Shraman Ray Chaudhuri

PERSONAL

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RESEARCH INTERESTS

Computer Vision, Robotics (scene understanding, 3D reconstruction, intuitive physics), Bayesian Machine Learning (graphical models, efficient inference)

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA — 09/2017 - 06/2018

Master of Engineering (M.Eng.), Electrical Engineering and Computer Science

- Relevant Coursework:
  - Computer Vision (6.869)
  - Bayesian Inference (6.882)
  - Advanced Algorithms (6.854)
  - Computational Cognitive Science (6.804)
  - Numerical Methods for PDEs (6.339)

Bachelor of Science (S.B.), Computer Science and Engineering — 09/2013 - 06/2017
Minor in Mathematics

RESEARCH EXPERIENCE

Massachusetts Institute of Technology, BCS, Cambridge, MA — 06/2017 – Present

M.Eng. Research Assistant under Prof. Josh Tenenbaum
Supervised by Dr. Ilker Yildirim

- Exploring probabilistic generative models, deep learning, and Bayesian optimization to infer pose and 3D representation of objects from a single RGB image.
- Developed a sampling-based training algorithm to optimize neural networks via physical simulation.
- Developed various research tools for the lab including a Python/C++ library for physics simulation with FleX and Bullet, a framework for ConvNet feature analysis, and a mesh rendering pipeline.

Massachusetts Institute of Technology, CSAIL, Cambridge, MA — 08/2016 – 06/2017

Undergraduate Research Assistant under Prof. Nir Shavit
Supervised by Dr. Alexander Matveev

- Explored deep learning methods to construct a connectivity map of the brain from cross-sectional EM images of brain tissue.
- Developed a multi-resolution ConvNet model based on U-Net, ResNet, and PixelCNN to generate probability maps for membrane segmentation. Achieved state-of-the-art performance on several EM datasets.
- Designed and implemented parallel algorithms for a 2D/3D deep learning library on multicore CPUs.

D.E. Shaw Research, New York, NY — 05/2016 – 08/2016

Scientific Associate Intern, Software & Applied Math Group
Supervised by Dr. Charles Rendleman

- Designed, implemented, and optimized a particle-mesh Poisson solver to efficiently compute Hamiltonian energies in molecular dynamics simulations.
- Developed a fast numerical integration technique and nonlinear optimization algorithm to increase simulation efficiency.

SpaceX, Hawthorne, CA — 05/2015 – 08/2015

Summer Intern, Propulsion Research Group

- Developed an automated anomaly detection algorithm for rocket telemetry using multiresolution analysis (wavelet transforms), one-class SVMs, hierarchical clustering, and various feature extraction methods.
- Developed an adaptive wavelet-based algorithm to compress telemetry signals by several orders of magnitude.

Publications

D. Budden, A. Matveev, S. Santurkar, **S. Ray Chaudhuri**, N. Shavit. "Deep Tensor Convolution on Multicores." *Proceedings of the 34th International Conference on Machine Learning* (ICML), Sydney, Australia. (2017)

S. Ray Chaudhuri, A. Matveev, N. Shavit. "High-Performance ConvNets for Iterative Membrane Segmentation." *MIT EECScon*. (2017)

Teaching

Design & Analysis of Algorithms (6.046)

Head Teaching Assistant — Fall 2017, Spring 2018
Teaching Assistant — Fall 2016, Spring 2017

- Teach recitation sections of 30-35 students; topics include Dynamic Programming, Max Flow, Linear Programs, [Randomized, Sublinear, Distributed] Algorithms, Convex Optimization, Complexity Theory, etc.
- Prepare homework/exam problems, organize review sessions, and handle various course logistics for over 300 students.
- Average Overall Rating (from course evaluations): 6.8/7.0

Intro to Deep Learning (6.S191)

Teaching Assistant — Winter 2017

- Give lectures and design labs for a 2-week course on deep learning during MIT's Independent Activities Period (IAP). Topics include CNNs, GANs, LSTMs, and Deep RL.

Leadership & Activities

Machine Intelligence Community

Co-Founder and Executive Member — 03/2016 – Present

- Organize a weekly reading group for undergraduate students to present and discuss modern ML research. Paper presentation encompass a wide variety of topics in computer vision, reinforcement learning, and evolutionary strategies.
- Organize workshops and competitions for underclassmen to learn practical ML techniques using modern libraries (e.g. TensorFlow, Keras).
- Host talks from industry partners and neighbor institutions (e.g. Harvard, BU).

IEEE/ACM Club

Executive Member, Faculty Chair — 12/2016 – 12/2017

- Organized bi-weekly "Faculty Dinners" to facilitate student-faculty interaction a more casual setting. Frequent topics of discussion included advice for grad school, ways to improve the CS curriculum, and culture at MIT. The initiative received high praise from the EECS Dept.
- Organized panels for graduate-level courses and undergraduate research opportunities (UROPs) to foster interest in research and higher studies.

Honors

1st Place (out of 70+ submissions) at MIT EECScon 2017
MIT EECS Undergraduate Research and Innovation Scholar
IEEE Eta Kappa Nu (HKN) Honor Society

Select Course Projects

– "Activity Recognition with Google Glass." (paper)
– "Auto-encoding Variational Bayes with Extensions." (paper) (code)
– "Gradient Coupling Methods for Fast Non-linear Optimization." (paper)
– "Godunov Finite-Volume Methods for Traffic Modeling." (paper) (code)
– Chess AI Bot. (code)

Skills

Programming Languages: C, C++, Python, Java, Lua, MATLAB
Research Tools: TensorFlow, Torch, Caffe, OpenCV, OpenGL, Bullet, FleX
Misc. Tools: CUDA, Cilk, ROS, gcc, Git, Linux/Bash