

# Muhammad Salman Ali

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## SUMMARY

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Ph.D. in Computer Vision and Deep Learning from Kyung Hee University, with publications in NeurIPS, BMVC, and WACV. Specializing in learned image compression and 3D Gaussian Splatting (3DGS) compression, with proven success delivering real-time, resource-efficient AI systems (up to 600 FPS) and robust architectures for safety-critical applications.

## EDUCATION

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- **Ph.D. in Computer Science and Engineering** *Sep 2018 - August 2025*  
Yongin-si, South Korea  
*Kyung Hee University (KHU)*
  - Advisor: Prof. Sung-Ho Bae
  - Dissertation: From Efficiency to Adaptability: Advancing Learned Image Compression with Correlation Loss and Low-Rank Adapters
- **Bachelor of Science in Computer Science** *September 2014 - June 2018*  
Islamabad, Pakistan  
*National University of Sciences and Technology (NUST)*
  - GPA: 3.88/4.00 (Distinction-Gold Medal)

## EXPERIENCE

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- **Ulsan National Institute of Science & Technology (UNIST) (Vision & Learning Lab)** *Sep 2025 - Present*  
Ulsan, South Korea  
*Postdoc Fellow*
  - Investigating 3DGS compression and scene editing, with a focus on scalable representations and efficient manipulation of 3D scenes.
  - Exploring token-dropping strategies for learned image compression, targeting reduced computational and memory overhead while maintaining competitive rate-distortion performance.
  - Mentored graduate students and contributed to the submission of three papers currently under review at CVPR, supporting problem formulation, experimental design, and technical writing.
- **Kyung Hee University (Machine Learning and Visual Computing Lab)** *Sep 2018 - Present*  
Yongin-si, South Korea  
*Graduate Research Associate*
  - Engaged in high-impact research across image compression, 3D Gaussian Splatting compression, Implicit Neural Representations (INRs), and neuromorphic computing.
  - Proposed a novel correlation loss to reduce redundancy in latent representations of Learned Image Compression (LIC) models, leading to 17% BD-rate improvement on the Kodak dataset (published at NeurIPS 2023).
  - Designed I-INRs, an iterative plug-and-play framework for refining Implicit Neural Representations, achieving superior results in image restoration, signal denoising, and 3D occupancy estimation (under review).
  - Investigated learnable quantization and sparsity methods for LIC models, demonstrating the role of latent-space sparsity in improving entropy coding and compression performance (published in KIISE Journal, 2022).
  - Enhanced model robustness for neuromorphic systems under high bit-error rates by developing a tailored activation function and error-correction layer, improving classification performance and reducing prediction instability for reliable deployment in safety-critical systems (evaluated on CIFAR-10/100, ImageNet; IEEE Access).
  - Co-authored multiple research papers in top-tier venues, including NeurIPS and ICCV contributing to both theoretical insights and empirical validations.
  - Mentored junior researchers in project design, experimentation, and paper writing, contributing to over 10 publications, including in ICCV, NeurIPS Workshop, and IEEE Access.
- **Télécom Paris, Multimedia Lab** *Feb 2024 - Aug 2024*  
Palaiseau, France  
*Ph.D. Research Intern*
  - Focused on efficient compression and acceleration techniques for 3D Gaussian Splatting (3DGS), targeting real-time neural rendering applications.
  - Proposed a gradient-informed iterative pruning method that enables structured sparsity in 3DGS models while preserving or improving rendering quality (published at BMVC 2024).
  - Designed a differentiable quantization and entropy coding pipeline, achieving up to 75% model size reduction and 50× compression with minimal loss in fidelity (published at WACV 2025).
  - Enabled real-time rendering at 600 FPS by optimizing the compressed representation of 3DGS models, supporting interactive and resource-constrained deployment.
  - Introduced LoRA adapters for rate adaptation in LIC models, allowing a base anchor model to be efficiently fine-tuned to new bitrates with minimal additional training (published at VCIP 2024).
  - Contributed to multiple publications, including BMVC 2024, WACV 2025, and VCIP 2024, demonstrating strong impact in neural compression and 3D scene representation.

## SELECTED PUBLICATIONS

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### Conference Proceedings

1. **Muhammad Salman Ali**, Yeongwoong Kim, Maryam Qamar, Sung-Chang Lim, Donghyun Kim, Chaoning Zhang, Sung-Ho Bae, and Hui Yong Kim. "Towards Efficient Image Compression Without Autoregressive Models." Advances in Neural Information Processing Systems (NeurIPS). [**Rank: A\***]
2. **Muhammad Salman Ali**, Maryam Qamar, Sung-Ho Bae, and Enzo Tartaglione. "Trimming the fat: Efficient compression of 3d gaussian splats through pruning." British Machine Vision Conference (BMVC). [**Rank: A**]
3. **Muhammad Salman Ali**, Sung-Ho Bae, and Enzo Tartaglione. "ELMGS: Enhancing memory and computation scalability through coMPression for 3D Gaussian Splatting." Winter Conference on Applications of Computer Vision (WACV). [**Rank: A**]
4. Gabriele Spadaro\*, **Muhammad Salman Ali\***, et al. "ALICE: Adapt your Learnable Image Compression model for variable bitrates." IEEE Visual Communications and Image Processing (VCIP)". [**Equal Contribution**]
5. Haider Ali, **Muhammad Salman Ali**, et al. "I-INR: Iterative Implicit Neural Representations." AAAI Conference on Artificial Intelligence (AAAI). [**Rank: A\***]
6. Kim, Youmin, Jinbae Park, YounHo Jang, **Muhammad Salman Ali**, Tae-Hyun Oh, and Sung-Ho Bae. "Distilling Global and Local Logits with Densely Connected Relations." International Conference on Computer Vision (ICCV). [**Rank: A\***]

### Journal Proceedings

1. **Muhammad Salman Ali**, Tauhid Bin Iqbal, Kang-Ho Lee, Abdul Muqteet, Seunghyun Lee, Lokwon Kim, and Sung-Ho Bae. "ERDNN: Error-resilient deep neural networks with a new error correction layer and piece-wise rectified linear unit." IEEE Access. [**Rank: Q1**]
2. Kang, Jungheum\*, **Muhammad Salman Ali\***, Hyewon Jeong, Changkyun Choi, Younhee Kim, Se Yoon Jeong, Sung-Ho Bae, and Hui Yong Kim. "A Super-Resolution-based Feature Map Compression for Machine-oriented Video Coding." IEEE Access. [**Equal Contribution, Rank: Q1**]
3. Uddin AFM Shahab\*, **Muhammad Salman Ali\***, Muhammad Awais, Jiwon Hwang, TaeChoong Chung, and Sung-Ho Bae. "Give me a hint: an explicit prior based image denoising." Signal, Image and Video Processing. [**Equal Contribution, Rank: Q2**]
4. Kumar, Teerath, Jinbae Park, **Muhammad Salman Ali**, AFM Shahab Uddin, Jong Hwan Ko, and Sung-Ho Bae. "Binary-classifiers-enabled filters for semi-supervised learning." IEEE Access 9: 167663-167673. [**Rank: Q1**]
5. **Muhammad Salman Ali**, Chaoning Zhang, Marco Cagnazzo, Giuseppe Valenzise, Enzo Tartaglione, and Sung-Ho Bae. "Compression in 3D Gaussian Splatting: A Survey of Methods, Trends, and Future Directions." Submitted in IEEE Transactions on Circuits and Systems for Video Technology. [**Under Minor Revision**]

## SKILLS

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- Programming & Tools: Python, PyTorch, Weights&Biases, Tensorboard, CUDA, Git, LaTeX, Jupyter, Google Colab, Linux Shell
- Deployment & Experimentation: Experience with large-scale datasets, benchmarking, and reproducibility.
- Ability to collaborate with other team members and work independently to solve complex problems.

## AWARDS AND VOLUNTEER WORK

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- Selected for a fully funded research internship at Télécom Paris, Multimedia Lab (Feb–Aug 2024).
- Recipient of the AI Grand Challenge Award Korea (2020).
- Awarded Scholarship for Ph.D. in Computer Science and Engineering at Kyung Hee University in 2018
- Received the Gold Medal for achieving the highest GPA among 120 students at NUST.
- Served as a peer reviewer for leading AI and computer vision conferences, including CVPR, NeurIPS, ICCV, and ECCV.
- Recipient of the INNOCORE Postdoctoral Fellowship Program.