XIAOYUN MARGARET ZHANG

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EDUCATION

Massachusetts Institute of Technology, Cambridge, MA
PhD Candidate (GPA 4.7/5**)** **05/2027**
Architectural Studies, Design & Computation (Major), Model-Based Cognitive Robotic Systems (Minor)

- MIT Presidential Award (2022).
- Department of Architecture teaching assistant (2022-present).
- Research: Probabilistic machine learning in modeling designers' creative visual thinking through eye-tracking.

Master of Science in Architectural Studies, Design & Computation (GPA 4.8/5**)** **2021**

- Thesis: "Investing Design Intentions: Eye-tracking and machine learning in perception of architectural sketches".

University of Notre Dame, Notre Dame, IN
Master of Architectural Design and Urbanism (GPA 3.8/4**)** **2019**

- Thesis: "Institute of Dunhuang Arts: Architectural heritage and its roles in a modern metropolis".
- Ferguson and Shamamian Awards (excellence in classical/traditional design in graduate thesis); Alberti Award (highest grade point average in post-professional degree); Tau Sigma Delta Honors Society.

Bachelor of Architecture (GPA 3.8/4. Cum Laude**)** **2017**

- Noel Blank Design Awards (Top undergraduate thesis).
- Thesis: "Grand Theater of Dunhuang Arts: Solidifying festivity and reliving the arts with architecture".
- Noel Blank Design Awards (top two undergraduate thesis projects).

RESEARCH EXPERIENCE

ARCHITECTURE, REPRESENTATION AND COMPUTATION GROUP (ARC) **2019 - present**
Massachusetts Institute of Technology
Probabilistic Machine Learning of Creative Visual Thinking **2021 - present**
PhD Thesis: ROSAS: Neural Network architecture; Retrospective Observational Stochastic Action-Space

- Designed machine learning architecture using TensorFlow on processing designers' goal-directed eye movements to recognize what a designer thinks when looking at a design sketch.
- Implemented learnable, Transformer-like vector fields in CNN to represent abstract concepts in dynamic environments with eye movement patterns.
- Integrated stochastic approach from autonomous robots' path-planning into deciphering designers' creative and goal-directed visual search using probabilistic machine learning in multimodal action recognition.
- Developed Envisage II: dynamic computer vision representation of goal-oriented visual search during design analysis.
- Developed Envisage I: externalize architectural intentions from eye-tracking heatmaps to design sketches.
- Conducted labs instruction including generative AI, eye-tracking, image feature analysis for student architects.

UX Design, Architectural Visualization + Presentation, VR + AR, Web Development **2022 - 2023**
Web Development for MIT Design Heritage

- Designed and implemented interactive web platform for custom editing and uploading digital models in storylines.
- Revised model uploading, backend data structure, storyline communication, and UI in JavaScript, HTML, and WebGL.

Game Design and XR Museum Experience of the Eastern Asian Wing w/ **2020 - 2023**
Boston Museum of Fine Arts + Kyoto Institute of Technology

- Designed and developed games in VR and WebGL in Unity 3D in C# for virtual museum experience and dynamic time-travel impression of Horyu-Ji in Nara, Japan.
- Improved photorealistic coloration and lighting, and redesigned shaders in C++ for more effective texture weathering and lighting in real-time rendering.
- Refined photogrammetry pipeline to repair and retexture 4k resolution 3D scans.
- Integrated cinematic methods in interactive application and visualization of the Art of Japan collection.

Interactive Architectural Visualization of Alvar Aalto's House w/ **2019 - 2021**
Aalto Foundation, Helsinki

- Revised mesh models optimization methods for Photogrammetry for real-life scale, high detailed visualization of Aalto's residence and MIT's Baker house.
- Collaborated in developing AR application for Alvar Aalto's House Exhibition in Tokyo, Japan.

DIGITAL HISTORIC ARCHITECTURAL RESEARCH AND MATERIAL ANALYSIS (DHARMA) TEAM **2015 - 2023**
University of Notre Dame
Co-investigator: Conventional and Digital Visualization Specialist

Digital Future of the Roman Forum w/ Soprintendenza Speciale per i Beni Archeologici di Roma **2020 - 2023**

- Researched and applied methodologies of integrating digital modeling and rendering with high-resolution point cloud data visualization with cross-discipline teams (computer scientists, art historians) on DHARMA website.
- Created reconstruction models of 10 architecture monuments in addition to laser scan context data and documentation of over 10k m^2 of historical site of the Forum.

Evolution of the Cortile del Belvedere, the Vatican City w/ the Vatican Museum **2018-2022**

- Produced 6 plates of 11x 17" watercolor reconstruction of the historical conditions of the Cortile del Belvedere and a 3-minute 3D animation.
- Exhibited at the Bibliotheca Hertziana, Rome for the conference "The End of Architectural Drawings?"

Preservation and Documentation of the Taj Mahal w/ Archaeological Survey of India **2015**

- Surveyed crafters' markings on 5,000 original paving stones and marble damage of the mausoleum in Agra.
- Digitalized the main mausoleum using laser scan for the Archaeological Survey of India with 5 team members.

PUBLICATIONS

Literature

- **Zhang, X.**, Nagakura, T. (2025). Observe Like an Architect: A neural network model that recognizes embedded design intentions in plan sketches through eye-tracking. 43rd Education and research in Computer Aided Architectural Design in Europe Conference Proceedings.
- **Zhang, X**., Nagakura, T. (2024). Eye-tracking Architects: Investigating design intentions in plan drawings. XXVIII International Conference of the Ibero-American Society of Digital Graphics Proceedings.
- Brown, C.J., Yao, S., **Zhang, X**., Brown, C.J. et al. (2023). Visualizing digital architectural data for heritage education. IS&T Conference on Visualization and Data Analysis.
- Dressen, A., Camerlenghi, N., Krusche, K.U., **Zhang, X.** (2022). Digital Humanities Workshop I: Learning about 3D models and virtual realities through two projects. The Renaissance Society of America Virtual.
- **Zhang, X.** (2021). Envisage: Investigating design intentions and visual perception through eye-tracking of architectural sketches. Massachusetts Institute of Technology. SMArchS Thesis.

Exhibition

- Nagakura, T., Tu, H., Peng, W., Cheng, C., Zhang, J., **Zhang, X**., Sung, W., Ishikawa, K. et al (2024). Singapore GeAR. SIGGRAPH 2024.
- **Zhang, X.** Nagakura, T. (2021). Metropolitan Museum of Art, Art of Japan. Medieval Japanese Buddhist Statues of the Temple Room. Interactive digital exhibition of 4k statues.
- Nagakura, T., **Zhang, X**., Sung, W. (2020). Full-scale AR Reconstruction of Alvar Aalto's Resident, Aino and Alvar Aalto Shared Visions: Small is beautiful – ideal homes for everyone. Gallery A-Quad. Tokyo, Japan.

SKILLS

- **Computer**: **Programming**: TensorFlow, PyTorch, C#, Python, JavaScript; **CAD + Modeling**: AutoCAD, Revit, Rhinoceros, Grasshopper, 3DS MAX, Blender. **Graphics:** CG Illustration, Adobe Suite (Ps, Id, Pr, Ai); **Game Engines**: Unity 3D, Unreal.
- **Creative:** Free-hand drawing (pencil + pen), watercolor, classical Chinese choreography, costume making, computer illustration, traditional Asian calligraphy, Chinese ink painting.
- **Languages**: Mandarin Chinese (native), English (native-like), Italian + Turkish + Japanese (entry).

PROFESSIONAL EXPERIENCE

School of Architecture, University of Notre Dame, Notre Dame, IN
Visiting Scholar **2022**

- Provided instructions in graduate design studios, including design concept development, representation, and digital modeling.
- Provided design thinking feedback in department reviews for undergraduate and graduate students' term and thesis projects

Duncan Stroik Architects, South Bend, IN
Professional Internship **2019**

- Designed Classical interiors and architectural details for Catholic chapel projects in Michigan and Florida.
- Produced exterior and interior perspectives in watercolor and construction documentation.

Baldauf Catton Von Eckartsberg Architects, San Francisco, CA
Professional Internship **2016**

- Participated in conceptual design phase and 3D modeling of a shopping mall renovation in Irvine, CA.
- Participated in light fixture design of a new tea shop at the San Francisco International Airport.