Masoud Akbarzadeh *Sep 20, 1981*

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Summary

Creative designer with a unique academic background and experience in architectural design, computation, and structural engineering.

Masoud Akbarzadeh is an assistant professor of architecture in *Structures and Advanced Technologies* and the director of the *Polyhedral Structures Laboratory* (PSL) at the University of Pennsylvania School of Design (PennDesign). He holds a PhD from the Institute of Technology in Architecture, ETH Zurich, where he was a research assistant in the Block Research Group. He holds two degrees from MIT: a Master of Science in Architecture Studies (Computation) and an MArch, the thesis for which earned him the renowned SOM award. He also has a degree in earthquake engineering and dynamics of structures from the Iran University of Science and Technology and a BS in civil and environmental engineering. His main research topic is 3D graphical statics, which is a novel geometric method of structural design in 3D.

Research Interests

Three-dimensional graphical statics using polyhedral reciprocal diagrams, graphical statics, structural form finding, computational design, architectural design, computational geometry, structural design, spatial structures, architectural geometry, polyhedral geometry, geometric optimization, digital fabrication techniques, infrastructural design, hydraulic design, applied mathematics, and graph theories.

Education

Swiss Federal Institute of Technology — ZURICH, SWITZERLAND
Doctor of Science *2012 – 2016*
Thesis title: *3D Graphical Statics Using Reciprocal Polyhedrons*.Advised by P. Block, W. F. Baker (SOM).

Massachusetts Institute of Technology — CAMBRIDGE, MA, US
Master of Science in Architectural Studies Design and Computation *2010 – 2012*
Thesis title: *Designing performative surfaces: Computational interpretation of flow pattern drawings.* Advised by T. Nagakura, D. Shelden, and J. Lamere

Massachusetts Institute of Technology — CAMBRIDGE, MA, US
Master of Architecture *2007 – 2011*
Thesis title: *Hydropower cities: A new candidate for future*. Advised by N. Tehrani.

Iran University of Science and Technology — TEHRAN, IRAN
Master of Science in Earthquake Engineering and Dynamics of Structures *2004 – 2007*
Thesis title: *Characteristics of vertical spectrum of earthquake in near-field regions and its effects on dynamic responses of bridges*. Advised by M. Zahedi.

Zanjan University — ZANJAN, IRAN
Bachelor of Science in Civil and Environmental Engineering *1999 – 2004*

Research Grants

Penn Undergraduate Research Mentoring Program — PHILADELPHIA, PA, US
$8,000 *Summer 2018*
Penn supports undergraduate involvement in faculty research by providing a student the opportunity to spend a summer conducting research with a Penn faculty member.

University Research Foundation — PHILADELPHIA, PA, US
$50,000 *2018 – 2019*
Office of the Vice Provost for Research awarded Masoud Akbarzadeh to undertake pilot projects that will enable him to successfully apply for extramural sources of funding and aid in establishing his careers as an independent investigator.

Fellowship/Award

Swiss Federal Institute of Technology
ZURICH, SWITZERLAND
ITA Fellowship Award
2012 – 2016
Fully-funded PhD position from the Institute of Technology in Architecture (ITA), Department of Architecture (DArch).

Skidmore, Owings and Merrill LLP
CHICAGO, US
SOM Prize
2011
Travel research fellowship for architecture, design and urban design.

Massachusetts Institute of Technology
CAMBRIDGE, MA, US
Merit-Based Scholarship
2008 and 2011
Full-tuition award to study architecture at MIT Department of Architecture.

Massachusetts Institute of Technology
CAMBRIDGE, MA, US
First Prize
2010
Show Case Competition at MIT Department of Architecture.

Massachusetts Institute of Technology
CAMBRIDGE, MA, US
Scholarship
2007 and 2010
Half-tuition award to study MArch and SMArchs at MIT Department of Architecture.

Iran University of Science and Technology
TEHRAN, IRAN
Scholarship
2007
Ranked among 2% of 11,300 attendants in national graduate entrance exam.

Zanjan University
ZANJAN, IRAN
Scholarship
1999
Ranked among 0.01% of 300,000 attendants in national undergraduate entrance exam.

Teaching Experience

University of Pennsylvania, School of Design
PHILADELPHIA, PA, US
Assistant Professor of Architecture in Structures and Advanced Technologies
Jul '16 – Present

Contemporary Architects Association
TEHRAN, IRAN
Instructor
Jun '16 – Aug '16
HedraCrete, a workshop on 3D graphical statics and techniques in fabricating complex concrete, polyhedral structures, taught by M. Akbarzadeh, M. Mahnia, A. H. Tabrizi, and R. Taherian.

University of Stuttgart, ILEK
STUTTGART, GERMANY
Instructor
Jun '15
Funicular Funnel Shell Design; a workshop on form finding using RhinoVAULT and the fabrication process of a specific type of shells with tensile and compressive members, taught by M. Rippmann, M. Akbarzadeh, and O. Gericke.

ETH Zurich, DArch
ZURICH, SWITZERLAND
Invited Jury/ Student Consultant
Fall & Spring '13, '14, '15
Structural Design I, II, taught by Prof. Dr. Philippe Block.

MIT, Department of Architecture
CAMBRIDGE, MA, US
Teaching Assistant
Spring '12
Architectural Design Studio Level II, taught by Prof. Ana Miljacki.

Harvard Graduate School of Design
CAMBRIDGE, MA, US
Instructor
J-Term '12
Interlock: Plywood Design/Build Workshop, taught by Masoud Akbarzadeh and Arash Adel.

MIT, Department of Architecture
CAMBRIDGE, MA, US
Teaching Assistant
Fall '11
Geometric Disciplines and Architectural Design Skills, taught by Prof. Joel Lamere.

MIT, Department of Architecture
CAMBRIDGE, MA, US
Teaching Assistant
Spring '11
Soft Wood: Architectural Design Workshop, taught by Prof. Sheila Kennedy and Nick Gelpi.

MIT, Department of Architecture
CAMBRIDGE, MA, US
Instructor
IAP '11
Point Crowd: Rhino Script Workshop Using Python Programming Language, taught by Ari Kardasis and Masoud Akbarzadeh.

MIT, Department of Architecture   CAMBRIDGE, MA, US
    Teaching Assistant   *Fall '10*
        Architectural Design Studio Level I, taught by Prof.   William O'Brien Jr.
MIT, Department of Architecture   CAMBRIDGE, MA, US
    Teaching Assistant   *Fall and Spring '08 '09, '10*
        Geometric Disciplines and Architectural Design Skills I, II, taught by Prof.   Joel Lamere.

Experience

School of Design, University of Pennsylvania   PHILADELPHIA, PA, US
    Assistant Professor   *Jan '17 – present*
        Assistant professor of Architecture in Structure and Advanced Technologies; leading research in
        structural design and teaching technology elective courses and design research studios.

Polyhedral Structures Laboratory, PennDesign, University of Pennsylvania   PHILADELPHIA, PA, US
    Director   *Jan '17 – present*
        Polyhedral Structures Lab (PSL) is a multidisciplinary research lab connecting architecture, structural
        engineering, computer science, mathematics and material science to advance structural geometry and
        construction.

Block Research Group, ITA, ETH Zurich   ZURICH, SWITZERLAND
    Research Assistant   *Oct '12 – Jun '16*
        Developing methods of 3D graphical statics as the main area of research and collaborating in the design
        and fabrication of small- and large-scale structural prototypes, such as the nest floor prototype and
        funicular funnel shell prototype at ILEK, Stuttgart, Germany.

Masoud Akbarzadeh Studio   ZURICH, SWITZERLAND
    Structural Consultant   *May '14*
        Designing the structural concept of a competition entry for Augusta Raurica Archaeological Center in
        Basel, Switzerland.
    Architectural Consultant   *Sep '12 – Dec '12*
        Designing an expressive facade for a commercial building as well as the entrance space for the building
        and the bridges connecting the building to the street.

NADAAA   BOSTON, MA, US
    Architectural Designer/Researcher   *Jun '10 – Aug '10*
        Involved in the design of a private residence in Washington DC, and invited to a competition to design
        a wall in Austin, TX, US.
    Architectural Designer/Researcher   *Jun '09 – Aug '09*
        Involved in the conceptual design process of the School of Architecture, University of Toronto, Canada,
        and the School of Architecture, Melbourne University, Australia.

Ana Miljacki   CAMBRIDGE, MA,US
    Architectural Designer/Researcher   *Jan '09 – Feb '09*
        Prepared a design proposal for the expansion of the Center for Real Estate at MIT, Cambridge, MA, US.

Paul Lukez Architecture   CAMBRIDGE, MA,US
    Architectural Designer/Researcher   *Jun '08 – Aug '08*
        High rise design, 3000 housing units in Xiamen, Fujian, China.

Invited Lecture/Presentation

schlaich bergermann partner (sbp)   NEW YORK CITY, NY, US
    Invited Speaker invited by Dr.   Powell Draper.   *Apr '19*
Facade Forum 2019, Thomas Jefferson University   PHILADELPHIA, PA, US
    Invited Speaker at the College of Architecture and the Built Environment.   *Apr '19*
Knippers Helbig Advanced Engineering   NEW YORK CITY, NY, US
    Invited Speaker for Mr.   Thorsten Helbig and his team at NYC office.   *Mar '19*
Princeton University   PRINCETON, NJ, US
    Invited Speaker for Prof.   Sigrid Adriaenssens at Form Finding Lab.   *Feb '19*
Skidmore, Owings & Merrill Co.   CHICAGO, MI, US
    Invited Speaker for Mr.   William F. Baker and his research teams at SOM.   *Jan '19*
Mechanical Engineering and Applied Mechanics Department, UPenn   PHILADELPHIA, PA, US

Invited Speaker for Prof. Mark Yim in his MEAM348 course. *Feb '18*

School of Design, University of Pennsylvania PHILADELPHIA, PA, US
Invited Speaker in MASTERLECTURE Series, part of ARCH602 course. *Feb '18*

Mechanical Engineering and Applied Mechanics Department, UPenn PHILADELPHIA, PA, US
Invited Speaker for Prof. Mark Yim in his MEAM348 course. *Feb '18*

School of Design, University of Pennsylvania PHILADELPHIA, PA, US
Invited Speaker in MASTERLECTURE Series, part of ARCH602 course. *Feb '18*

HOK SAN FRANCISCO/NEW YORK CITY, US
Invited Speaker for structural engineers and architects New York city and San Francisco offices. *Jan '18*

San Francisco Dynamo User Group SAN FRANCISCO, CA, US
Invited Speaker in a monthly meeting for Dynamo visual programming enthusiasts. *May '17*

Mechanical Engineering and Applied Mechanics Department, UPenn PHILADELPHIA, PA, US
Invited Speaker for Prof. Mark Yim in his MEAM348 course. *Apr '17*

School of Design, University of Pennsylvania PHILADELPHIA, PA, US
Invited Speaker in MASTERLECTURE Series, part of ARCH602 course. *Feb '17*

ETH Zurich, (NCCR) Digital Fabrication ZURICH, SWITZERLAND
Invited Speaker for students of Master of Advanced Studies. *Feb '16*

International Association of Shell and Spatial Structures AMSTERDAM, THE NETHERLANDS
Paper Presentation at the Structural Morphology Group session. *Aug '15*

Amirkabir University of Technology TEHRAN, IRAN
Invited Speaker at the Department of Computer Science and Mathematics *Oct '14*

International Association of Shell and Spatial Structures BRASILIA, BRAZIL
Paper Presentation at the Structural Morphology Group session. *Sep '14*

Association for Computer-Aided Design in Architecture CAMBRIDGE, ONTARIO, CANADA
Paper Presentation at the conference with the main theme: Adaptive Architecture. *Oct '13*

International Association of Shell and Spatial Structures WROCLAW, POLAND
Paper Presentation at the Structural Morphology Group session. *Sep '13*

University of Florida, School of Architecture GAINESVILLE, FL, US
Invited lecture as a shortlisted candidate for a tenure-track position in architecture. *Mar '12*

Administrative and Collective Duties

Technology Committee at PennDesign US
Chair *Nov '17*
Responsible for reviewing the elective curriculum and making recommendation for any new faculty for core or elective curriculum to the Associate and Chair of the department.

International Journal of Space Structures US
Technical Reviewer *Feb '17*
A peer-reviewed journal addressing all aspects of analysis, design and construction of space structures.

John Stewardson Competition US
Jury *Feb '17*
The John Stewardson Memorial Fellowship in Architecture competition.

Computer-Aided Design Journal US
Technical Reviewer *Feb '17*
A leading international journal focusing on research and developments in the application of computers to design.

International Association of Shell and Spatial Structures AMSTERDAM, THE NETHERLANDS
Co-Chair *Oct '14*
The Computation and Geometry Session in Structural Morphology Group.

TAD the Journal of Technology, Architecture, and Design US
Technical Reviewer *Nov '16*
The inaugural issue of the Journal of TAD.

The Symposium on Simulation for Architecture and Urban Design US, UK
Technical Reviewer *Apr '15, '16*
SimAUD 2015 and SimAUD EU 2016.

Publications

M. Hablicsek, M. Akbarzadeh and Y. Guo. Algebraic 3D Graphic Statics: Reciprocal Constructions. *Computer-Aided Design Journal*, Submitted for review.

G. S. Athanasopoulos, M. Akbarzadeh, and A. McRobie. Graphic Statics: Constrained Form Finding for Parallel System of Forces Using Corsican Sum. In C. Mueller and S. Adriaenssens editors, *Proceedings of the IASS Symposium 2018, Creativity in Structural Design*, MIT, Boston, USA, July 16-20, 2018.

A. Tabatabaei Ghomi, M. Bolhassani, A. Nejur, and M. Akbarzadeh. The Effects of Polyhedral Subdivisions on the Local Buckling, Load-Path and Material Use. In C. Mueller and S. Adriaenssens editors, *Proceedings of the IASS Symposium 2018, Creativity in Structural Design*, MIT, Boston, USA, July 16-20, 2018.

M. Bolhassani, A. Tabatabaei Ghomi, A. Nejur, M. Omer Furkan, I. Bartoli, and M. Akbarzadeh. Structural Behavior of a Cast-in-Place Funicular Polyhedral Concrete: Applied 3D Graphic Statics. In C. Mueller and S. Adriaenssens editors, *Proceedings of the IASS Symposium 2018, Creativity in Structural Design*, MIT, Boston, USA, July 16-20, 2018.

M. Akbarzadeh, M. Hablicsek, and Y. Guo. Developing Algebraic Constraints for Reciprocal Polyhedral Diagrams of 3D Graphic Statics. In C. Mueller and S. Adriaenssens editors, *Proceedings of the IASS Symposium 2018, Creativity in Structural Design*, MIT, Boston, USA, July 16-20, 2018.

A. Nejur and M. Akbarzadeh, Constrained Manipulation of Polyhedral Systems. In C. Mueller and S. Adriaenssens, editors, *Proceedings of the IASS Symposium 2018, Creativity in Structural Design*, MIT, Boston, USA, July 16-20, 2018.

M. Bolhassani, M. Akbarzadeh, M. Mahnia, and R. Taherian. On Structural Behavior of a Funicular Concrete Polyhedral Frame Designed by 3D Graphic Statics. *Structures*, 14: 56-68, June, 2018.

M. Akbarzadeh, M. Mahnia, R. Taherian Ramtin, and A. H. Tabrizi. Hedracrete; Prefab, Funicular, Spatial Concrete. *DISCIPLINES & DISRUPTION: Projects Catalog of the 37th Annual Conference of the Association for Computer Aided Design in Architecture (ACADIA)*, Massachusetts Institute of Technology, Cambridge, MA, US, 2017.

M. Akbarzadeh, M. Mahnia, R. Taherian, and A. Tabrizi. Prefab, Concrete Polyhedral Frame: Materializing 3D graphic statics. In A. Bögle and M. Grohmann, editors, *Proceedings of the IASS Annual Symposium 2017, Inter-faces: architecture . engineering . science*, Hamburg, Germany, September 25-28th, 2017.

T. H. Nielsen, M. Akbarzadeh, and P. Goltermann. Addressing buckling of compression members using subdivision of force diagrams. In A. Bögle and M. Grohmann, editors, *Proceedings of the IASS Annual Symposium 2017, Inter-faces: architecture . engineering . science*, Hamburg, Germany, September 25-28th, 2017.

M. Akbarzadeh, T. Van Mele, and P. Block. Three-dimensional graphic statics:Initial explorations with polyhedral form and force diagrams. *International Journal of Space Structures*, 31(2): 217-226, June-September 2016.

M. Akbarzadeh. *3D Graphic Statics using Reciprocal Polyhedral Diagrams*. PhD thesis, ETH Zürich, Züurich, Switzerland, 2016.

M. Akbarzadeh, T. Van Mele, and P. Block. On the equilibrium of funicular polyhedral frames and convex polyhedral force diagrams. *Computer-Aided Design*, 63: 118-128, 2015.

M. Akbarzadeh, T. Van Mele, and P. Block. 3d graphic statics: Geometric construction of global equilibrium. *In Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium*, Amsterdam, The Netherlands, 2015.

M. Akbarzadeh, T. Van Mele, and P. Block. Three-dimensional compression form finding through subdivision. *In Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium*, Amsterdam, The Netherlands, 2015.

M. Akbarzadeh. *Designed For Water: Infrastructures taming the water and producing energy*. SOM Foundation, 2015.

D. Löpez Löpez, D. Veenendaal, M. Akbarzadeh, and P. Block. Prototype of an ultra-thin, concrete vaulted floor system. *In Proceedings of the IASS-SLTE 2014 Symposium*, Brasilia, Brazil, 2014.

M. Akbarzadeh, T. Van Mele, and P. Block. Compression-only form finding through finite subdivision of the external force polygon. *In Obrebski J.B. and R. Tarczewski, editors,Proceedings of the IASS-SLTE Symposium 2014*, Brasilia, Brazil, 2014.

M. Akbarzadeh, T. Van Mele, and P. Block. Equilibrium of spatial networks using 3d reciprocal diagrams. In J. B. Obrebski and R. Tarczewski, editors, *In Proceedings of the International Association for Shell and Spatial Structures (IASS)Symposium 2013*, Wroclaw, Poland, September 2013.

M. Akbarzadeh. Performative surfaces: Making adaptive tools to design roofs and landscapes based on computational interpretation of flow patterns. *In Association for Computer-Aided Design in Architecture 2013 International Conference: Adaptive Architecture*, Cambridge, Ontario, Canada, 2013.

M. Akbarzadeh. Robot arm. In S. Hirschman, editor,*Testing to Failure: Design and Research in MITâĂŹs Department of Architectur*e. SA+P Press, 2011.

M. Akbarzadeh. Tensional integrity. In A. Miljacki, L. Pauli, and B. Pinney,M. Sleeper, editors, *Uncertain Futures, Two Years of Student Research at The MITDepartment of Architectur*e. SA+P Press, 2009.

M. Zahedi, G. Ghodrati Amiri, and M. Akbarzadeh. Characteristics of vertical spectrum of earthquake in nearfeild regions and its effects on the dynamic responses of bridges. *In 4th International Conference on Earthquake Geotechnical Engineering*, ICEGE, Thessaloniki, Greece, June 25-28 2007.