Subhajit Chaudhury

CONTACT INFORMATION

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RESEARCH INTEREST

My research interests span areas of computer vision, computer graphics and machine learning. I am currently working on vision based infrastructure maintenance using deep learning techniques.

EDUCATION

Indian Institute of Technology, Bombay, India — July 2012 - June 2014
M.Tech, Department of Electrical Engineering
GPA : **9.81 out of 10**
Advised by Prof. Subhasis Chaudhuri

Jadavpur University, Kolkata, India — July 2008 - June 2012
B.E.(Hons.) Department of Electrical Engineering
GPA - **8.90 out of 10**(**Rank: 3rd/125**)
Advised by Prof. Amitava Chatterjee

WORK EXPERIENCE

Researcher — Oct 2014- Present
NEC Central Research Labs, Japan
Responsible for developing novel computer vision solutions for industrial research problems and publishing in high quality academic conferences and journals.

RESEARCH EXPERIENCE

NEC Central Research Labs, Japan — Oct 2014- Present
Computer vision based predictive infrastructure maintenance

- **Spatial-temporal motion analysis for invisible crack detection** Apr 2015 - Sept 2016
  Invented a crack detection algorithm that identifies internal cracks by finding discontinues in dense 2D motion. Localization is formulated as an energy minimization problem on a Conditional Random Fields (CRF) framework for robust structured prediction, which was experimentally shown to be superior (by 0.14 to 0.22 F1 Score) to state-of-the-art image based methods.
- **Fully convolutional networks for crack detection** Oct 2015 - Sept 2016
  Devised a fully convolutional network (FCN) system for pixel-level crack localization from raw images. The proposed FCN method provides real-time performance (16fps for VGA images) with similar localization accuracy to state-of-the-art methods.
- **Accelerating convolutional neural nets by layer re-ordering** June 2016 - Sept 2016
  Obtained computational speed-up in convnets inference by rearranging pooling and activation layer ordering for non-decreasing activation functions, which experimentally obtains up-to 4x speed-up in activation unit and 5% overall time improvements on both CPU and GPU tests.

Indian Institute of Technology (IIT), Bombay — July 2012- June 2014
Master of Technology (M. Tech) thesis, India — Prof. Subhasis Chaudhuri

- **Volume preserving haptic pottery** May 2012 - Dec 2012
  Developed a realistic deformation model for incompressible semi-solid clay based virtual pottery with volume preservation using Rayleigh clay distribution function, providing real time visual feedback at 25 fps and tactile feedback at 1000 Hz.
- **Feel Chat : 3D interactive virtual chat room with touch** Aug 2013 - June 2014
  Developed a virtual reality chatting system through VR headsets where users can feel the virtual

environment via a wearable suit made up of small tactile vibrators. Proposed a User Datagram Protocol (UDP) data transfer system which enabled seamless multi-client environment sharing while providing real-time graphics rendering and tactile feedback.

- **Web-cam based virtual trial room** Feb 2014 - June 2014
  Developed a real-time virtual cloth fitting using generic web camera input by representing human joints with a Directed Acyclic Graph (DAG) obtained from body parts detection and structurally aligning the input garment to the edges of the DAG. Mentored intern students for developing the algorithm and implementation in OpenCV.

Jadavpur University, India July 2008 - June 2012
Undergraduate (B.E.) project Prof. Amitava Chatterjee

- **Vision based door detection** Jan 2012 - May 2012
  Developed a door detection algorithm for autonomous mobile robot navigation by generating proposals for candidate door-like structures followed by a fuzzy classifier for final door detection based on geometric features.

Publications

1) *Subhajit Chaudhury*, Gaku Nakano, Jun Takada, Akihiko Iketani, **Spatial-temporal motion field analysis for crack detection on concrete surfaces**, IEEE Winter Conference on Applications of Computer Vision (WACV) 2017 (under review)

2) *Subhajit Chaudhury* and Hiya Roy, **Can fully convolutional networks perform well for general image restoration problems?**, arXiv:1611.04481v1, 2016 (Pre-print)
(submitted to International Conference on Machine Vision Applications MVA, 2017)

3) Vijay Daultani, *Subhajit Chaudhury*, Kazuhisa Ishizaka, **Convolutional Neural Network Layer Re-ordering for acceleration**, 20th Workshop on Synthesis And System Integration of Mixed Information (SASIMI), Kyoto, Japan, 2016 (**Poster acceptance**)

4) Sourav Saha, Pritha Ganguly, *Subhajit Chaudhury*. **Vision based human pose estimation for virtual cloth fitting**. Proceedings of the 2014 Indian Conference on Computer Vision Graphics and Image Processing (ICVGIP), Bangalore, India, pp 60:1-60:6 (**Poster: Acceptance rate 26%**)

5) *Subhajit Chaudhury*, Subhasis Chaudhuri, **Volume preserving haptic pottery**, 2014 IEEE Haptics Symposium (HAPTICS), Houston, TX, 2014, pp.129-134. (**Oral: Acceptance rate 27%**)

6) Hiya Roy, *Subhajit Chaudhury*, **Digitalisation of a Peak Voltmeter display and subsequenterror minimisation using Polynomial Compensation technique**, National Conference on Electrical,Electronics and Computer Engineering, IEEE CALCON 2011, Kolkata, India

Patents

1) Subhajit Chaudhury and Gaku Nakano , **A device for automatic crack detection from 2D motion in video sequences**, PCT/JP2016/072700 (*filed at NEC*)

2) Subhajit Chaudhury and Gaku Nakano , **A device for direct 3D deformation estimation from 2D optical flow**, PCT/JP2016/001406 (*filed at NEC*)

3) Subhajit Chaudhury, Vineet Gokhale, Subhasis Chaudhuri , **A virtual reality system and method for providing synchronous tactile feedback for user interaction**, Indian Patent, 503/MUM/2015 (*filed at IIT Bombay*)

Awards and Achievements

- Secured All India Rank **33 out of 110,125** students in Electrical Engineering, GATE-2012.

- Secured All India Rank **125 out of 72,680** students in Electrical Engineering, GATE-2011.
- Secured rank **86** in West Bengal Joint Entrance Examination, 2008 for Engineering (among about 80,000 students)
- Ranked 152 (state-rank) in All India Engineering Entrance Examination (AIEEE), 2008
- Former IEEE Students Member till December 2014.
- Recipient of academic excellence award for **1st** position in high school for both class 10 (ICSE-2006) and class 12 (ISC-2008) national board exam.
- Awarded **1st** position prize for winning Don-Bosco Inter-School coding competition.
- Achieved **2nd** position in All-Bengal spelling competition organised by Linc.

Other Relevant projects

1) Can fully convolutional networks perform well for general image restoration problems?
Proposed a fully convolutional network model for learning direct end-to-end mapping between corrupted images and desired clean images for image denoising and restoration task.

2) Direct reconstruction of dense 3D non-rigid deformation from 2D correspondences
Developed dense 3D surface deformation estimation method from monocular images by minimizing local-global 3D to 2D motion re-projection functional using Euler-Lagrange minimization method.

3) Deep Hyperspectral image classification
Implemented classification of Hyperspectral Satellite Images Using Convolutional Neural Networks.

Teaching Experience

- **EE702: Computer Vision** Spring 2014
  Teaching Assisstant for *Prof. Subhasis Chaudhuri*, IIT Bombay
- **EE603: DSP and its application** Autumn-2013
  Teaching Assisstant for *Prof. Animesh Kumar*, IIT Bombay
- **EE210: Signals and System** Spring-2013
  Teaching Assisstant for *Prof. Animesh Kumar*, IIT Bombay

Relevant Courses

Electrical Engineering: Wavelets, Statistic Signal Processing , Applied Linear Algebra , Digital Signal Processing, Number Theory and Cryptography, Digital Message Transmission

Computer Science: Computer Vision, Foundations of Machine Learning, Computer Graphics, Advanced Computer Graphics

Computer Skills

- **Programming Languages** : *C, C++, Java, Python*
- **Tools** : *Matlab, OpenCV, CUDA, OpenGL*
- **Machine learning Tools** : *scikit-learn, Theano + Lasagne, Keras, Caffe, Matconvnet*

Extra curricular activities

- Executive Council member of IIT Bombay Alumni Association in Tokyo from 2015.
- Passed Japanese Language Proficiency Test, N4 level.(Ability to follow general conversations)
- Volunteered to create a Japanese to English document translation website to ease the transition of new foreign graduates joining NEC.
- Member of IIT Bombay swimming club and participated in various swimming competitions.
- Trained in classical guitar lessons and performed at many events.
- Hobbies : Photography, music composition, cooking, hiking