

# GAUTAM PAI

## Present Position:

PhD Candidate  
Department Of Computer Science,  
Technion - Israel Institute Of Technology

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## Contact Details:

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## RESEARCH INTERESTS

My research interests lie in the intersection of geometry processing, machine learning, signal processing and computer vision, with geometry and numerical schemes being a dominant factor. In particular, I am interested in developing computational routines motivated from modern learning systems for exploring and understanding geometric structures in data. During the course my research career, I have experience in tackling problems like shape correspondence, spectral shape analysis, manifold learning, numerical schemes for PDE's in geometry and vision, and image filtering and denoising.

## EDUCATION

### Doctor Of Philosophy

Technion - Israel Institute of Technology, Haifa-Israel  
**Advisor:** Ron Kimmel

2015 - 2019

Grade: **95.8/100**

### Master Of Engineering

Indian Institute Of Science - Bangalore  
**Major:** Signal Processing  
**Advisor:** Venu Madhav Govindu

2011 - 2013

CGPA: **6.6/8**

Dissertation Grade: **8.0/8.0**

**First Class**

### Bachelor Of Engineering

Sardar Patel College Of Engineering - University Of Mumbai  
**Major:** Electrical Engineering

2007 - 2011

**80.77%**

**First Class with Distinction**

## RESEARCH, TEACHING AND PROFESSIONAL EXPERIENCE

- 1. PhD Student, Geometric Image Processing Laboratory, Technion** 2015 - present  
I am currently finishing my PhD with Professor Ron Kimmel in the Faculty of Computer Science at the Technion. My research focuses on exploring the relationship between the computational routines of numerical geometry and modern learning systems like convolutional neural networks. In addition, I was a teaching assistant for the course: Geometric Computer Vision which covers various aspects of geometry involved in computer vision, image processing and allied areas. I have also been a reviewer for ICCV, IEEE-PAMI, and JMIV.
- 2. Senior Research Engineer, Philips Research Bangalore:** 2013 - 2015  
I have worked on multiple research projects that comprised of developing prototypes of medical devices, that use signal and image processing algorithms for extraction of human vital signs from image and video inputs. In addition, I have supervised and managed the clinical data-collection process of one such project which was conducted in the rural areas of Mysore District, Karnataka in India.
- 3. Masters Student, Computer Vision Laboratory, IISc Bangalore:** 2011 - 2013  
I did my masters dissertation with Professor Venu Madhav Govindu in the Electrical Engineering Department at IISc Bangalore. My work was based on non-parametric and data adaptive filters for de-noising of natural images. In this thesis, we proposed a novel consistency principle

for non-parametric filtering of images and showed how it leads to desirable *symmetric smoothing filters* with interesting properties. We explain the action of our filter using spectral graph theory and develop a simple algorithm to boost de-noising performance of natural images.

## PUBLICATIONS

### Journals

1. **Symmetric Smoothing Filters from Global Consistency Constraints**  
Sheikh Mohammadul Haque\*, Gautam Pai\* and Venu Madhav Govindu  
IEEE Transactions on Image Processing (TIP) 2015. \*Equal Contribution
2. **Sparse Approximation of 3D Meshes Using the Spectral Geometry of the Hamiltonian Operator**  
Yoni Choukroun, Gautam Pai and Ron Kimmel.  
Journal of Mathematical Imaging and Vision (JMIV) 2018  
Short Version:  
**Schrodinger Operator For Sparse Approximation of 3D Meshes**  
Yoni Choukroun, Gautam Pai and Ron Kimmel.  
Symposium on Geometry Processing (SGP) 2017 - Posters.

### Conferences

1. **Bilateral Operators for Functional Maps**  
Gautam Pai, Mor Joseph-Rivlin and Ron Kimmel.  
(submitted)
2. **Deep Eikonal Solvers**  
Moshe Lichtenstein, Gautam Pai, and Ron Kimmel.  
International Conference on Scale Space and Variational Methods in Computer Vision (SSVM) 2019. (oral presentation) **Best Paper Award.**
3. **DIMAL: Deep Isometric Manifold Learning Using Sparse Geodesic Sampling**  
Gautam Pai, Ronen Talmon, Alex Bronstein and Ron Kimmel.  
IEEE Winter Conference on Applications Of Computer Vision (WACV) 2019
4. **Learning Invariant Representations Of Planar Curves**  
Gautam Pai, Aaron Wetzler and Ron Kimmel.  
International Conference on Learning Representations (ICLR) 2017.
5. **Camera based respiration rate of neonates by modeling movement of chest and abdomen region**  
Vishnu Makkapati, Pujita Raman and Gautam Pai  
IEEE - International Conference on Signal Processing and Communications (SPCOM) 2016, Bangalore, India

### Book Chapters

1. **Geo-metric Learning: Deep Metric Learning for Numerical Geometry**  
Gautam Pai and Ron Kimmel.  
Springer series on Mathematics and Visualization (submitted)
2. **On Geometric Invariants, Learning, and Recognition of Shapes and Forms**  
Gautam Pai, Mor Joseph-Rivlin, Ron Kimmel and Nir Sochen.  
Springer handbook on variational methods for nonlinear geometric data and applications (submitted)

## TALKS AND POSTER PRESENTATIONS

1. IPAM Workshop on Shape Analysis and Learning by Geometry and Machine, February 8 - 12, 2016, at IPAM - UCLA. **Poster:** Spectral Geometry of Shapes from Photometric Stereo
2. IPAM Workshop on New Deep Learning Techniques, February 5 - 9, 2018, at IPAM - UCLA. **Poster:** Learning Invariant Representations of Planar Curves
3. Dagstuhl Workshop on Shape Analysis: Euclidean, Discrete and Algebraic Geometric Methods, October 14 - 19, 2018, at Schloss Dagstuhl, Germany . **Talk:** *Geo-metric* Learning: Deep Isometric Manifold Learning Using Sparse Geodesic Sampling
4. Israel Computer Vision Day, December 10, 2017. **Talk:** Learning Invariant Representations of Planar Curves
5. The Computer Vision Seminar, The Hebrew University of Jerusalem, March 25, 2018 . **Talk:** Learning Invariant Geometric Representations
6. Symposium on Geometry Processing (SGP) 2017, **Poster:** Schrodinger Operator For Sparse Approximation of 3D Meshes.

## AWARDS AND SCHOLARSHIPS

1. **Technion Cyber Security Research Fellowship 2016-2019** for PhD studies at the Technion - Israel Institute Of Technology, Haifa-Israel
2. Excellence Scholarship Award from the Faculty of Computer Science - Technion, 2018
3. **Lady Davis Fellowship 2015-2016** for Graduate studies at the Technion - Israel Institute Of Technology, Haifa-Israel
4. **Ratan Tata Scholarship:** Recipient of a tuition-waiving scholarship for two consecutive years in 2008 and 2009 by the Sir Ratan Tata Trust - Mumbai for academic excellence in bachelors degree of engineering.
5. ICLR - Student Travel Award for travel to International Conference on Learning Representations - 2017 held at Toulon, France.
6. All India Rank: **33 (top 0.04%)** in Graduate Aptitude Test in Engineering (GATE)-2011.
7. Awarded the Institute Second Merit Prize for two consecutive years at SPCE, Mumbai in 2008-2010.
8. Recipient of scholarship from the Ministry Of Human Resources (MHRD) - Government Of India during my Masters Program from 2011-2013

## REFERENCES

1. **Professor Ron Kimmel**  
Professor, Department Of Computer Science,  
Technion-Israel Institute Of Technology, Haifa, Israel - 3200003.  
<http://www.cs.technion.ac.il/~ron/>

Additional references available on request.