*Curriculum Vitae (March 2024)*

# Mahdi Majidi

Assistant Professor in Communications Group
Department of Electrical and Computer Engineering
University of Kashan
Kashan, Iran

## PERSONAL INFORMATION

**First Name:** Mahdi
**Surname:** Majidi
**Born**: 1982-Esfahan
**Email:** m.majidi@kashanu.ac.ir
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**Marital Status:** Married

## EDUCATION AND RESEARCH

- **Senior Communication System Design Engineer (**2023-2024**)**
  - A company for design and production of GNSS and IoT chip named Qualinx B.V., Delft, Netherland
  - **Subject of collaboration**: Design, analysis, and test of digital base-band of Global Navigation Satellite System (GNSS) and Bluetooth Low Energy (BLE)
- **Ph.D. in Electrical Engineering, Communication systems (**2008-2013**)**
  - Amirkabir University of Technology (Tehran Polytechnic), Electrical Engineering Department, Tehran, Iran
  - **GPA**: 19.11/20 (not including thesis number)
  - **Thesis Title**: Analysis of nonlinear effects of power amplifier on the resource allocation in cooperative cognitive radio networks
  - **Supervisors**: Prof. Abbas Mohammadi and Prof. Abdolali Abdipour
  - **Research Lab**: Microwave\Millimeter-wave, and Wireless Communications Research Laboratory
  - **Thesis Grade**: Excellent (19.75/20)
- **Ph.D. Sabbatical Leave** (2012)
  - National University of Singapore (NUS), Electrical and Computer Engineering Department, Singapore
  - **Supervisor**: Dr. Rui Zhang
  - **Research Lab**: Communications and Networks Laboratory

- **M.Sc. in Electrical Engineering, Communication systems** (2004-2006)
    - Amirkabir University of Technology (Tehran Polytechnic), Electrical Engineering Department, Tehran, Iran
    - **GPA**: 17.65/20
    - **Thesis Title**: Interference reduction for space-time coded multicarrier CDMA systems
    - **Supervisor**: Dr. Aghaeinia
    - **Advisor**: Dr. Sayed Mohammad Razavizadeh
    - **Research Lab**: Spread Spectrum Wireless Communications Research Laboratory
    - **Thesis Grade**: Excellent (19.75/20)
- **B.Sc. in Electrical Engineering** (2000-2004)
    - Isfahan University of Technology, Electrical and Computer Engineering Department, Isfahan, Iran
    - **GPA**: 17.9/20
    - **Thesis Title**: Design and implementation of a very narrowband filter in 27 MHz with an adjustable center frequency in a 100 kHz band for RADAR applications
    - **Supervisor**: Dr. Mohsen Mivechi
- **National Diploma in Mathematics and Physics** (1996-2000)
    - National Organization of Exceptional Talents (NODET), Shahid Ejei School, Isfahan, Iran
    - **GPA**: 18.3/20

## AWARDS AND ACHIEVEMENTS

- Admission to the National Organization for Development of Exceptional Talents in high school and also guidance school.
- **Ranked 900$^{th}$** among more than 410,000 participants in the 2000 nationwide university entrance exam for undergraduate studies, 2000.
- **Ranked 1$^{st}$** in the 1$^{st}$ Robotics Competition at Pathfinder in the Electrical Eng. Dep. of Isfahan University of Technology, 2002.
- **Ranked 10$^{th}$** among 170 Electrical Engineering students in the Isfahan University of Technology and ranked 4$^{th}$ among Electronic Engineering students.
- **Ranked 85$^{th}$** in Iranian National Entrance Exam for graduate study in Electrical Engineering among 50,000 participants, 2004.
- **Ranked 1$^{st}$** among all Ph.D. students in Communications (field and system) who were admitted in 2008, Electrical Engineering Department, Amirkabir University of Technology.
- The **best assistant professor** in the field of education in the communication group of Electrical and Computer engineering department of the University of Kashan in 2017.
- The **best assistant professor** in the field of education in Electrical and Computer engineering department of the University of Kashan in 2020.
- The **outstanding researcher** of Electrical and Computer engineering department, University of Kashan, 2022.

## RESEARCH INTERESTS

- Analytical and numerical methods of optimizations
- Machine learning
- Direction Finding and Position estimation
- Internet of Things (IoT) communication networks and their energy management
- Design of Software Defined Radio (SDR) communication systems with considering the constraints of digital and RF sections
- Statistical signal processing, detection of signals, and estimation of their parameters
- Wireless communications and MIMO systems

## TEACHING EXPERIENCES

- **Graduate Courses:**
  - Convex Optimization
  - Advanced Communication Theory
  - Spread Spectrum Communications
  - Stochastic Processes
  - Communication Networks
- **Undergraduate Courses:**
  - Digital Communications
  - Principles of Electrical Engineering
  - Communication Networks
  - Signals and Systems
  - Digital Communications Laboratory

## LECTURES

- "Optimization methods in communications", *A presentation at Faculty of Engineering of Isfahan University (IU),* First two-hour session on October 2018, Second two-hour session on February 2019.
- "Combinatorial optimization and its applications to next generation communication networks", *A two-hour presentation at Iran Telecommunication Research Center (ITRC), Tehran, Iran,* September 2017.
- "Direct sequence spread spectrum signals: several structures, detection and estimation methods, and the challenges", *A four-hour presentation at Imam Hussein University*, 2013.
- "A survey on: Energy efficient (green) communications in cognitive radio networks", *A two-hour presentation at Communications and Networks Laboratory, National University of Singapore (NUS),* 2013.

## PAPERS

➢ **English papers:**

- T. Analooei, S. M. Saberali, and M. Majidi, "Maximum likelihood based detector for PD-NOMA with statistical CSI: more efficient and lower complexity compared to SIC" *Wireless Networks*, Jan. 2024. (ISI Journal)
- E. Nazemorroaya, M. Shafieirad, and M. Majidi, "Consensus-based algorithm for distributed convex optimization", *4'th International Conference on Computational Algebra, Computational Number Theory and Applications (CACNA)*, June 2023.
- P. Shiri and M. Majidi, "Real-Time implementation of software defined radio FMCW radar using BladeRF", *3'rd Conference on Applied Research in Electrical Engineering*, Feb. 2023.
- F. Ghalgarzadeh, M. Majidi, R. Mirzavand Boroujeni, "Phase Shift Design for Intelligent Reflecting Surfaces under Practical Reflection Models in NOMA Network", *8'th Iranian Conference on Signal Processing and Intelligent Systems (ICSPIS)*, Dec. 2022.
- Z. Memarian and M. Majidi, "Multiple Signals Direction Finding of IoT Devices Through Improved Correlative Interferometer Using Directional Elements," *6'th International Conference on Smart Cities, Internet of Things and Applications (SCIoT)*, Sep. 2022.
- N. Khatami and M. Majidi, "Resource allocation for full-duplex wireless information and power transfer in wireless body area network," *Journal of Electrical and Computer Engineering Innovations (JECEI)*, Nov. 2021.
- T. Analooei, S. M. Saberali, and Mahdi Majidi, "Multi-threshold detector with fair power allocation coefficients for NOMA signals with statistical CSI," *IEEE Communications Letters*, vol. 25, no. 12, pp. 3970-3974, Dec. 2021. (ISI Journal)
- B. Alinezahd Seyyedmahalleh, S. M. Saberali, F. Parvaresh, and M. Majidi, "ECF-based estimator for the LOS power in uplink NOMA system with unknown impulsive noise," *IEEE Signal Processing Letters*, vol. 28, Aug. 2021. (ISI Journal)
- B. Alinezhad Seyyedmahalleh, S. M. Saberali, F. Parvaresh, and M. Majidi, "On the performance of ECF-based multi-threshold receiver in NOMA systems for vehicular communications with unknown impulsive noise," *Vehicular Communications*, vol. 29, June 2021. (ISI Journal)
- E. Mansoori, A. Siavashi, and M. Majidi, "Sensing, Wireless Transmission, and Smart Processing of Heart Signals", *5'th International Conference on Internet of Things and Applications (IoT 2021)*, Isfahan University, May 2021.
- H. Moazzen, A. Mohammadi, and M. Majidi, "Accurate modelling of power amplifier energy consumption for resource allocation in wireless networks," *Electronic Letters*, vol. 56, no. 3, Feb. 2020. (ISI Journal)
- M. Majidi, A. Mohammadi, A. Abdipour, and M. Valkama, "Characterization and performance improvement of cooperative wireless networks with nonlinear power amplifier at relay," *IEEE Transactions on Vehicular Technology*, vol. 69, no. 3, pp. 3244-3255, Jan. 2020. (ISI Journal)
- H. Moazzen, M. Majidi, and A. Mohammadi, "Linearization of M-LINC systems using GMP and particle swarm optimization for wireless communications," *AUT Journal of Modeling and Simulation*, DOI: 10.22060/miscj.2019.16585.5162, September 2019.
- S. M. Saberali, M. Majidi, and S. Bakhshandeh, "Analytic performance investigation of signal level estimator based on empirical characteristic function in impulsive noise," *Digital Signal Processing*, vol. 92, pp. 20-25, September 2019. (ISI Journal)
- H. Moazzen, A. Mohammadi, and M. Majidi, "Performance analysis of linear precoded MU-MIMO-OFDM systems with nonlinear power amplifiers and correlated channel," *IEEE Transactions on Communications*, vol. 67, no. 10, pp. 6753 - 6765, Oct. 2019. (ISI Journal)

- M. Baghani, A. Mohammadi, and M. Majidi, "Optimum power allocation in OFDM systems under power amplifier nonlinearity," *Analog Integrated Circuits and Signal Processing*, vol.99, no. 1, pp 33-38, April 2019. (ISI Journal)
- M. Baghani, A. Mohammadi, M. Majidi, Mikko Valkama, "Downlink resource allocation in OFDMA wireless networks under power amplifier nonlinearity," *IET Communications*, vol. 11, no. 18, pp. 2751-2757, 2017. (ISI Journal)
- M. Baghani, A. Mohammadi, and M. Majidi, "An Accurate Analysis of the Power Amplifier Nonlinearity on Power Allocated SC-FDMA Signals," *Wireless Networks*, DOI: 10.1007/s11276-017-1573-3, August 2017. (ISI Journal)
- M. Baghani, A. Mohammadi, and M. Majidi, "Uplink Resource Allocation in Multiuser Multicarrier Cognitive Radio Networks under Power Amplifier Nonlinearity," *Transactions on Emerging Telecommunications Technologies*, vol. 28, no. 10, March 2017. (ISI Journal)
- M. Baghani, A. Mohammadi, M. Majidi, and M. Valkama, "Analysis and rate optimization of OFDM-based cognitive radio networks under power amplifier nonlinearity," *IEEE Transactions on Communications*, vol. 62, no. 10, pp. 3410-3419, Oct. 2014. (ISI Journal)
- M. Majidi, M. Mohammadi, and A. Abdipour, "Analysis of the power amplifier nonlinearity on the power allocation in cognitive radio networks," *IEEE Transactions on Communication*s, vol. 62, no. 2, pp. 467-477, Feb. 2014. (ISI Journal)
- M. Majidi, M. Mohammadi, and A. Abdipour, "Accurate analysis of spectral regrowth of nonlinear power amplifier driven by cyclostationary modulated signals," *Springer Journal on Analog Integrated Circuits & Signal Processing*, vol. 74, no. 2, pp. 425-437, Feb. 2013. (ISI Journal)
- P. Rastegari, Mahdi Majidi, and M. Khalilian, "Analysis of WiMAX performance improvement using serial and parallel concatenated convolutional codes," *International Journal of Computer Theory and Engineering (IJCTE),* vol. 5, no. 2, April 2013, pp. 326-330.
- M. Majidi, H. Aghaeinia, and S. M. Razavizadeh, "Tomlinson-Harashima precoding for the Downlink of Multiple Antenna Multi-code MC-CDMA Systems," *Accepted in Intern. Conf. Advanced Commun. Technol. (ICACT'07).*
- M. Majidi, H. Aghaeinia, and S. M. Razavizadeh, "On the receiver design for downlink of MIMO MC-CDMA systems over frequency selective Rayleigh fading channels," in *Proc. the 13th IEEE Symp. Commun. Vehicular Technol. (SCVT 2006),* Belgium, Nov. 2006.

### ➢ Papers in Farsi:

- Fatemeh Saeidnejad and Mahdi Majidi, "A survey on security of communication networks used in power distribution networks," *Soft Computing Journal*, April 2022, doi: 10.22052/scj.2022.242847.0.
- S. Dehghanpour and M. Majidi, "Simultaneous wireless information and power transfer in a network of on-body and implantable sensors with temperature constraint and intelligent channel prediction" *Scientific Journal of Computational Intelligence in Electrical Engineering*, Oct. 2021.
- A. Torabzadeh, M. Majidi, and M. Baghani, "Energy efficiency improvement in dynamic orthogonal and non-orthogonal multiple access uplink networks," *Journal of Advanced Signal Processing*, vol. 4, no. 1, 2020.
- K. Ansari and M. Majidi, "3D beamforming and secrecy rate improvement in wireless powered communication networks based on intelligent reflecting surfaces", *11'th Conference on Information and Knowledge Technology (IKT2020),* Tehran, December 2020.

- Z. Salman-Taheri and M. Majidi, "Analytical solution of 3D beamforming problem in wireless communication networks using intelligent reflecting surfaces" *5'th Conference on Electrical and Computer Engineering Technology (ETECH 2020)*, Tehran, October 2020.
- A. Mohammadalipoor, M. R. Zoghi, and M. Majidi, "Hybrid precoding in mm-wave massive multi-antenna multi-carrier systems using alternating minimization algorithm", *4'th National Conference on Applied Research in Electrical, Mechanical, Computer, and IT Engineering*, Shiraz, September 2018.
- M. Majidi, A. M. Ravandi, N. Ghalamzan, H. Khosravi Boroujeni, "Design and implementation of intelligent controller of evaporative cooler using WiFi network for internet of things applications," *Third National Conference on Cyber City*, Tehran University, Iran, December 2017.
- M. Aghazahiri Kashani, M. Majidi, "Design and implementation of digital communication transmitter-receiver by the use of software-defined-radio structures," *4'th International Conference on Knowledge-Based Engineering and Innovation*, Iran University of Science and Technology, December 2017.
- Mohammad Majidi, Alireza Erfanian, P. Heidari, Mahdi Majidi, and M. Rashidi, "Optimization with particle swarm method for the structure of variable capacitors with electrostatic actuators," *Electronic Industries Periodical*, 2012. (Scientific-Research Journal)
- M. T. Naghavi and M. Majidi, "Blind detection and symbol rate estimation of DS-CDMA signals using 2D-slices of 4th-order cumulant and array antennas in multipath fading channel," in *Proc. 19th Iranian Conf. Elect. Eng. (ICEE'11)*, Tehran, Iran, May 2011, (in Persian).
- M. T. Naghavi and M. Majidi, "Detection of direct-sequence spread spectrum signals by a combination of 2D-slices 4th order cumulant and second order moment, and adaptively adjusting the threshold," in *Proc. 16th Iranian Conf. Elect. Eng. (ICEE'08)*, Tehran, Iran, May 2008, (in Persian).
- M. Majidi, H. Aghaeinia, and S. M. Razavizadeh, "Improvement of multi-user detection at a downlink MIMO MC-CDMA system by arrangement of data symbols at transmitter," in *Proc. 15th Iranian Conf. Elect. Eng. (ICEE'07)*, Tehran, Iran, May 2007, (in Persian).

## PROJECTS WITH UNIVERSITY OR BETWEEN UNIVERSITY AND INDUSTRY (FUNDED)

- 'Direction Finding of Coherent Signals with Smart Antenna Arrays and Practical Considerations', 2022.
- 'Comprehensive investigation of communications technologies in wireless radios', As the research opportunity project between university and industry for assistant professors, 2021.
- 'Deep learning approaches and their applications in modern communication systems', 2020.
- 'Study and design of hybrid direction and position finding of satellite communication terminals', 2018.
- 'Comprehensive investigation of modern satellite communications technologies', 2018.
- 'Design and implementation of digital receiver processing algorithm with SDR technique for detection of FSK signals', 2017.

## OPERATIONAL PROJECTS (AS A COWORKER OR PROJECT MANAGER)

- Applied and implementation project with title: "Design and Implementation of Digital Communications Laboratory", University of Kashan, 2019.

- Design and implementation of an FMCW radar by using bladeRF and GNU Radio based on deep learning.
- Design and implementation of a digital communication transceiver by the use of HackRF One and RTL-SDR as SDR platforms and the software GNU-Radio.
- Design, writing software, and implementation of an intelligent temperature control system of the house under WiFi network (an application of IoT).
- Design and implementation of a little intelligent Parking prototype using Arduino and LoRa modules.
- Design and implementation of an SDR transmitter-receiver using FL2K and RTL-SDR modules.
- Design, programming, and Implementation of a Road Tracker Robot.
- Design, programming, and Implementation of an SDR system for intelligent monitoring and parameter estimation of spread spectrum signals at VHF-UHF bands.
- Design, programming, and implementation of Direction of Arrival (DOA) system at UHF band.
- Design, programming, and Implementation of a spread-spectrum transmitter-receiver with maximum distance of 20 km.
- Design and implementation of a monitoring and parameter estimation system for the different bands in frequency spectrum.
- Scheduling of an operational plan for implementation of a wideband communication network similar to LTE for the ICT research institute.
- Design and implementation of simulator of the multi-user DS wideband signal with possibility for each user to select the pseudo noise (PN) code, digital modulation, SNR, bit rate and chip rate.
- Design and implementation of an analog narrowband filter in 27 MHz with 2 kHz Bandwidth and ability to change the central frequency in a 100 kHz range (for RADAR applications).
- Design and implementation of a system for measurement of the electromagnetic radiations in the environment and sending report by the cellular network to the control center (for the Communications Regulatory Authority of Iran)
- Design and implementation of a digital communication transceiver using the ISM band modules (with carrier frequency 315 MHz) type ASK DX-RF 315.

## RESEARCH AND SIMULATION PROJECTS, AND SOME WORK SKILLS

- Collaboration with C++, VHDL, and Verilog experts for converting MATLAB codes to those programming languages (such as fix-point conversion and considering the computation delays in feedback loops), and validation of the results.
- Data estimation for OFDM signal in a multipath channel using deep learning.

- Initial synchronization and tracking of the PN sequence of DS-SS signals using matched filter implemented by overlap-save method and FFT.
- Different acquisition and tracking methods like matched filter, DLL, partial correlation, etc.
- Position finding methods of users at cellular networks at multipath channels.
- Position finding in cellular network by using the second order cone programming (SOCP).
- Satellite communication systems of DVB-S and DVB-S2.
- Green (energy-efficient) communications in cognitive radio networks.
- Hybrid Direct Sequence/Frequency Hopping (DS/FH) systems.
- Spectrum sensing at cognitive radio systems.
- Chip rate estimation of the direct-sequence spread spectrum (DS-SS) signals by using the spectral correlation of the cyclostationary signals.
- Blind carrier frequency estimation of spread spectrum signals.
- Carrier frequency and phase recovery by the combination of two techniques, Costas loop and automatic frequency control (AFC) loop.
- Blind carrier frequency and phase recovery of the DS-SS signals by the use of a technique based on Tanlock loop.
- Direction of arrival (DOA) estimation using switched-antenna-array by a few techniques like ESPRIT, MUSIC and Interferometry.
- Automatic modulation recognition of analog and digital communication signals.
- An OFDM Transceiver with channel estimation and equalization using LS and NLMS algorithms.
- Symbol timing recovery in digital receivers by the use of filter bank.
- Using the particle filters for the joint blind equalization and decoding in frequency selective fading channels.
- Ergodic and outage capacity of MIMO communication systems in different situations.
- Turbo-BLAST transceivers for multi-antenna systems with iterative decoding (using BCJR algorithm) and iterative channel estimation.
- Spatial multiplexing systems including VBLAST, DFE, and Tomlinson Harashima precoding (for the precoding at the transmitter side using the CSI).
- Multi-user detection in uplink CDMA systems including ZF, MMSE, PIC, SIC, and decorrelator algorithms.
- MIMO multi-carrier (MC) CDMA and MIMO DS-MC CDMA systems to benefit from the advantages of MIMO, OFDM and CDMA techniques.
- A simulator for generating multiuser spread spectrum signals with selectable PN code, digital modulation, SNR, data rate, and chip rate for each user.
- Spectral analysis of filtered digitally modulated signals after passing through the nonlinear power amplifier.

- Physical layer of WiMAX standard.
- Amplify and forward in cooperative networks.
- Link budget computations.
- Physical layer of IFF receivers for commercial airplanes.
- Direction of Arrival (DoA) finding of FH signals by Cyclic MUSIC method.

## REVIEWER

- Amirkabir International Journal of Electrical Engineering (AJEE) from the Amirkabir University of Technology (AUT).
- IEEE Transactions on Communications.
- Iranian Conference on Electrical Engineering (ICEE).
- Iranian Journal of Electrical and Computer Engineering (IJECE).
- International Journal of Information and Communication Technology Research (IJICTR).

## CERTIFICATES

- Introduction to GSM, *Mobile Company of Iran (MCI),* 30 hours.
- A Physical Layer Perspective on Wireless Networks, *A Workshop Presented by Prof. Aazhang from Rice University*, IST 2012.
- Considerations of Joint Design of RF and Digital Signal Processing Units at satellite Receivers, *A Workshop at the Conference of Satellite for Sustainable Development*, *Amirkabir University (Tehran Polytechnic)*, 2011.

## COMPUTER AND PROGRAMMING SKILLS

- MATLAB, Simulink, Python, OrCAD
- Maple, Mathematica
- VHDL, Assembly
- Microsoft Office, Microsoft Visio, Latex, WinEdt, TeXstudio

## LANGUAGES

- English (Reading, Writing, Speaking, Listening)
- Persian (Mother tongue)
- Dutch (A1)

## PROFESSIONAL MEMBERSHIPS

- International Institute of Electrical and Electronic Engineers (IEEE), January 2008 - Now.