integrated (5 yr.) M.Sc. Tech. in Applied Geophysics Overall GPA: 8.48/10 (Rank 1; Director's Gold Medal)	<i>July 2008 - May 2013</i>

EXPERIENCE

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| Informatics Institute (QUVA Lab), University of Amsterdam
<i>Postdoctoral Researcher (Deep learning, computer vision)</i> | <i>Jan 2019 - Present</i>
<i>Amsterdam, Netherlands</i> |
| <ul style="list-style-type: none">· I am currently involved in the following research projects:<ul style="list-style-type: none">– Developing deep learning algorithms for object tracking in long-term videos.– Developing efficient neural network architectures based on mathematically justified evolution schemes.– Supervising students on projects related to medical imaging, biological cell tracking, reducing model decay in long-term object tracking, and developing VQ-VAE based generative models for modification of selective patches in images. | |
| Shell Technology Center
<i>Researcher (Applied machine learning, computer vision)</i> | <i>Nov 2017 - Jan 2019</i>
<i>Bangalore, India</i> |
| <ul style="list-style-type: none">· Unsupervised/semi-supervised learning based real-time automated detection of energy events in passive microseismic data.· Application of deep learning methods in automating parts of seismic data processing. | |
| Faculty of 3mE, Delft University of Technology
<i>Researcher</i> | <i>Sep 2013 - Aug 2017</i>
<i>Delft, The Netherlands</i> |
| <ul style="list-style-type: none">· Deep learning based models for noise reduction and data recovery (Aug 2016 - Aug 2017).<ul style="list-style-type: none">– Developed a stacked autoencoder framework to learn geophysical models for denoising purposes.– Explored the potential of convolutional autoencoders in denoising of geophysical data.· Topology optimization (TO) for high-resolution designs (<i>PhD project</i>, Apr 2014 - Aug 2017).<ul style="list-style-type: none">– Developed a combined mesh and penalization adaptivity based TO scheme.– Established uniqueness bounds and identified numerical artefacts in multiresolution TO methods.– Formulated a dp-adaptive scheme for high-resolution structural designs.· Optimization of metallization design in solar cells (<i>PhD project</i>, Sep 2013 - July 2017).<ul style="list-style-type: none">– Developed a novel 2D finite element model for numerical modeling of the electrical parameters.– Optimized metallization designs for freeform geometries and variable conditions. | |

EarthByte Group, University of Sydney
Visiting Student

Dec 2012 - Jan 2013
Sydney, Australia

- Developed a C++ based plate rotation utility in the *GPlates* software.

Schlumberger Asia Services Ltd.
Summer Intern

June 2012 - July 2012
Dehradun, India

- Machine Learning based automated correlation of well logs and identification of lithological features.
 - Developed a pattern-recognition approach based on sliding window and normalized cross-correlation.
 - Implemented the algorithm using *Ocean* API as a plugin for *Petrel* software.

Indian Institute of Technology (ISM)
Research Student

Jan 2010 - Mar 2013
Dhanbad, India

- Soft computing for intelligent interpretation of petroleum data and characterization of reservoirs (M.Sc. thesis: Mar 2012 - Mar 2013).
 - Implemented a least square fitting based semi-automated tool for prediction of missing log data.
 - Developed a global optimization based tool for the prediction of reservoir properties.
 - Formulated an ant colony method based approach for automated horizon selection in seismic data.
- Recursive ant colony optimization (RACO) (May 2011 - Apr 2012).
 - Proposed a recursive variant of ACO well suited for continuous optimization problems.
 - Tested applicability of RACO on various geophysical examples.
- Computational seismicity analysis and earthquake forecasting (Jan 2010 - Apr 2011).
 - Developed a stress transfer model for Chamoli-Uttarkashi region using *Coulomb* software.
 - Developed *FractalAnalyzer*, a MATLAB based GUI for earthquake forecasting based on multifractal analysis.

TECHNICAL STRENGTHS

Computer Languages	C, C++, Python, MATLAB, JAVA, C#
Software Libraries	Pytorch, Tensorflow, Keras, deal.II
Operating systems	Linux, MacOS, Windows

GRANTS/AWARDS/SCHOLARSHIPS

2018	:	Shell Special Recognition Award
2014	:	Gene Golub SIAM Summer Fellowship
2013-17	:	Shell-NWO Computational Sciences for Energy Research (CSER) Fellowship
2013	:	Director's Gold Medal at IIT (ISM) Dhanbad
2013	:	SEG-ENI Scholarship
2012	:	SEG Foundation Grant
2012	:	SPG India Student Grant
2008-13	:	SHE-INSPIRE Fellowship from Dept. of Science & Tech., Govt. of India

SUPERVISION TASKS

M.Sc. Students

- 2019 - current: Elias Kassapis (UvA); Estimating semantic segmentation uncertainty using a trained discriminator. (*tentative, collaboration with TomTom*)
- 2019 - current: Max Bos (UvA); Deep learning based identification of patterns/features in ECGs. (*tentative, collaboration with UMC Utrecht*)
- 2019 - current: Max Filtenborg (UvA); Tracking under object and action constraints (*tentative*).

- 2019 - current: Dragos Grama (UvA); Real-time tumour tracking during radiotherapy treatment (*tentative, collaboration with VUmc*).
- 2019 - current: Bryan Cardenas (UvA); Object-specific generative models for large images with multiple objects (*tentative*).
- 2019 - current: Joaquim Fererra (UvA); Adaptive neural networks (*tentative*).
- 2019 - current: Alvise Sembenico (UvA); Reducing model decay in long-term tracking (*tentative*).
- 2019 - current: Andreas Panteli (UvA); Tracking-assisted segmentation of biological cells (*tentative*). [[NeurIPS'19-w](#)]
- 2019: Dimitrios Tsimpoukis (UvA); Multilabel learning from noisy labeled fashion image data: a semi-supervised approach.
- 2016-17: Marco Swiestra (TU Delft); Post-Processing of Topology Optimized Results. [[thesis](#)]
- 2016-17: Joachim K. van Schoubroeck (TU Delft); An investigation of the effect of initial design choices in density-based topology optimization. [[thesis](#)]

B.Sc. Students

- 2019: Nathan de Bruin (UvA); Deep learning for cell tracking. [[NeurIPS'19-w](#)]
- 2019: Daan Lee (UvA); Influence of the choice of loss functions on the performance of autoencoders.
- 2019: Baart van Latum (UvA); Predicting the time of an earthquake event.

Interns

- 2014: Bas Smits (TU Delft, TNO); Optimal design of a solar cell front electrode (co-supervisor).

SELECTED PUBLICATIONS

- Gupta D.K., de Bruin N., Panteli A. and Gavves E., 2019, Tracking-Assisted Segmentation of Biological Cells, *NeurIPS 2019; Medical Imaging Meets NeurIPS workshop*.
- Gavves E., Tao R., Gupta D.K. and Smeulders A.W.M., 2019, Model Decay in Long-Term Tracking, *arXiv*, arXiv:1908.01603.
- Garg A., Vos A., Bortych N., Gupta D.K. and Verschuur D.J., 2019, Spatial Aliasing Removal using Deep Learning Super-Resolution, *First Break*, 37 (9), 87-92.
- Gupta, D.K., Shrivastava, R.K., Phadke, S. and Goudswaard, J., 2019, Intelligent Microseismic Event Detection Using Kirchhoff Migration Style Stacking in Combination with Iterative Clustering based Segmentation, *81st EAGE Conference and Exhibition*.
- Bhowmick D., Gupta D.K., et. al., 2019, Stacked autoencoders based machine learning for noise reduction and signal reconstruction in geophysical data, *arXiv*, arXiv:1907.03278 (under review in Geophysical Prospecting).
- Gupta D.K., van der Veen G.J., et al., 2017, Bounds for decoupled design and analysis discretizations in topology optimization, *International Journal for Numerical Methods in Engineering*, 111 (1), 88-100.

Full list of publications can be found [here](#).

REVIEWER

Journals : SMO (Springer), IJNME (Wiley), Geophysics (SEG)
 Conferences : ICML'19 ICCV'19, ECMLPKDD'19, EAGE'16, EAGE'15, EAGE'14.

CERTIFICATIONS

Machine Learning Nanodegree

April 2018 - Dec 2018

Udacity program on machine learning comprising 6 projects and 1 capstone project

Deep Learning Specialization

Sep 2017 - March 2018

A 5-course-series [specialization](#) by *deeplearning.ai* hosted on Coursera

- [Neural Networks and Deep Learning](#) • [Structuring Machine Learning Projects](#)
- [Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization](#)
- [Convolutional Neural Networks](#) • [Sequence Models](#)

Other MOOCs

[Discrete Optimization](#), [Finite Element Method for Physics](#)

Relevant courses

- Scientific computing • Structural Optimization: Algorithms and Applications
- Simulation, Optimization, and Identification in Solid Mechanics
- Introduction to Programming on the GPU • Object Oriented Programming
- Numerical and Statistical Methods • Methods of Applied Mathematics I & II
- Introduction to Descriptive Statistics • Geophysical Signal Processing
- Geophysical Inversion • Signal Analysis Theory • Discrete Optimization

ADDITIONAL INFORMATION

Extracurricular activities

- Member of [DSV Concordia](#) cricket team and played in [KNCB](#) cricket tournaments (2015-17).
- President of EAGE Student Chapter of IIT (ISM) for the term 2012-13.
- Volunteered as a teacher for more than two years for [Kartavya](#), an NGO run by IIT (ISM) students aimed at providing free education to under-privileged children.
- Represented India as a team in the finals of the 2009 Global Entrepreneurs' Program conducted by Stanford Entrepreneurs' Society of Stanford University.

Languages

- English (professional proficiency)
- Hindi (native)
- Bengali (intermediate)

Hobbies

- cricket, football and swimming
- sketching and computer gaming