Subhajit Chaudhury

CONTACT INFORMATION

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RESEARCH INTEREST

I am currently working as a research scientist in the Artificial Intelligence group at IBM Research-Tokyo. My research interests lie in developing intelligent multi-modal systems at the intersection of vision and natural language for real-world applications. I am also investigating reinforcement learning based systems for visual imitation learning and text-based intelligent conversation agents.

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, 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

PROFESSIONAL EXPERIENCE

IBM Research-Tokyo, Japan — April 2017- Present
Position : ***Research Scientist***, *Embodied Learning team*

- **Conditional generation of multi-modal data using constrained embedding mapping**: Developed a multi-modal generative method that maps multiple data modalities to a common latent space. Proposed method can synthesize images from text and raw audio input while producing better PSNR values than baseline methods.

- **Reinforcement learning for text-based conversation generation**: Involved in design of reinforcement learning algorithms for text-based games (like Zork) with the aim of creating intelligent conversation agents using transformers and policy gradient methods.

- **Imitation learning from high dimensional observations**: Developed an imitation learning method that learns action policies from high dimensional expert observations (like raw videos) in the absence of reward signal. Our method can imitate raw YouTube videos and out-performs state-of-the-art video imitation methods.

- **Detecting Events in Unsupervised Sports Videos (DEUS)**: Developed an weakly-supervised object detection method for facilitating event detection in unstructured table tennis videos captured. Our method demonstrate average F1-score performance above 90% even on unseen videos from YouTube while also being robust to external noise.

- **Transfer learning from synthetic to real images using VAEs for robotic applications**: Developed a method to transfer object detection learned in a simulation environment to the real world by performing a two-stage training on variational auto-encoders (VAE). The proposed method is 6 to 7 times more precise than baseline methods and robust to lighting conditions.

NEC Central Research Labs, Japan Oct 2014- March 2017
Position : ***Researcher***, *Predictive Infrastructure Maintenance group*

- **Spatial-temporal motion analysis for invisible crack detection**:
  Developed a crack detection algorithm that identifies internal cracks by finding discontinues in dense 2D motion fields using energy minimization on a Conditional Random Fields (CRF). Improved F1 score by 0.22 compared to state-of-the-art image based methods.

- **Deep learning for image-based crack detection**:
  Developed a fully convolutional network based system for pixel-level crack localization from images. Collaborated with Texas Department of Transportation (TxDOT) for application on real captured road videos with real-time performance (16fps for VGA images) with localization accuracy similar to state-of-the-art methods.

- **Accelerating convolutional neural nets by layer re-ordering**:
  Obtained computational speed-up of 4x in activation units with 5% overall improvement, in convolutional neural networks inference by rearranging pooling and activation layer ordering.

SELECTED PUBLICATIONS

1) Daiki Kimura, *Subhajit Chaudhury*, Ryuki Tachibana and Sakyasingha Dasgupta, **Internal Model from Observations for Reward Shaping**, International Conference of Machine Learning(ICML), Adaptive Learning Agents Workshop (ALA), 2018

2) Phongtharin Vinayavekhin, *Subhajit Chaudhury*, Asim Munawar, Don Joven Agravante, Giovanni De Magistris, Daiki Kimura and Ryuki Tachibana, **Focusing on What is Relevant: Time-Series Learning and Understanding using Attention**, International Conference on Pattern Recognition (ICPR), 2018

3) Tadanobu Inoue, *Subhajit Chaudhury*, Giovanni De Magistris and Sakyasingha Dasgupta, **Transfer learning from synthetic to real images using variational auto-encoders for robotic applications**, IEEE International Conference on Image Processing (ICIP), 2018

4) *Subhajit Chaudhury*, Sakyasingha Dasgupta, Asim Munawar, Md. Salam Khan and Ryuki Tachibana, **Conditional generation of multi-modal data using constrained embedding space mapping**, International Conference on Machine Learning (ICML), Implicit Models Workshop, 2017

5) *Subhajit Chaudhury*, Sakyasingha Dasgupta, Asim Munawar, Md. Salam Khan, Ryuki Tachibana, **Text to image generative model using constrained embedding space mapping**, IEEE International Workshop on Machine Learning for Signal Processing (MLSP), 2017 (**Oral**)

6) *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

7) *Subhajit Chaudhury* and Hiya Roy, **Can fully convolutional networks perform well for general image restoration problems?**, Intl. Conf. on Machine Vision Applications, 2017

8) 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)

9) *Subhajit Chaudhury*, Subhasis Chaudhuri, **Volume preserving haptic pottery**, 2014 IEEE Haptics Symposium (HAPTICS), Houston, TX, 2014, pp.129-134. (**Oral**)

Professional activities

- Reviewer for International Conference on Robotics and Automation (ICRA), 2018.
- Reviewer for International Conference on Intelligent Robots and Systems (IROS), 2018, 2019.
- Reviewer for IEEE Transactions on Multimedia (TMM), 2018.
- Co-reviewer for International Joint Conference on Artificial Intelligence (IJCAI), 2019.
- Co-reviewer for European Conference on Machine Learning ECML-PKDD, 2019.

Academic research projects

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

- **Volume preserving haptic pottery** : Developed a realistic deformation model for interactive rendering of semi-solid clay with volume preservation. Proposed model enabled real time visual feedback at 25 fps and tactile feedback at 1000 Hz much faster than prior works.

- **Feel Chat : 3D interactive virtual chat room with touch** : Developed a virtual reality chatting system using virtual reality headsets and wearable tactile suit where users can touch the surrounding virtual environment by tactile feedback.

- **Web-cam based virtual trial room** : Developed a real-time virtual cloth fitting using generic web camera input by structurally aligning the input garment to the skeletal joints using OpenCV.

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

- **Vision based door detection** : Developed a door detection algorithm for mobile robot navigation by generating proposals for candidate door-like structures based on geometric features.

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 **86/80,000** in West Bengal Joint Entrance Examination, 2008 for Engineering.
- Received 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.

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** : *Python, C++, C, Java*
- **Tools** : *Matlab, ROS, Gazebo, OpenCV, CUDA, OpenGL,*
- **Machine learning Tools** : *Tensorflow, Keras, Pytorch, scikit-learn*

Extra curricular activities

- Executive Council member of IIT Bombay Alumni Association in Tokyo (2015-2018)
- Passed Japanese Language Proficiency Test, N4 level
- Member of IIT Bombay swimming club (2012-2014)