

Adeer Khan

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EDUCATION

- **Korea Advanced Institute of Science and Technology (KAIST)** Feb 2024 - Aug 2025
MSc in Civil and Environmental Engineering Daejeon, South Korea
 - CGPA: 3.50/4.30 (92/100 %)
- **Selected Coursework:**
 - IT for Smart City
 - Deep Learning for Computer Vision
 - Cyber-Physical Systems & Smart Spaces
 - Computer Graphics
 - Transportation System Analysis and Operations
 - Smart and Green Environmental Design
- **Capital University of Science and Technology (CUST)** Sep 2018 - Jul 2022
B.Sc. Civil Engineering Islamabad, Pakistan
 - CGPA: 3.88/4.00 (Gold Medalist)

RESEARCH INTERESTS

- Application of generative AI for automated design and optimization in the AEC industry.
- Leveraging large language models (LLMs) for intelligent digital twin management, adaptive control, and human-AI collaboration in architecture.

PUBLICATIONS

- [J.1] Khan, A., Chang, S., & Chang, H. (2025). **Generative AI approaches for architectural design automation.** *Automation in Construction*, 180, 106506. (IF = 11.5).
- [J.2] Lee, C.-S., Khan, A., Chang, S., & Chang, H. (2025). **Neural Network Coding Layer (NNCL): Enhancing Deep Learning Robustness against Feature Erasure.** *IEEE Access* (IF = 3.6).
- [J.3] Khan, A., & Sudheer, M. (2022). **Machine learning-based monitoring and modeling for spatio-temporal urban growth of Islamabad.** *The Egyptian Journal of Remote Sensing and Space Science*, 25(2), 541–550 (IF = 4.1).

RESEARCH EXPERIENCE

- **Research Assistant - KAIST** Feb 2024 - Present
LLM integrated Digital Twin Development Daejeon, South Korea
 - Implementing an LLM-assisted digital twin framework in Unity 3D, integrating IoT hardware (Arduino, ESP32) for intelligent building system simulation and control.
 - Responsible for managing the lab server and website, and maintaining the lab's IT infrastructure.
- **Master's Thesis** Mar 2023 – Aug 2025
Performance-Conditioned Generative AI for Energy-Optimized Floorplan Generation
 - Developed a novel framework for generating energy-optimized floorplans using performance conditioned generative AI, integrating VQ-VAE and Transformer models.
 - Incorporated multi-criteria energy performance metrics (daylight autonomy, thermal comfort, energy use intensity) through Honeybee and Ladybug simulations with local climate data.
 - Achieved significant performance gains compared to baseline: 5.2% reduction in EUI, 4.8% increase in daylight autonomy, 6.3% improvement in thermal comfort, and 3.1% reduction in CO₂ emissions.
 - Currently preparing a journal article and retraining the model on a larger dataset to further enhance generalization and scalability.
- **Ongoing Research**
 - *Mamba-Materials*, a state space model (SSM)-based AI architecture for concrete strength prediction; currently writing manuscript for journal submission.
- **Bachelor's Thesis** Sep 2021 – Aug 2022
A Simple and Sustainable Approach for Structural Health Monitoring of Structures
 - Designed a low-cost vibration-based SHM platform using Arduino microcontroller + accelerometers and a MATLAB/Seismosignal pipeline; conducted snapback and harmonic tests on a lab prototype with a locally built shake table to extract modal parameters and time histories.
 - Computed base shear and energy dissipation to evaluate damage states, demonstrating that inexpensive instrumentation can provide reliable early-warning signals for strength degradation in resource-constrained settings.

SKILLS

- **GeoInformatics (GIS):** ArcGIS, QGIS, PyQGIS plugin development
- **Programming/DevOps:** Python, C#, Git Control, Amazon Cloud AWS, PyTorch, Linux
- **Machine & Deep Learning:** Diffusion Models, Autoencoders, Transformers, Gaussian Splatting, NeRF
- **Analysis and 3D Design:** Blender 3D, Digital Twin with Unity3d, SketchUp, CSI SAFE, ETABS
- **Building Information Modeling (BIM):** Autodesk Revit, Rhino Grasshopper, Ladybug Tools
- **Presentation:** Streamlit, ParaView, Microsoft Office, Adobe Illustrator & Photoshop

PROFESSIONAL EXPERIENCE

- **NeoBim AI GmbH** Oct 2023 - Present
AI Research Engineer Germany (Remote)
 - Specializing generative models for AEC industry, with expertise in developing floorplan generation systems using Diffusion models, Autoencoders, Transformers, and 3D Gaussian Splatting (image/text-to-3D conversion).
 - Engaged in technical implementation of end-to-end ML pipelines connecting frontend interfaces to AWS-hosted model backends, including dataset preparation, API development, and deployment architecture.
 - Evaluated 50+ generative AI repositories and finetuned models (Stable Diffusion, Flux, Mistral, Qwen, LLaMA) for scalable, domain-specific AEC design automation.
- **Joyn Group** Aug 2023 - Oct 2023
Data Scientist Islamabad
 - Developed Urdu audio transcription pipelines with OpenAI Whisper, reducing word error rate from 70% to 22%.
 - Trained DistilBERT for Named Entity Recognition in the cement industry, generating spatial market rate maps.
- **Softoo Pvt. Ltd. (collab with Abyss Solutions)** Apr 2023 - Aug 2023
Asset Integrity Engineer Pakistan
 - Worked with ML and computer vision models for 3D point cloud generation from LIDAR for structure inspections.
 - Improved redlining processes for offshore platforms, reducing time and costs.
- **McKinsey Academy** Nov 2022 - Jul 2023
Apprenticeship Remote
 - Strengthened strategic thinking and problem-solving abilities by analyzing case studies through frameworks.
- **IEEE CUST Student Branch** Jan 2019 - Aug 2022
Graphics Head Islamabad, Pakistan
 - Led graphic design team, organized 40+ webinars and events like AI-Funoon Gala and ICSEC.

HONORS AND AWARDS

- **KAIST International Scholarship**
Korea Advanced Institute of Science and Technology
 - Recipient of prestigious merit-based scholarship covering full tuition with additional monthly stipend for living expenses.
- **Participant of South Asian Quiz Contest CMC Quiz Mania - 5**
Kathmandu, Nepal
 - Represented Pakistan in Quiz Mania which was telecasted on Nepal TV.
- **Quaid-e-Azam Gold Medal**
Capital University of Science and Technology
 - Awarded for overall best achievement in extra- and co-curricular activities.
- **National Level Distinction in Final Year Design Project**
Pakistan Engineering Council
 - Awarded 2nd prize at Pakistan Engineering Council's Engineering Capstone Expo 2022.
- **Research Excellence Award 2021**
Capital University of Science and Technology Research Committee
 - Designated as honorary chair of the Research Excellence Award Ceremony (REA) - 2021.
- **Graphics Head**
16th International Conference on Emerging Technologies (ICET 2021)
 - Supervised a team to professionally undertake the graphical work of the conference.
- **Proofreader**
International Conference on Advances in Mechanical Engineering
 - Responsible for proofreading and structuring the conference proceedings.
- **University Level Distinction in Final Year Design Project**
10th Industrial Open House

◦ Awarded 1st Position at the event held by the university.

• **Runner Up**

SUPARCO World Space Week 2022 Pakistan

◦ Secured 2nd position in SDG Video Contest on Sustainable Human Footprint.

• **Chancellor's Honor Roll**

Capital University of Science and Technology

◦ Awarded twice for securing a 4.0 GPA in two semesters of the Engineering Degree.

VOLUNTEER EXPERIENCE

• **Open-Source Contributor**

Aya: An Open Science Initiative

◦ Contributing to multilingual generative models for Pashto and Urdu in the Aya project.

Jul 2023 - Present



• **Substitute Teacher**

Teach for Pakistan School

◦ Conducted workshops on Popular Education Pedagogy for social uplift.

Dec 2020 - Jan 2021



• **Volunteer**

The NGO World Foundation

◦ Promoted youth volunteering and participated in reporting workshops.

Jun 2019 - Jul 2019



CERTIFICATIONS

• **Machine Learning Specialization**

Stanford

• **Introduction to Computer Vision and Image Processing**

IBM

• **Imagery, Automation, and Applications**

UC Davis

• **Introduction to Deep Learning & Neural Networks with Keras**

IBM

PROFESSIONAL MEMBERSHIPS

• **Institute of Electrical and Electronics Engineers (IEEE)**, Student Member

Present

• **American Society of Civil Engineers (ASCE)**, Affiliate Member

Present

• **American Society for Testing and Materials (ASTM) International**, Student Member

Present

• **Cohere For AI (C4AI)**, Volunteer Member

Present

ADDITIONAL INFORMATION

Languages: English (IELTS Band 7.5), Pashto (Native), Urdu (Native)

Interests: Generative AI, Digital Twin, Sustainable Infrastructure, Open-Source Development **Community**

Engagement: Regularly track and share the latest developments in AI through my Twitter and a Discord server I manage, *GenAI in AEC*.

REFERENCES

1. **Seongju Chang**

Invited Professor, Department of Civil and Environmental Engineering

Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea

Email: schang@kaist.ac.kr

Phone: +82-42-350-3627

Relationship: MS Supervisor

2. **Imtiaz Ahmad Taj**

Professor and Dean Faculty of Engineering, Department of Electrical Engineering

Capital University of Science and Technology, Islamabad

Email: imtiaztaj@cust.edu.pk

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Relationship: Mentor

3. **Majid Ali**

Professor, Department of Civil Engineering

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Relationship: BS Advisor