

# Mohammad Kakooei, PhD

Senior Remote Sensing Specialist  
Machine Learning Developer – Parallel Processing Expert  
Research Scientist at Chalmers University of Technology, Gothenburg, Sweden

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## Researcher:

- **2021-Present - Research Scientist**

*Chalmers University of Technology, Data science and Artificial Intelligence Division, Gothenburg, Sweden.*

**Research Topic:** *Deep Learning for Predicting Poverty from Satellite Images*

## Postdoc Researcher:

- **2020-2021 - Postdoc Researcher**

*Babol Noshirvani University of Technology, Babol, Iran.*

**Research Topic:** *Mapping building height using satellite imagery and investigate its environmental effects*

## Education:

- **2014-2020 - Doctor of Philosophy in Digital Electronics**

*Babol Noshirvani University of Technology, Babol, Iran*

**Thesis Title:** *Parallel Strategy for Building Damage Assessment after Natural Disasters by Fusion of Satellite, Aerial and UAV images*

- **2011-2014 - Master of Engineering in Electronics**

*Iran University of Science and Technology, Tehran, Iran*

**Thesis Title:** *Proposing Parallel Data Stream Clustering Algorithm Based on GPU*

- **2006-2011 - Bachelor of Engineering in Electronics**

*Shahid Beheshti University, Tehran, Iran*

## Visiting PHD Student:

- **2017/09- 2018/02 - Visiting PHD Student**

*KTH (Royal Institute of Technology), Geoinformatics Division, Stockholm, Sweden.*

**Research Topic:** *Urban area extraction by fusion of Sentinel-1 and Sentinel-2 data within GEE*

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### Research Topics & Interests:

- Earth Observation and Remote Sensing
  - Optical and radar image processing
  - Vertical and Oblique image processing
  - Pixel-based and object-based image analysis
- Data mining
  - Big data cubes exploitation
  - Parallel processing (i.e. GPU CUDA kernels)
  - Real-time image processing
  - Cloud-based technology (i.e. Google Earth Engine)
- Machine learning
  - Pattern Recognition
  - Image fusion
  - Supervised and Unsupervised methods
- Computer Vision
  - Feature Extraction
  - Statistical models
  - Time series analysis

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### Research expeditions:

- **2020** – Responsible for designing and developing a smartphone accessory, Thermometer-Oximeter-Heartbeat rate. [Link](#)  
*Programmed in Java, Android, and C++*
- **2018-2019** – Responsible for modeling and implementation of an Infrared vein finder  
*Programmed in Python. [Link](#)*
- **2015-2017** – Responsible for designing and implementing an automatic real-time smartphone-based robot development kit  
*Programmed in Java, Android, and C++. [Link](#)*
- **2013-2014** – Responsible for developing a fast, parallel GPS acquisition algorithm based on hybrid GPU and multi-core CPU  
*Programmed in CUDA and MATLAB.*

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### Teaching experience:

- **2019-present:** Instructor in remote sensing applications  
*Iranian academia of Remote Sensing, Tehran, Iran [Original Link](#). [Link in English](#)*
  - *Wildfire analysis using Modis, Landsat and Sentinel-2 data within GEE*
  - *Shadow detection in Sentinel-2 data within GEE*
  - *Urban area analysis using Sentinel-1, -2 and DEM within GEE*
  - *Change detection in aerial NAIP images within MATLAB*
  - *Soil moisture analysis by optical/radar data within GEE*
  - *Cropland extraction using Sentinel-1, -2 and Landsat within GEE*
  - *Cropland extraction using Sentinel-1, -2 and Landsat within MATLAB*
  - *Soil salinity determination using Landsat and Sentinel-2 within GEE*
  - *Soil texture sand/clay/silt using Sentinel-1, -2 data within GEE*
  - *Phenology-based rice area mapping using Landsat within GEE*
  - *Application UI design within GEE*
  - *Water body extraction using Landsat within GEE*
  - *Flood detection using Landsat and Sentinel-1 within GEE*

- *Neural networks for processing remote sensing data in MATLAB*
- *Remote Sensing Image Processing using MATLAB (Basics, Principles and Machine Learning methods) (3 DVDs)*
- **2015-2021:** Course instructor  
*Electronics and Computer engineering department, Babol Noshirvani University of Technology, Babol, Iran*
  - *Digital Design*
  - *Microprocessor and Assembly*
  - *Computer Architecture*
- **2015-2019:** Teaching assistant  
*Electronics and Computer engineering department, Babol Noshirvani University of Technology, Babol, Iran*
  - *Image Processing*
  - *Pattern Recognition*
  - *Computer Vision*
- **2015-2019:** laboratory supervisor  
*Electronics and Computer engineering department, Babol Noshirvani University of Technology, Babol, Iran*
  - *ASIC and FPGA*
  - *Digital design and computer architecture*
- **2014-2018:** Course instructor  
*Electronics and Computer engineering department, Rouzbahan University, Sari, Iran*
  - *Microprocessor and Assembly*
  - *Digital Design*
  - *Microelectronic Circuits*
- **2013-2014:** Laboratory supervisor  
*Electronics and Computer engineering department, Shahid Rajae Teacher Training University, Tehran, Iran*
  - *Digital design and computer architecture*
- **2012-2013:** Teaching assistant  
*Electronics engineering department, Iran University of Science and Technology, Tehran, Iran, including*
  - *Microelectronic Circuits*
  - *Linear Control Systems*

#### **Supervising/ Mentoring experience:**

- **2021-present:** Graduate Thesis Co-Supervisor at Department of Soil Sciences, Agricultural College, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran
  - *Co-supervising a PHD student*
  - Thesis Title: Remote sensing soil characteristics under various land use and pipe drainage performance assessment*
- **2017-2020:** Graduate Thesis Co-Supervisor at Electronics and Computer engineering department, Babol Noshirvani University of Technology, Babol, Iran

➤ *Co-supervised a master student*

**Thesis Title:** *Building Detection in Time-Series Multispectral images using Endmember Extraction Algorithms*

➤ *Co-supervising a PHD student*

**Thesis Title:** *Wildfire analysis using Remote Sensing technology*

- **2015-2020:** Supervising and Mentoring many Graduate and Undergraduate Students at ASIC and FPGA lab, Babol Noshirvani University of Technology, Babol, Iran

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### Peer-reviewed journal articles: Published

1. **Kakooei, Mohammad**, Yasser Baleghi, and Meisam Amani. "Adaptive thresholding for detecting building facades with or without openings in single-view oblique remote sensing images." *Journal of Applied Remote Sensing* 15, no. 3 (2021): 036511. [Abstract](#)
2. **Kakooei, Mohammad**, and Yasser Baleghi. "A Two-level Fusion for Building Irregularity Detection in Post-Disaster VHR Oblique Images." *Earth Science Informatics*, (2020). [Abstract](#)
3. **Kakooei, Mohammad**, and Yasser Baleghi. "Shadow detection in very high resolution RGB images using a special thresholding on a new spectral–spatial index." *Journal of Applied Remote Sensing* 14, no. 1 (2020): 016503. [Abstract](#)
4. **Kakooei, Mohammad**, and Yasser Baleghi. "VHR Semantic Labelling by Random Forest Classification and Fusion of Spectral and Spatial Features on Google Earth Engine." *Journal of AI and Data Mining*, (2020). [Abstract](#)
5. **Kakooei, Mohammad**, and Amir Tabatabaei. "A Fast Parallel GPS Acquisition Algorithm Based on Hybrid GPU and Multi-core CPU." *Wireless Personal Communications* 104, no. 4 (2019): 1355-1366. [Abstract](#)
6. **Kakooei, Mohammad**, and Yasser Baleghi. " Building detection by defining a common color space between pre- and post-disaster images." *Journal of Electronic Industries SaIran*, pp. 35-46, 2018. [Abstract](#)
7. **Kakooei, Mohammad**, and Yasser Baleghi. "Fusion of satellite, aircraft, and UAV data for automatic disaster damage assessment." *International journal of remote sensing* 38, no. 8-10 (2017): 2511-2534. [Abstract](#)
8. Amani, Meisam, Sahel Mahdavi, **Mohammad Kakooei**, Arsalan Ghorbanian, Brian Brisco, Evan Delancey, Souleymane Toure, and Eugenio Landeiro Reyes. "Wetland Change Analysis in Alberta, Canada using Four Decades of Landsat Imagery." *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing* (2021). [Abstract](#)
9. Amani, Meisam, **Mohammad Kakooei**, Armin Moghimi, Arsalan Ghorbanian, Babak Ranjgar, Sahel Mahdavi, Andrew Davidson, Thierry Fiset, Patrick Rollin, Brian Brisco, "Application of Google Earth Engine Cloud Computing Platform, Sentinel Imagery, and Neural Networks for Crop Mapping in Canada." *Remote Sensing*, (2020). [Abstract](#)
10. Amani, Meisam, Brian Brisco, Sahel Mahdavi, Arsalan Ghorbanian, Armin Moghimi, Evan DeLancey, Michael Merchant, Raymond Jahncke, Lee Fedorchuk, Amy Mui, Marcelle Grenier,

Thierry Fiset, **Mohammad Kakooei**, Seyed Ali Ahmadi, Brigitte Leblon, Amir Behnamian, "Evaluation of the First Canadian Wetland Inventory Map using Multiple Sources: Challenges of Wetland Classification using Remote Sensing." *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, (2020). [Abstract](#)

11. Amani, Meisam, Arsalan Ghorbanian, Ali Ahmadi, **Mohammad Kakooei**, Armin Moghimi, S. Mohammad Mirmazloumi, Sayyed Hamed Alizadeh Moghaddam, Sahel Mahdavi, Masoud Ghahramanloo, Saeid Parsian, Qiusheng Wu, Brian Brisco, "Google Earth Engine Cloud Computing Platform for Remote Sensing Big Data Applications: A Literature Review" *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, (2020). [Abstract](#)
12. Ghorbanian, Arsalan, **Mohammad kakooei**, Meisam Amani, Sahel Mahdavi, Ali Mohammadzadeh, Mahdi Hasanlou. "Improved land cover map of Iran using Sentinel imagery within Google Earth Engine and a novel automatic workflow for land cover classification using migrated training samples." *ISPRS Journal of Photogrammetry and Remote Sensing*, (2020). [Abstract](#)

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### Book chapter

1. **Kakooei, Mohammad**, Arsalan Ghorbanian, Yasser Baleghi, Meisam Amani, and Andrea Nascetti. "Remote Sensing Technology for Post-Disaster Building Damage Assessment." In *Computers in Earth and Environmental Sciences*, Elsevier, 2021.

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### Conference articles/presentations

1. **Kakooei, Mohammad**, and Yasser Baleghi. "Spectral Unmixing of Time Series Data to Provide Initial Object Seeds for Change Detection on Google Earth Engine." In *2019 27th Iranian Conference on Electrical Engineering (ICEE)*, pp. 1402-1407. IEEE, 2019. [Abstract](#)
2. **Kakooei, Mohammad**, and Yasser Baleghi. "Leaf-Less-Tree feature for semantic labeling applications on Google Earth Engine." In *2018 9th International Symposium on Telecommunications (IST)*, pp. 609-613. IEEE, 2018. [Abstract](#)
3. **Kakooei, Mohammad**, Andrea Nascetti, and Yifang Ban. "Sentinel-1 Global Coverage Foreshortening Mask Extraction: An Open Source Implementation Based on Google Earth Engine." In *IGARSS 2018-2018 IEEE International Geoscience and Remote Sensing Symposium*, pp. 6836-6839. IEEE, 2018. [Abstract](#)
4. Ban, Yifang, Andrea Nascetti, and **Mohammad Kakooei**. *Sentinel-1 SAR and Sentinel-2 MSI Dense Time Series for Urban Extraction in Support of Urban Sustainable Development Goal*, Dragon 4 Symposium, 2019. [Abstract](#)
5. Nascetti, Andrea, **Mohammad Kakooei**, and Yifang Ban. "Urban Extraction Using Sentinel-1 and Sentinel-2 Dense Time Series with Google Earth Engine." In *2nd mapping urban areas from space*, ESA, 2018. [Abstract](#)
6. **Kakooei, Mohammad**, and Hadi Shahriar Shahhoseini. "A parallel k-means clustering initial center selection and dynamic center correction on GPU." In *2014 22nd Iranian Conference on Electrical Engineering (ICEE)*, pp. 20-25. IEEE, 2014. [Abstract](#)

7. Zeinali, Behnam, Ahmad Ayatollahi, and **Mohammad Kakooei**. "A novel method of applying directional filter bank (DFB) for finger-knuckle-print (FKP) recognition." In *2014 22nd Iranian Conference on Electrical Engineering (ICEE)*, pp. 500-504. IEEE, 2014. [Abstract](#)
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## Patents

1. **Kakooei, Mohammad**, Ehsan Hasanzadeh, Mohammad Ali Heidari Gorji. Patent for Infrared Vein Finder using a Road Network Detection Method in Satellite images. patent classification A61B 6/06; A61B 5/00
  2. **Kakooei, Mohammad**, Ehsan Hasanzadeh, Mohammad Ali Heidari Gorji. Patent for Wireless smartphone-based device to monitor body temperature, blood oxygen, and heart beat rate. patent classification A61B 5/01, A61B 5/02, A61B 5/20, A61B 5/00.
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## Reviewer for international journals

1. GIScience & Remote Sensing
  2. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing
  3. ISPRS Journal of Photogrammetry and Remote Sensing
  4. IEEE Transactions on Geoscience and Remote Sensing
  5. Remote Sensing MDPI
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## Programming experiences

- Python
  - *API of the Google Earth Engine platform that I used in my several publications*
  - *Satellite image/data processing via Jupyter Notebook and Google Colab*
  - *Image processing by OpenCV and similar libraries*
  - *Raspberry Pi programming in the "Vein Detector" project*
- JavaScript
  - *Main API of the Google Earth Engine platform that I used in my several publications*
- MATLAB
  - *Image processing projects*
  - *Data mining projects*
- C/C++
  - *Programming CPU host code in GPGPU applications*
  - *Microcontroller programming in different projects such as "smartphone-based robot development kit" and "smartphone-based accessory for Thermoxy"*
- CUDA
  - *Programming Nvidia GPU devices in GPGPU applications*
- JAVA
  - *Smartphone programming, USB connection, Image processing, and database management in smartphone-based projects*
  - *Smartphone User Interface in smartphone-based projects*

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## Hardware Design Capabilities

- GPGPU (General Purpose GPU)
- Microcontroller (AVR, Arduino, Raspberry Pi)
- FPGA
- Embedded Processor
- Digital Circuits
- Sensor utilization and calibration

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## Awards, and Honors

- **2020-2021- Fellowship for Postdoc researching (Competitive) (\$17K)**  
*Iran National Science Foundation (INSF), Tehran, Iran*
- **2017-2018- Fellowship for Visiting Ph.D. Students (Competitive) (\$10K)**  
*Ministry of Science Research and Technology, Tehran, Iran*
- **2014-2020- Scholarship for Ph.D. Thesis (\$40K)**  
*The Iranian Red Crescent Society (IRCS), Tehran, Iran*
- **2014-2020- Scholarship for Ph.D. (Competitive) (\$20K)**  
*Ministry of Science Research and Technology, Tehran, Iran*
- **2011-2014- Fellowship for M. Eng. Students (Competitive) (\$20K)**  
*Ministry of Science Research and Technology, Tehran, Iran*
- **2006-2011- Fellowship for B. Eng. Students (Competitive) (\$20K)**  
*Ministry of Science Research and Technology, Tehran, Iran*

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## Languages

- Persian (Mother tongue)
- English (Advanced writing, reading, and speaking)
- Arabic (Intermediate writing and reading)