MOHAMMAD AMIN TALAGHAT, Ph.D.
Contracts & Technical Affairs Specialist | AI & Digital Twin Researcher
Ph.D. in Construction Management (Amirkabir University) | Visiting Research Assistant (University of Oulu - DigiPave)
Grade 3 Licensed Construction Supervisor & Executor | Co-Founder at ArkaNoyan & WebAlfa
Shiraz, Iran | +98 917 188 3502, +358 41 7182 239 | atalaghat@aut.ac.ir, atalaghat@gmail.com | linkedin.com/in/atalaghat | atalaghat.github.io/atalaghat/

PROFESSIONAL PROFILE

Civil engineer and construction management professional with a completed Ph.D. in Construction Management, focused on AI-driven Digital Twin systems for pavement and smart infrastructure. Experienced in connecting academic research with product-oriented and commercial infrastructure applications, including road pavement digital twins, automated condition assessment, data-driven maintenance decision support, BIM/IoT integration, and infrastructure asset management. Combines international research collaboration with practical experience in construction project management, technical office leadership, contract administration, delay claims, cost estimation, and web/software development.

TARGET COLLABORATION FIT

- Direct strongest area: highway, road and urban pavement digital twin solutions, including AI-based pavement distress detection/segmentation, condition assessment, PCI-oriented workflows, and maintenance optimization.
- Transferable adjacent area: airport pavement monitoring and digital twin implementation, using the same core logic of georeferenced inspection, computer vision, data fusion, asset management, and decision-support workflows.
- Commercial bridge: ability to support regional infrastructure collaboration by combining research credibility, local project/contract experience, and product-oriented technical communication.

CORE EXPERTISE

Digital Twin for Road Pavement and Infrastructure Assets	AI / Machine Learning / Deep Learning for Condition Assessment
Pavement Management Systems and Maintenance Decision Support	Computer Vision-Based Distress Detection and Segmentation
BIM, IoT Integration and Data-Centric Engineering Workflows	Project Planning, Project Controls and Technical Office Management
Contract Administration, Claims, Delay Analysis and Cost Estimation	Python, Data Mining, Web Development and Engineering Software Tools

PROFESSIONAL & CONSULTING SERVICES

1. Civil Engineering, Technical Office & Project Controls

- **Bidding, Pricing & Tenders (Taksa):** Preparation of 4-factor price breakdown (Circular 4951), mark-up/discount analysis, and bidding documentation in Taksa.
- **Interim & Final Payment Certificates:** Drafting, auditing, and defending monthly interim and final payment certificates under official price books.
- **Price Escalation & Adjustments (Circular 173073):** Quarterly price escalation calculations adhering strictly to Circular 173073 and branch indexes.
- **New Rates & Variation Claims (Article 29):** Formulation and defense of new rate claims and variation orders per Article 29 of General Conditions (Circular 4311).
- **Financial & Cost-Benefit Analysis:** Continuous project cost/revenue audits to safeguard contractor margins and avoid cash-flow loss.
- **Site Minutes & Execution Records:** Drafting, certifying, and defending temporary and final site work records, hidden works, and execution logs.
- **Contract Claim Management:** Strategic contractual dispute documentation, entitlement defense, and negotiation under Circular 4311 and FIDIC.
- **Quantity Surveying & Take-Off:** Detailed quantity takeoff sheets, re-measurement against drawings, and material reconciliation in Excel and Taksa.
- **Contracts Administration (Circular 4311 & FIDIC):** Contractual administration, clause interpretation, risk allocation, and statutory alignment.

• **Extension of Time (EOT) & Delay Claims (Circular 5090):** Systematic delay analysis (excusable vs. non-excusable) based on Circular 5090 and CPM critical path impact.

• **Executive & Periodic Reporting:** Dynamic weekly, monthly, and milestones reports tailored for executive leadership and PMO steering committees.

• **Master Scheduling & Controls (MSP / Primavera P6):** Master WBS structuring, baseline scheduling, resource allocation, and progress tracking in Microsoft Project and Primavera P6.

• **Loss, Expense & Idling Claims:** Quantification of indirect overheads, prolonged site costs, and idle equipment claims under Article 49 suspension.

• **CAD Drafting & Engineering Drawings (AutoCAD):** Architectural, structural, and infrastructure Phase 1 & 2 CAD drafting following AIA layering standards.

• **3D BIM Modeling & Clash Detection (Revit):** Parametric architectural, structural, and MEP modeling, clash detection, and quantity extraction in Autodesk Revit.

• **Structural Analysis & Design (ETABS, SAFE, SAP2000):** Structural analysis, seismic code compliance (Standard 2800, Parts 9 & 10) in ETABS, SAFE, and SAP2000.

• **Tekla Structures Shop Detailing & Cutting Sheets:** Detailed steel fabrication models, CNC cutting sheets, connection detailing, and bar bending schedules in Tekla Structures.

• **Executive BI Dashboards & EVM:** Deployment of Earned Value Management (CPI, SPI, EAC) and executive KPI dashboards.

• **Pavement Management Systems (PMS & APMS):** ASTM D6433 PCI pavement condition surveys, deterioration forecasting, and multi-objective maintenance prioritization.

2. Software Architecture, Web Platforms, UI/UX & Hosting

• **Full-Stack Web & Portal Development:** Custom corporate, engineering, and platform applications built with WordPress, PHP, React.js, and modern toolchains.

• **UI/UX Design & Architecture:** Modern, ergonomic, responsive, RTL-optimized interfaces adhering to clean code standards and Figma design systems.

• **Web Hosting & Linux Server Administration:** Fast, secure LiteSpeed/NGINX cloud hosting setups, SSL, hardening, and performance tuning for Core Web Vitals.

• **Custom Web Applications & Engineering Tools:** Bespoke engineering calculators, data ingestion portals, and workflow pipelines.

3. R&D Consulting, Academic Research & AI Engineering

• Computer Vision, Automated Detection & Segmentation: End-to-end computer vision pipelines utilizing YOLOv8/v11, foundation models, and diffusion-based generative AI for high-fidelity pavement and structural distress detection, crack instance segmentation, and multi-modal UAV thermal infrared analysis.

• Deep Predictive Modeling & Time-Series Forecasting: Hybrid MLP–LSTM and deep residual neural network architectures for forecasting non-linear infrastructure deterioration rates, distress severity/density metrics, and equipment fault anomalies over decadal horizons.

• Multi-Objective Engineering Optimization: Constrained multi-objective optimization using NSGA-II/III, Genetic Algorithms (GA), and PSO for multi-year capital Maintenance & Rehabilitation (M&R) budget allocation, joint energy-carbon-maintenance optimization, and autonomous inspection tasking.

• 4D Digital Twin Architecture & Cyber-Physical Integration: Full-lifecycle infrastructure digital twins adhering to open-BIM and IFC 4.3 standards, synchronizing real-time IoT sensor telemetry, fleet-sourced 4D spatial reconstruction, and automated prescriptive decision-support engines.

• Top-Tier ISI Manuscript Advisory, LaTeX Typesetting & Peer Review: Strategic manuscript structuring for top-tier journals (Nature Portfolio, Elsevier, ASCE, Springer), rigorous research gap formulation, complex LaTeX/BibTeX mathematical typography, and evidence-bounded peer review rebuttal authoring.

EDUCATION

Ph.D. in Civil Engineering - Construction Engineering and Management **2021 - 2025**
Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran
Thesis: Development of a digital twin-based intelligent decision support system for asphalt pavement maintenance | Supervisor: Dr. Amir Golroo

Ph.D. Visiting Scholar, DigiPave Project **Oct 2024 - Apr 2025**
University of Oulu, Oulu, Finland

Host Professor: Professor Rauno Heikkila
Research focus: road pavement digital twin, AI-driven infrastructure monitoring and intelligent maintenance systems

M.Sc. in Civil Engineering - Construction Engineering and Management **2017 - 2020**
K. N. Toosi University of Technology, Tehran, Iran
Thesis: Development of a building energy management system by integrating BIM and IoT to improve efficiency in public buildings | Supervisor: Dr. Ehsan Saghatforoush

B.Sc. in Civil Engineering **2011 - 2016**
Shiraz University, Shiraz, Iran

PROFESSIONAL AND RESEARCH EXPERIENCE

Technical & Contracts Affairs Specialist | Sahar Sazeh Novin Paydar Co. **Jun 2025 - Present**
Shiraz, Iran

- Manage technical office and contractual documentation, including project correspondence, progress reporting, estimation, contract records, and claim-related evidence.
- Prepare and review project control documents, technical reports, quantity take-offs, interim payment statements, variation/price analysis and contractual deliverables.

Research Collaborator / Research Assistant | University of Oulu - DigiPave Project **Jan 2024 - Present**
Oulu, Finland / Hybrid

- Worked on AI-driven road pavement digital twin architecture, automated condition assessment, data-driven maintenance decision support, and smart infrastructure systems.
- Integrated pavement engineering, georeferenced inspection data, computer vision, AI analytics, BIM/IoT concepts, and maintenance planning into practical digital twin workflows.

Co-Founder, CEO and Project Manager | ArkaNoyan Industry Development Co. **2019 - Present**
Shiraz, Iran

- Led construction-contracting and engineering activities covering project coordination, execution management, technical office work, project planning, cost control and commercial follow-up.
- Coordinated multidisciplinary teams and managed executive, technical, financial and contractual aspects of building and infrastructure-related projects.

Technical Office and Project Controls Supervisor | Arshsazan Negin Co. **Apr 2025 - Jun 2025**
Shiraz, Iran

- Supervised technical office workflows, project controls, documentation, quantity surveying, scheduling, and coordination between site, design and management teams.

Contract Affairs Expert | Iran Gas Engineering and Development Co. / NIGC Eng. **Jan 2022 - Jan 2024**
Tehran, Iran

- Supported contract affairs, risk analysis, contractual documentation, project finance and BOT-related studies for oil, gas and infrastructure project environments.
- Contributed to research and technical studies on fair risk allocation, financing models and contractual structures for infrastructure projects.

Technical & Execution Supervisor | Peynavardan Shahr Co. **2020 - 2021**
Shiraz, Iran

- Supervised execution activities, technical documentation, site coordination and quality-related follow-up for construction works.

Technical Office Engineer and Project Controls Engineer | Debleh Construction Co. **2018 - 2019**
Tehran, Iran

- Prepared schedules, progress control documents, quantity surveying reports, technical submittals and project coordination documents.

Web Developer and Designer / Director | WebAlfa and Tarnamagostar Parslabkhand Co. **2016 - Present**
Shiraz, Iran

- Designed and developed web platforms and applications using UI/UX, HTML/CSS, JavaScript/React, PHP/Laravel and related digital tools.

PROJECTS

- Road Pavement Digital Twin / DigiPave - decision-support system for pavement maintenance, Oulu, Finland.
- Building smartness and BIM/IoT-based energy management system for Roger Williams College, Florida, USA.
- Deep vision-based railway condition assessment using AI and georeferenced maintenance intelligence on the line, Tehran, Iran.
- Delay and damages claim preparation and project scheduling for the 3,300-ton/day Fars Cement Factory in Kharameh, Iran.
- Delay claim documentation for Q Residential-Commercial Complex, 170,000 m2, Khorramabad, Iran.
- Project planning and controls for the 1,210-unit Mehr Housing Project, 120,000 m2, Pardis, Iran.
- Quantity surveying and estimation for the 60-hectare Mehr Housing landscaping project, Pardis, Iran.
- Construction of the Electrical and Computer Engineering Faculty of Shiraz University, 6,000 m2, Shiraz, Iran.
- Design, drawings and structural calculations for a 6-story residential building, 2,000 m2, Shiraz, Iran.
- Design and development of WebAlfa, BIMGate, Paprika and TwinUp digital platforms.

HONORS, LICENSES AND CERTIFICATES

- Ph.D. Visiting Scholar (Funded Fellowship), University of Oulu, Oulu, Finland, Oct 2024 - April 2025
- Member of Iran Construction Engineering Organization; Grade 3 Licensed Construction Supervisor and Executor.
- Winner of Iran's National Elites Foundation talented students' award, 2021.
- Ranked 20th in the Iranian Nationwide Ph.D. Entrance Exam, 2021.
- Ranked 3rd among M.Sc. students in Construction Engineering and Management, 2020.
- Certificates/courses: HSE, MATLAB engineering programming, ETABS/SAFE structural design, AutoCAD, Revit/BIM, Python data mining and machine learning, Microsoft Project, Taksa quantity surveying and payment statements.

TECHNICAL TOOLS AND LANGUAGES

Programming & Data Science: Python (PyTorch, TensorFlow, Scikit-Learn, OpenCV, Pandas, NumPy), MATLAB, JavaScript, React.js, Next.js, PHP / Laravel, HTML5 / CSS3, SQL, RapidMiner, Weka, Claude API.

Engineering, Costing & Scheduling: Taksa (تکسا), Tadkar (تدکار), Microsoft Project (MSP), Primavera P6, AutoCAD, Autodesk Civil 3D, Autodesk Revit (Architecture, Structure, MEP & Clash Detection), Autodesk InfraWorks, CSI ETABS, CSI SAFE, CSI SAP2000, Tekla Structures (Shop Detailing, Cutting Sheets & CNC/DSTV).

Contractual & Regulatory Frameworks: Standard Conditions of Contract (Circular 4311 / نشریه ۴۳۱۱), Delay Claims & Extension of Time (Circular 5090 / بخشنامه ۵۰۹۰), Price Adjustment & Index Escalation (Circular 173073 / بخشنامه ۱۷۳۰۷۳), 4-Factor Price Breakdown (Circular 4951 / بخشنامه ۴۹۵۱), FIDIC Red & Yellow Books, Earned Value Management (EVM), Critical Path Method (CPM), Work Breakdown Structure (WBS).

Infrastructure, AI & Quality Domain: Digital Twin 4D Architecture, Pavement Management Systems (PMS & APMS, ASTM D6433 PCI Condition Surveys), Computer Vision & Object Segmentation (YOLOv8/v11, SAM), Quality Assurance & Quality Control (QA/QC), Health, Safety and Environment (HSE).

Web Hosting, UI/UX & Cloud Infrastructure: WordPress Enterprise Architecture, Figma Design Systems, Adobe Photoshop, Adobe XD, Linux Server Hosting & Administration, LiteSpeed, NGINX, SSL Security Hardening, Speed & Core Web Vitals Optimization.

Languages: Persian (Native); English (Full professional working proficiency - IELTS C1 equivalent).

PUBLICATIONS AND MANUSCRIPTS

1. Talaghat, M. A., Golroo, A., Shahhosseini, V., & Rasti, M. (2026). An implemented AI-driven digital twin architecture for proactive pavement maintenance in Finland. *Scientific Reports*.
2. Talaghat, M. A., Golroo, A., Shahhosseini, V., Rasti, M., Daneshvar, A., & Moghadas Nejad, F. (2026). Hybrid MLP–LSTM deep predictive modeling of pavement distress severity and density and condition indices. *International Journal of Pavement Engineering*, *27*(1). 2624565.
3. Talaghat, M. A., Golroo, A., Rasti, M., & Shahhosseini, V. (2026). Road Pavement Digital Twin: A Blueprint with a Case Study. *Journal of Computing in Civil Engineering*, *40*(3), 05026001.
4. Talaghat, M. A., Golroo, A., Shahhosseini, V., & Rasti, M. (2025). Enhancing pavement distress segmentation model with diffusion-based generative AI: a digital twin perspective. *International Journal of Pavement Engineering*, *26*(1), 2540076.
5. Talaghat, M. A., Golroo, A., Kharbouch, A., Rasti, M., Heikkilä, R., & Jurva, R. (2024). Digital twin technology for road pavement. *Automation in Construction*, *168*, 105826.
6. **Talaghat, M. A., Golroo, A., Shahhosseini, V., & Rasti, M. (2026).** Fully Automated Pavement Crack Quantification and PCI Estimation via a Digital Twin-Ready Vision-Based Deep Learning Pipeline. *Results in Engineering*.
7. Talaghat, M. A., Golroo, A., Shahhosseini, V., Rasti, M., & Daneshvar, A. (2026). A data-driven optimization framework for network-level pavement maintenance planning. *International Journal of Pavement Engineering*. *(under review)*
8. Sedighian-Fard, M., Golroo, A., Javanmardi, M., Alahi, A., Dehghan Tezerjani, H., Talaghat, M. A., Shahhosseini, V., & Rasti, M. (2026). Explainable AI-enhanced pavement deterioration modeling using deep learning. *Scientific Reports*.
9. Nouri, S., Rezaeemanesh, M., Talaghat, M. A., Rasti, M., & Golroo, A. (2026). Self-supervised crack segmentation with data-driven severity detection. *IEEE Transactions on Intelligent Transportation Systems*. *(under review)*
10. Sedighian-Fard, M., Talaghat, M. A., et al. (2026). Deep vision-based railway track superstructure condition assessment using YOLOv26 and georeferenced maintenance intelligence: Field validation on the Zanjan-Tehran railway line. *Scientific Reports*. *(under review)*
11. Sedighian-Fard, M., Golroo, A., Javanmardi, M., Alahi, A., Talaghat, M. A., Shahhoseini, V., Amiri, S., Moghadas Nejad, F. (2026). A complete pipeline for automated pavement distress detection, segmentation, and quantification using a new surface condition index. *Case Studies in Construction Materials. (under review)*
12. Sedighian-Fard, M., Javanmardi, M., Alahi, A., Talaghat, M. A., & Shahhosseini, V. (2026). Vehicle-based pavement condition monitoring: A review of evidence, technology readiness, and management integration. *Journal of Traffic and Transportation Engineering. (under review)*
13. Alobaidi, M., Golroo, A., Sedighian-Fard, M., & Talaghat, M. A. (2026). Synchronized 2D–3D edge sensing for automated ASTM D6433 pavement condition assessment: A Baghdad case study. *Measurement. (under review)*
14. Talaghat, M. A., Sedighian-Fard, M., Golroo, A., & Rasti, M. (2025). Leveraging digital twin technology for data-driven pavement maintenance. In *AM3P Conference* (Vol. 4, pp. 604-608). TU Wien, E230-03 Road Engineering.

15. Talaghat, M. A., Golroo, A., & Rasti, M. (2025). Improving Pavement Distress segmentation with Diffusion-Based Generative AI. *In AM3P Conference* (Vol. 4, pp. 579-582). TU Wien, E230-03 Road Engineering.

16. Sedighian-Fard, M., Fathali, M., Yazdani Tabai, S. H., Homavandi, S., Akbari, M., & Talaghat, M. A. (2026). Interpretable machine-vision indices for monitoring sand fouling, ballast whitening and vegetation in climatically diverse Iranian railways. International Journal of Railway Research *(under review).*

17. Saghatforoush, E., Abbasianjahromi, H., Talaghat, M. A., & Kahvandi, Z. (2022). Development of a Management System to Improve the Energy Efficiency of Public Buildings by Integrating IoT and BIM. *Lean Construction Journal*.

18. Talaghat, M. A., & Sedighian-Fard, M. (2026). *A self-calibrating probabilistic digital twin of road pavement networks with decision-centric tasking of autonomous vehicle fleets. (under review)*

19. Talaghat, M. A., & Sedighian-Fard, M. (2026). *A self-updating, two-way building digital twin for grid-interactive operation: Forecasting equipment faults and jointly optimising energy, peak demand, carbon and maintenance*. Sustainable Energy, Grids and Networks. *(under review)*

20. Talaghat, M. A., & Sedighian-Fard, M. (2026). ARGONet-4D: A maturity-graded digital twin of urban road surfaces that links fleet-sourced 4D reconstruction, foundation-model distress objects, IFC 4.3 semantics, IoT-informed forecasting and prescriptive maintenance. *Innovative Infrastructure Solutions. (under review)*

RESEARCH BACKGROUND AND INTERESTS

- Ph.D. and DigiPave background: digital twin-based intelligent decision-support systems for asphalt pavement maintenance, integrating pavement management systems, georeferenced inspection data, AI-driven condition assessment, automated monitoring and maintenance optimization.
- AI/computer vision interests: pavement distress detection and segmentation, crack quantification, severity/density estimation, PCI-oriented pipelines, diffusion-based generative AI, self-supervised learning, YOLO-based infrastructure inspection, MLP-LSTM prediction and explainable deterioration modelling.
- Asset-management and decision-support interests: data-driven prioritization, network-level maintenance planning, predictive condition modelling, treatment optimization and integration of technical, economic and operational constraints for infrastructure owners.
- BIM/IoT and building-energy research: BIM/IoT-based energy management systems, data-centric engineering workflows, operational performance monitoring and occupant-comfort analysis using meta-synthesis and AHP methods.
- Construction management and contracts: project controls, technical office management, quantity surveying, cost estimation, delay claims, contract administration, project finance, BOT studies and fair contractual risk allocation; current interest is practical deployment of AI-driven Digital Twin and smart asset-management platforms in real infrastructure projects.

REFERENCES

Dr. Amir Golroo - Associate Professor of Civil and Environmental Engineering, Amirkabir University of Technology (Tehran Polytechnic) | agolroo@aut.ac.ir

Dr. Mehdi Rasti - Associate Professor of Information Technology and Electrical Engineering, University of Oulu | mehdi.rasti@oulu.fi

Dr. Rauno Heikkilä - Professor of Digitalized Construction and Mining Operations, Faculty of Technology, University of Oulu; Head of the Structures and Construction Technology Research Unit | rauno.heikkila@oulu.fi

Dr. Vahid Shah Hosseini - Associate Professor of Civil Engineering, Amirkabir University of Technology (Tehran Polytechnic) | shahhosseini@aut.ac.ir

Dr. Ehsan Saghatforoush - Associate Professor of Construction Economics and Management, Wits University | ehsan.saghatforoush@wits.ac.za

Dr. Hamidreza Abbasianjahromi - Assistant Professor of Civil Engineering, K. N. Toosi University of Technology | habasian@kntu.ac.ir

Dr. Mohammad Reza Talaghat - Associate Professor, Department of Chemical, Oil and Gas Engineering, Shiraz University of Technology | talaghat@sutech.ac.ir