Farzad Towhidkhah – Academic Career Summary

Name: Farzad Towhidkhah
Date of birth: 1959
Place of birth: Kermanshah, Iran
Academic rank: professor
Grade: 30
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Education

Degree	Rank	Duration From	Duration To	Country	City	University Name	Field of Study	Degree Title
Bachelor of Electrical Engineering	first rank	1977	1985	Iran	Tehran	Industrial Amir Kabir	Electrical Engineering	Bachelor's Degree
Master of Electrical Engineering		1985	1989	Iran	Tehran	Industrial Amir Kabir	Electrical Engineering	Master's Degree
Doctorate in Medical Engineering		1990	1996	Canada	Saskatoon	Saskatchewan	Medical Engineering	PhD
Doctoral thesis title	Controlling joint movement using predictive control and impedance tuning							

Chronological Progression, Role Transitions, and Notable Achievements

Year(s)	Position	Institution	Department/School	Employment Type	Main Responsibilities
1985-1986	Educational Specialist	Iran University of Science and Technology	Control Laboratory, School of Electrical Engineering	Full-time contractual	Curriculum development, laboratory instruction
1991-1996	Teaching Assistant	University of Saskatchewan	Electrical Engineering	Part-time	Supporting undergraduate courses, managing laboratory sessions, assisting with research projects
1996-2000	Associate Professor	Amirkabir University of Technology (Tehran)	School of Electrical/Biomedical Engineering	Full-time permanent	Research in biomedical signal processing, mentoring graduate students
2000-2004	Associate Professor	Amirkabir University of Technology	Biomedical Engineering faculty	Full-time	Administrative and graduate studies responsibilities, coordinating graduate programs, developing interdisciplinary coursework
2004	Dean	Amirkabir University of Technology	Biomedical Engineering School	Permanently tenured	Establishing research centers, fostering international collaborations

2005-2007	Leader, Bioelectric/Biovalo research group; Director of Graduate Studies	Amirkabir University of Technology	Biomedical Engineering	Full-time academic	Initiating projects in bioelectric signal analysis, national recognition
Since 2008	Dean; Professor	Amirkabir University of Technology	Biomedical Engineering	Leadership positions	Curriculum development, strategic planning, modernizing academic programs, elevating institution's profile

Profile Summary: Interdisciplinary Achievements in Biomedical Engineering

Integration of Control Theory, Computational Modeling, and Neuroscience

Spanning over two decades of academic leadership and research, this profile showcases a dynamic integration of control theory, biomedical engineering, computational modeling, and neuroscience. The work reflects a commitment to advancing education, pioneering research, and driving innovative projects that bridge engineering and medicine, with a particular emphasis on neuro-engineering, intelligent systems, and translational biomedical technologies. These contributions have elevated institutional profiles, modernized curricula, and led to nationally recognized advancements in Iran's biomedical engineering landscape.

With over twenty years of experience in academic leadership and research, I have developed an interdisciplinary expertise that combines control theory, biomedical engineering, computational modeling, and neuroscience. My career has been dedicated to advancing education through curriculum development and strategic planning, while pioneering research initiatives that integrate engineering with medicine. I have focused particularly on neuro-engineering, intelligent systems, and translational biomedical technologies, driving innovative projects that have modernized academic programs and elevated institutional profiles. My contributions have received national

recognition, significantly shaped Iran's biomedical engineering landscape and fostering advancements in both educational and research domains.

COURSES TAUGHT

Postgraduate Courses

- Control of Neuromuscular Systems: Explores advanced control methodologies for biological motor systems, preparing graduates for neuro-prosthetics and rehabilitation engineering.
- Application of Information Technology in Medicine: Introduces IT solutions for medical diagnostics and patient care, fostering digital health innovation.
- Digital Control: Covers digital system control techniques, enabling precise biomedical instrumentation and automation.
- Modeling of Biological Systems: Teaches mathematical and computational approaches to simulate physiological processes, critical for modern medical device design.
- System Identification: Focuses on data-driven modeling of complex biological systems, enhancing predictive capabilities in healthcare.
- Advanced Topics in Modeling of Biological Systems: Presents cutting-edge modeling strategies for complex biomedical phenomena.
- Predictive Control: Equips students with tools for anticipatory regulation of medical systems, relevant to patient monitoring and therapy optimization.

Undergraduate Courses

- Electronic Measurement: Fundamentals of measuring biomedical signals and device calibration.
- Circuit 1 & 2, Electrical Machines: Core concepts in electronics and electromechanical systems for medical applications.
- Linear Control: Introduction to control systems, forming the basis for biomedical automation.
- Computer-Aided Controller Design & Analog Design: Hands-on experience in designing controllers and analog circuits, vital for medical device development.
- Bachelor's Thesis Project Supervision: Guidance on applied research projects, fostering independent inquiry and innovation among undergraduates.

Bachelor's Thesis Projects

- Hospital Monitoring System Development: Design and construction of switching power supplies and ECG receiver boards, enhancing patient monitoring reliability.
- Medical Equipment Review: Analysis and evaluation of hospital unit standards and national medical device infrastructure.
- Education System Review: Comparative study of medical engineering curricula in Iran and internationally, informing program modernization.
- Device Innovation: Projects include phacoemulsification device improvements, stem cell incubator design, and laparoscopic surgical assistant robots, advancing clinical technology.

Master's Thesis Supervision

- Neural and Behavioral Modeling: Implementation of cerebellar models, fuzzy logic in joint control, and reinforcement learning applications in decision-making.
- Medical Imaging and Signal Processing: Development of MRI image transmission interfaces, facial image tracking software, and laser Doppler blood flow measurement systems.
- Control Systems: Design of robust controllers for haptic systems, combustion chambers, and FES controllers for paraplegic rehabilitation.
- Clinical Software Solutions: Creation of intelligent algorithms for anesthesia depth control, neonatal jaundice prediction, and speech therapy platforms.

Doctoral Thesis Supervision

- Dynamic and Computational Modeling: Advanced research on modeling Parkinson's disease, attention control systems, and spatial memory using neural networks and chaos theory.
- Innovative Control Strategies: Self-organizing control for skilled movements, predictive control for hemodialysis systems, and adaptation in speech production.
- Neuroengineering and Cognitive Science: Investigation of brain stimulation effects, modeling of learning and decision-making processes, and quantification of MS lesions.

RESEARCH PROJECTS

- Biomedical Signal Analysis: Initiated groundbreaking studies in bioelectric signal processing, contributing to national recognition and improved diagnostic tools.
- Medical Device Development: Led design and simulation of devices such as blood flow viscometers, tactile sensors, and magnetic field generators, directly impacting clinical diagnostics and therapy.
- Computational Neuroscience: Modeled gait disorders, pain mechanisms, and motor control in neurological conditions like Parkinson's and MS, informing rehabilitation strategies.
- Intelligent Systems and Machine Learning: Developed algorithms for disease prediction (e.g., premature birth, kidney stones), working memory enhancement, and facial image analysis, fostering personalized medicine.
- Healthcare Process Optimization: Modeled emergency medical services and staff scheduling systems, improving patient care delivery and resource allocation.
- Human-Computer Interaction: Designed virtual reality environments and computer-aided therapy systems, enhancing rehabilitation and educational outcomes.
- Neuroimaging and Brain Connectivity: Analyzed functional MRI data to investigate brain structure and function in disorders such as ADHD and amphetamine dependence.

INNOVATIONS AND FIRSTS IN IRAN

- Academic Program Advancement: Launched Iran's first doctoral course in medical engineering and a bachelor's program in biomaterials and biomechanics, setting new standards in biomedical education.
- Device Prototyping and Clinical Testing: Developed and clinically tested laboratory prototypes for transcranial electrical stimulation and multi-channel electrical stimulation devices, propelling neurotherapeutic research.
- Laser Doppler Blood Flow Measurement: Designed and manufactured semi-industrial and laboratory prototypes, pioneering non-invasive vascular diagnostics in Iran.
- Pattern Recognition and Neural Network Innovation: Enhanced neural network efficiency for recognizing sitting and standing patterns, enabling bidirectional functionality and improved rehabilitation technologies.
- Integration of Sensory Information: Presented new models for sensory integration and movement estimation, contributing to understanding and treatment of neurodevelopmental disorders.