Shaden Alshammari

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Education

MEng. in Computer Science and Engineering **Sep. 2023 - Feb. 2025**
Massachusetts Institute of Technology (MIT) — GPA: 5.0/5.0 *Cambridge, MA*

Advisor: William T. Freeman — **Concentration:** Machine Learning
Thesis: Unifying Contrastive Feature and Cluster Learning through Preserving Local Structures.

B.S. in Computer Science and Engineering & Mathematics **Sep. 2019 - Jun. 2023**
Massachusetts Institute of Technology (MIT) — GPA: 5.0/5.0 *Cambridge, MA*

Technical Skills

Domains Self-Supervised Learning, Imbalanced Learning, Vision Language Models, Networks
Languages Python, Julia, MATLAB, Java, JavaScript, C, LaTeX.
Frameworks PyTorch, TensorFlow, Keras, Scikit-learn, OpenCV, CUDA, Microsoft Azure, AWS.

Publications

[1] **S. Alshammari**, Y. Wang, D. Ramanan, and S. Kong. Long-tailed recognition via weight balancing. IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2022. **(+140 citations)**

[2] **S. Alshammari**, M. Hamilton, A. Feldmann, J. Hershey, WT. Freeman: Unifying Contrastive Feature and Cluster Learning through Preserving Neighborhood Structures (under review for ICLR 2025).

[3] **S. Alshammari***, K. Alhamoud*, Y. Tian, G. Liu, PHS. Torr, Y. Kim, M. Ghassemi: Vision-Language Models Do Not Understand Negation. Emergent Visual Abilities and Limits of Foundation Models at ECCV 2024.

[4] **S. Alshammari**, V. Dean, T. Hellebrekers, P. Morgado, A. Gupta: Using contact microphones for robot manipulation. Women in Machine Learning Workshop at the Conference on Neural Information Processing Systems (NeurIPS), 2022.

[5] Y. Li, **S. Alshammari**, J. Jin, S. Kong: Continual Long-Tailed Recognition: Merge Tail Classes Today, Separate them Tomorrow.

Experience

MIT Computer Science & Artificial Intelligence Laboratory (CSAIL) **Sep. 2023 – present**
Research Assistant with Prof. William T. Freeman *Cambridge, MA*

- Introduced a comprehensive framework that extends and generalizes popular contrastive learning, supervised learning, dimensionality reduction, and clustering methods.
- Achieved state-of-the-art performance on key unsupervised clustering and image segmentation benchmarks, including ImageNet 1K, CIFAT100, STL-10, and MS COCOStuff.

Robotics Institute - Carnegie Mellon University (CMU) **Jun. 2022 – Aug. 2022**
Research Intern with Dr. Victoria Dean and Prof. Abhinav Gupta [abstract, poster] *Pittsburgh, PA*

- Adapted contact audio as an alternative tactile modality for complex manipulation tasks that are challenging from vision alone and analyzed feature representations for the audio-visual data and implemented robot manipulation algorithms on it
- Deployed the developed model on Franka arm, Robotiq gripper, and Piezo microphones.

MIT Sloan School of Management **Mar. 2022 - May 2022**
Research Assistant w. Prof. Abdullah Almaatouq *Cambridge, MA*

- Built a statistical pipeline that visually summarizes and highlights the properties of data from a large survey.
- Constructed a model that is robust to new data and new variables which predicts some variables about an individual given other variables using machine learning and dimensionality reduction algorithms.

CMU Argo AI Center for Autonomous Vehicle Research **Jun. 2021 – Mar. 2022**
Research Intern with Prof. Deva Ramanan and Prof. Shu Kong - [GitHub, poster, paper] *virtual*

- Developed an effective approach to mitigate data bias in long-tailed distribution images using weight balancing.
- Achieved competitive results on iNaturalist 2018, ImageNet-LT and CIFAR100-LT, and it can be easily attached to existing LTR methods to achieve higher accuracy.

Harvard-MIT Health Sciences and Technology **Jan. 2021– May 2021**
Undergraduate Researcher with Dr. Li-wei Lehman *virtual*

- Modeled delayed linear dynamical systems (dLDS) using gradient descent which achieved lower error compared to analytical approximations for dLDS.

Additional Projects

A Survey of Variational Methods for Estimations in Graphical Models [*paper*] **Spring 2023**
- Conducted a survey on variational methods for approximating partition functions in graphical models, exploring techniques for both lower and upper bounds on the partition function such as Mean-Field, Bethe approximation, and tree-reweighted methods.

A Survey on Node Ranking Algorithms [*paper*] **Spring 2022**
- A survey on different node ranking algorithms for graphs, their numerical estimation methods, and applications in search engines, social media networks, and recommendation systems.

Facial Images Colorization [*paper*] **Spring 2021**
- Built a fully automatic model to convert grayscale facial image to a colored one using Conditional Generative Adversarial Nets (cGANs) and adapted the colorization model to extract image representation and use it for face segmentation task (self-supervised model) which achieved 90% accuracy.

Fixed Points of Random Permutations [*paper link*] **Spring 2021**
- Found a closed form formula for the number of permutations that fixes a certain number of points using generating functions and studied the corresponding moments value and proved that they are constant.

Teaching Experience

MIT Department of Mathematics **Sep. 2023 – present**
Instructor-Graduate for Linear Algebra and Optimization (18.C06) *Cambridge, MA*

- Teach two weekly one-hour recitation sessions for a class of 38 students and host review sessions.
- Develop course material, weekly recitation handouts, and problem sets for over 180 students.
- Received an overall teaching quality rating of 6.9/7.0 and was nominated for the Teaching Awards by students.

MIT Department of Electrical Engineering and Computer Science (EECS) **Jan. 2024 – May 2024**
Teaching Assistant for Introduction to Machine Learning (6.036) *Cambridge, MA*

- Worked with a team of seven professors and lecturers to organize technical materials on various ML topics.
- Conducted weekly recitations and lab sessions, and hosted office hours to support student learning.

Awards and Honors

Bronze Medal at the International Mathematical Olympiad (IMO)	2017	International
Gold Medal at the European Girls Mathematical Olympiad (EGMO)	2017	International
Gold Medal at the Balkan Mathematical Olympiad (BMO)	2016	International
Honorable mentions from the American Mathematical Society presented at Intel ISEF	2016	International