

# Nikan Doosti

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## EDUCATION

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- **Aalto University** Espoo, Finland  
Mar 2025 - present
  - *Doctor of Science (Technology) in Mechanical Engineering*
    - **Thesis:** AI-assisted Product Development
- **Iran University of Science and Technology (IUST)** Tehran, Iran  
Aug 2019 - Dec 2022
  - *Master of Science in Computer Engineering - Artificial Intelligence*
    - **Thesis:** High Resolution Neural Topology Optimization via Differentiable Physics Engine (code)
    - **Defense:** Achieved **maximum thesis score** (20.5/20) accompanied with a peer-reviewed publication
    - **Honors:** Selected as an **Exceptional Talent** ( $\leq 300/15000$ ) for direct admission to a **top-3 national university**
- **University of Guilan (UoG)** Rasht, Iran  
Aug 2015 - Aug 2019
  - *Bachelor of Science in Computer Engineering*
    - **Thesis:** Descreening and Rescreening of Halftone Images via Data-Driven Deep Learning Methods (code)
    - **Honors:** Graduated **3rd** out of 55 (GPA: 18.64/20); **First-Class Honors** and **Distinction for thesis research.**

## RESEARCH INTERESTS

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- Computer Graphics
- Machine Learning
- Inverse Problems
- Geometry processing
- Computational Fabrication
- Physics-based Simulation

## PUBLICATIONS

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- [Under review] Multimodal Ensemble Detection and Self-Healing of Defects in Laser-based Powder Bed Fusion. **Nikan Doosti**, Olli Nyrhilä, Jan Akmal. Additive Manufacturing, 2025.
- Topology Optimization via Frequency Tuning of Neural Design Representations. **Nikan Doosti**, Julian Panetta, Vahid Babaei. ACM Symposium on Computational Fabrication (SCF), 2021. (Publisher, Code)

## TALKS

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- [Invited] "Complementary Benefits of MPM Modality for AM Quality Monitoring." **Electro Optical Systems (EOS) GmbH**. Krailling, Germany and Turku, Finland. Technical Talk. January, 2026. (Length: 60 mins.)
- [Invited] "Neural Design Representations" **Toronto Geometry Colloquium (TGC)** advised by Prof. Alec Jacobson - University of Toronto. Technical Talk (virtual). March, 2022. (Length: 10 mins., Video)
- "Topology Optimization via Frequency Tuning of Neural Design Representations." **SCF 2021**. Technical Paper Presentation (virtual). October, 2021. (Length: 15 mins., Video)

## RESEARCH EXPERIENCE

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- Full-time Graduate Researcher** Espoo, Finland
- **Aalto University** Mar 2025 - Present
  - Materials to Products Group (M2P) and Aalto Digital Design Lab (ADDLAB)*
    - Project Overview: Real-time defect detection and compensation in laser-based powder bed fusion (PBF-LB) through multimodal neural fusion of non-destructive, cheap, and widely available in-situ monitoring sensors, verified through lab experimentation
    - Supervisors: Supervised by **Prof. Jan Akmal** from M2P and **Olli Nyrhilä** from Electro Optical Systems (EOS GmbH).

- Outcome: **First researcher to demonstrate the complementary benefit of MPM modality** for print quality monitoring, leading to a paper under review in Additive Manufacturing journal, being **invited to present the findings to EOS's global R&D teams** following strong endorsement from EOS's senior inventor and researchers.
- Method: Laser parameters were systematically varied to induce defects in PBF-LB. In-situ images were acquired using **near-infrared, sCMOS-based optical tomography and dual-photodiode melt-pool monitoring**. We developed a **multimodal ensemble learning** approach that leverages these widely used yet independent modalities and demonstrates **complementary cross-modal confidence**. Defects spanning up to seven layers were healed. .

### Full-time Graduate Researcher

Saarbrücken, Germany

*Jul 2020 - Mar 2021*

- **Max Planck Institute for Informatics (MPII)**

#### *Artificial Intelligence aided Design and Manufacturing Group*

- Project Overview: Novel self-supervised neural design representation for obtaining the optimum design as an inverse problem, showcased in topology optimization
- Supervisors: Supervised by **Dr. Vahid Babaei** from MPII and **Prof. Julian Panetta** from the University of California, Davis, USA.
- Outcome: Resulted in a paper published and presented at the **ACM Symposium on Computational Fabrication 2021**. Among very few master's students whose thesis led to a publication in a highly regarded venue.
- Method: Utilized **physics-informed deep learning** by integrating analytical **physical simulators of PDE-constrained density-based topology optimization** into **neural fields**, enabling **generative continuous design** through sub-voxel (pixel) tuning .

### Undergraduate Research Assistant

Rasht, Iran

*Sep 2018 - Aug 2019*

- **University of Guilan**

#### *Computer Engineering Group*

- Project Overview: Worked on descreening and rescreening of halftone images via supervised deep learning methods
- Supervisors: Supervised by **Prof. Mahdi Aminian** and **Dr. Vahid Babaei** from MPII.
- Outcome: On top of deep study of visual computing, I became a top contributor of PyTorch forum, getting invited to the PyTorch Conference

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## TEACHING EXPERIENCE

- **Head Teaching Assistant - Advanced Programming (AP)**

*Supervisor: Dr. Ghasem Mirroshandel - University of Guilan*

*Aug 2018 - Feb 2019*

- **Head Teaching Assistant - Algorithms Design (AD)**

*Supervisor: Dr. Mojtaba Shakeri - University of Guilan*

*Aug 2018 - Feb 2019*

- **Head Teaching Assistant - Computational Intelligence (CI)**

*Supervisor: Dr. Mojtaba Shakeri - University of Guilan*

*Feb 2018 - Jul 2018*

Developed lectures for Java, gave recitation lectures, held office hours, designed and graded homework assignments, gave recitation lectures, and evaluated final projects in AP course (~60 students). Gave recitation lectures, graded homework assignments, and created programming tasks for AD (~60 students) and CI (~40 students) courses (partial materials).

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## COMMUNITY AND VOLUNTARY ACTIVITIES

### Top Contributor

- **Official PyTorch Forum**

*2018 - 2022*

*Official forum with 60K+ members and developers of the PyTorch*

- Ranked 15th (top 0.02%) as an active and helpful contributor with 183 solutions and 566 posts (profile)
- Publicly praised by Thomas Viehmann (author, *Deep Learning with PyTorch*) for insightful posts (source)
- Resulted in being awarded three consecutive, fully-waived invitations to the exclusive PyTorch Developer/Ecosystem Day and conference by the core team

## Organizer and Mentor

- *IUST Projects*

2019 - 2021

*An Open and Free Organization For Sharing Ideas, Showcasing Projects, and Mentoring Students*

- Mentored junior students in preparation for going through the MSc thesis process, from ideation to publishing, and job hunting. Few are now senior backend developers (feedback available upon request).

## Mentor and Lecturer

- *Rasht School of AI*

2018 - 2021

*An Open and Free Organization For Introducing AI and Mentorship (meetup materials)*

## Teacher

- *Independent work*

2023 - 2024

*Teaching Math and Programming to Underprivileged Teenagers in Low-income Regions*

## INDUSTRIAL EXPERIENCE

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### Founder and Engineer

Tehran, Iran

- *AI Venture (toy example)*

Aug 2023 - Jul 2024

*Specializing in Automated Document Image Analysis*

- Problem: Many small to medium companies, **lack structured data pipelines** and use their own specific layout for their documents which degrades inter-company interactions.
- Method: Developed an automated document image analysis platform to **transform unstructured, denormalized documents into accessible, structured data**, semantically searchable. Then a **no-code/low-code configuration system** for domain-expert intuition integration and a **human-in-the-loop review process** for quality control and compliance of the business logic was developed.
- Outcome: **Secured a pre-seed grant** (=84X of monthly minimum wage) and **first commercial client** in quality control inspection of a bicycle factory, however bureaucratic challenges ended this venture.

### Full-time Machine Learning Engineer

Karaj, Iran

- *Panafor*

Apr 2022 - Jan 2024

*Specializing in Data-driven Decision Making for Business Optimization*

- Problem: Growing customer volume made expert assignment inefficient; a real-time system was needed to identify high-value customers and route them to the right experts.
- Outcome: Decreased personnel error by 10% as a result of applicant prioritization. The **comprehensive screening process automation** (text/voice) coupled with filtering calls based on the complexity of inquiries, **reduced manual workload by 40%**. Furthermore, Oversaw the development of a proprietary data extraction and preprocessing pipeline, resulting in a **35% reduction in poor-quality data**. Finally, I established myself as the primary person for onboarding and training new team members.

### Summer Intern

Tehran, Iran

- *Matris Corporation*

June 2018 - August 2018

*Specializing in hardware inspection of manufactured personal computers*

## TECHNICAL SKILLS

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Deeply Involved: Python, PyTorch, Tensorflow, Git, Windows, Linux/Debian, MLFlow, DVC, Pandas, Sklearn, ExplainableAI, Sphinx Doc

Have Experience With: Docker, DevOps, CI/CD, Slurm, PostgreSQL, FastAPI, Shell, Latex

## SELECTED AWARDS AND CERTIFICATES

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- Accepted in MSc program as a **National Exceptional Talent**, with **Tuition Waiver** at IUST 2019
- **Ranked 3rd** among BSc graduates in Computer Engineering, with **Tuition Waiver** at UoG 2019
- Selected to participate in the Deep Learning Summer School at Gdańsk University of Technology 2020
- PyTorch Conference/Developer/Ecosystem Day registration **scholarship and invitation (3x)** 2019-21
- MOOC including Coursera ML and DL specialization, NYU DLSP, and many more. -

## LANGUAGE SKILLS

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- English: TOEFL 108 (Reading: 30, Listening: 27, Speaking: 23, Writing: 28)
- Persian: Native