

# Dr.-Ing. Bashir Kazimi

☎ (+49) 162-593-0923 | ✉ [kazimibashir907@gmail.com](mailto:kazimibashir907@gmail.com) | 🌐 [bashirkazimi.github.io](https://bashirkazimi.github.io) | **in** [bashirkazimi](#) | 📱 [bashirkazimi](#) | 🏠 [bashir-kazimi](#) | 🐦 [bashir\\_kazimi](#) | 🎓 [Bashir Kazimi](#)

## SUMMARY

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Postdoctoral researcher at Forschungszentrum Jülich (FZJ) with a background in Computer Science and Artificial Intelligence and 7+ years of experience in deep learning and computer vision.

## EDUCATION

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### Leibniz University Hannover

Hannover, Germany

*Ph.D. in Geodesy and Geoinformatics with a focus on Deep Learning*

*Apr. 2017 – Jul. 2021*

- Worked on applications of deep learning in airborne laser scanning data
- Multiple publications and projects on detection of archaeological objects
- Dissertation on Self Supervised Learning for Detection of Archaeological Monuments in LiDAR Data supervised by Prof. Dr.-Ing. habil. Monika Sester

### Polytechnic University of Catalonia

Barcelona, Spain

*M.Sc. in Artificial Intelligence*

*Sep. 2015 – Apr. 2017*

- Fundamental courses and projects in Machine Learning, Computer Vision, and Natural Language Processing
- Master Thesis in Neural Machine Translation supervised by Marta Ruiz Costa-jussà
- Publication at International Journal of the Spanish Society for Natural Language Processing

### Middle East Technical University (METU)

Ankara, Turkey

*B.Sc. in Computer Engineering*

*Sep. 2010 – Jun. 2015*

- Got a Turkish Government Scholarship for undergraduate studies
- Was part of a 4-people team that built a social network as a graduation project

## EXPERIENCE

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### Research Group Leader

Sep. 2023 – Present

*Forschungszentrum Jülich, Institute for Materials Data Science and Informatics (IAS-9)*

*Aachen, Germany*

- Leading the Data Science and Computer Vision for Electron Microscopy Lab
- Research on deep learning for electron microscopy data
- PhD Supervisor: Deep-Learning Assisted Fast In Situ 4D Electron Microscope Imaging, Helmholtz Imaging Project (From 2024)
- Help teach master level course: Deep Learning for Materials Science, Master Level Course at RWTH Aachen (2023)

### Postdoctoral Researcher

Feb. 2023 – Aug. 2023

*Forschungszentrum Jülich, Institute for Materials Data Science and Informatics (IAS-9)*

*Aachen, Germany*

- Research on deep learning for electron microscopy data
- Prototyping and implementation of unsupervised, semi-supervised and supervised learning models
- Applications of Generative Adversarial Networks (GANs), Autoencoders and Diffusion Models
- Denoising, super-resolution and segmentation of transmission electron microscopy (TEM) images of nanoparticles
- Implementations in PyTorch/Lightning
- Data pre and post-processing and visualization with Scikit-Learn, Pandas, Scikit-image, and Matplotlib
- Experiment tracking, monitoring and visualization with Wandb

### Postdoctoral Researcher

Apr. 2021 – Dec. 2022

*Helmholtz Zentrum Hereon, Institute of Materials Physics*

*Hamburg, Germany*

- Research on segmentation of bone implants using deep learning and synchrotron radiation computed tomography (CT) data
- Development of active learning methods well-suited for tasks with small amounts of annotated data
- Implementations in PyTorch
- Data analysis and visualization using Fiji/ImageJ

- Contribution to a web-service for the active learning model to help users/domain experts apply segmentation on their data without having to learn or implement deep learning methods

## Doctoral Researcher

Apr. 2017 – Apr. 2021

*Leibniz University Hannover, Institute of Cartography and Geoinformatics*

*Hannover, Germany*

- Research on detection and description of historical man-made landscape structures
- Prototyping and implementation of self supervised learning models (GANs and Autoencoders) to leverage large volumes of unlabeled data
- Transfer learning with self-supervised pretrained models customized for and finetuned on downstream tasks (classification, semantic and instance segmentation) with limited annotated data
- Worked on digital terrain models from airborne laser scanning data
- Worked with the ArcGIS software and Python Osgeo/Gdal library for data processing
- Used Tensorflow and Keras libraries for implementing deep learning models
- Published papers and open sourced implementations for classification, semantic segmentation, and instance segmentation of archaeological objects in digital terrain data using deep learning
- Helped teach master level courses: Internet-GIS (2017) and Environmental Data Analysis (2018 & 2020)
- Master Thesis Supervision, Segmentation of Linear Terrain Structures in Digital Terrain Models Using Deep learning by Heyeu Zhang at Leibniz University Hannover (2020)
- Master Thesis Supervision, Estimation of building parameters from street view images by Xin Hu at Leibniz University Hannover (2020)
- Master student project supervision, Extraction of linear structures from digital terrain models using deep learning by Ramish Satari at Leibniz University Hannover (2020)

## Visiting Researcher

Nov. 2017 – Dec. 2017

*University of Melbourne, Department of Infrastructure Engineering*

*Melbourne, Australia*

- Research visit as part of a scholarship award by DAAD: German Academic Exchange Service
- Research collaboration between Institute of Cartography and Geoinformatics at Leibniz University Hannover and Department of Infrastructure Engineering at University of Melbourne
- Worked on and published a paper for archaeological object detection in airborne laser scanning data

## Quality Assurance Intern

Jul. 2016 – Mar. 2017

*Typeform S.L.*

*Barcelona, Spain*

- Automated and manual software tests for features before being shipped for production

## Java Developer

Feb. 2016 – Jul. 2016

*Open University of Catalonia*

*Barcelona, Spain*

- Helped improve a website for students to upload programming assignments to be graded automatically

## SKILLS

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**Languages:** Persian (Native), Turkish (Advanced), English (Advanced), German (B2, Goethe Certificate)

**Technical Skills:** Python, PyTorch/Lightning, Tensorflow/Keras, Pandas, Scikit-Learn, ArcGIS, Osgeo/Gdal, Git, Docker, SQL, Linux, Matplotlib, Wandb

**Machine Learning:** Linear/Logistic Regression, Clustering, Convolutional Neural Networks, Classification, Semantic Segmentation, Object Detection, Instance Segmentation, Prototyping, GANs, Autoencoders, Vision Transformers, Diffusion Models

## AWARDS AND FUNDINGS

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### Helmholtz Imaging Project Funding

2023

- Project title: Deep-Learning Assisted Fast In Situ 4D Electron Microscope Imaging
- Prof. Stefan Sandfeld and I, together with our collaborators, Prof. Christoph Kirchlechner and Dr. Subin Lee from Institute for Applied Materials – Mechanics of Materials and Interfaces (IAM-MMI), got the Helmholtz Imaging Project funding of 200K Euros for the proposal of our project planned for 3 years

### Help a hematologist out Challenge

2022

- 3rd place winning solution
- I took part in the Help a hematologist out Challenge at Helmholtz Incubator Summer Academy - From Zero to Hero, 2022 and joined the BLAMAD team. The theme of the challenge was to find creative domain adaptation solutions for blood-cell classification which is important for diagnosis of diseases such as anemia or leukemia. We used domain adaptation techniques and won the 3rd place among all participating teams

## PRESENTATIONS/TALKS

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- 1st Conference on Artificial Intelligence in Materials Science and Engineering, Saarbrücken, Germany, Nov. 2023. Oral presentation on *Enhancing Semantic Segmentation in High-Resolution TEM Images through Pretraining on Unlabeled Data*.
- 2nd Joint Lab MDMC Workshop, Jülich, Germany, Mar. 2023. Oral presentation on *Introduction to the joint ER-C/IAS-9 Electron Microscopy Data Science Lab*.
- Helmholtz AI Conference, Dresden, Germany, Jun. 2022. Oral presentation on *Deep Active Learning for Segmentation of Biodegradable Bone Implants in High Resolution Synchrotron Radiation Microtomograms*.
- Conference on Cultural Heritage and New Technologies (CHNT 25), Vienna, Austria, Nov. 2020, Oral presentation on *Effectiveness of DTM Derivatives for Object Detection Using Deep Learning*.
- Conference on Cultural Heritage and New Technologies (CHNT 24), Vienna, Austria, Nov. 2019. Oral presentation on *Semi Supervised Learning for Archaeological Object Detection in Digital Terrain Models*.
- 38. Wissenschaftlich-Technische Jahrestagung der DGPF e.V., PFGK18, Munich, Germany, Mar. 2018. Poster presentation on *Classification of laser scanning data using deep learning*.
- 10th International Conference on Geographic Information Science, GIScience, Melbourne, Australia, Aug. 2018. Oral presentation on *Deep learning for archaeological object detection in airborne laser scanning data*.
- The 18th International Conference on Computer Analysis of Images and Patterns, Salerno, Italy, Sep. 2019. Poster presentation on *Object instance segmentation in digital terrain models*.
- Joint ISPRS Conference on Photogrammetric Image Analysis and Munich Remote Sensing Symposium, PIA 2019+MRSS, Munich, Germany, Sep. 2020. Oral presentation on *Semantic Segmentation of Manmade Landscape Structures in Digital Terrain Models*.

## PUBLICATIONS

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- [1] B. Kazimi and M. Sester, “Self-supervised learning for semantic segmentation of archaeological monuments in dtms,” *Journal of Computer Applications in Archaeology*, vol. 6(1), pp. 155–173, Nov 2023.
- [2] B. Kazimi, P. Heuser, F. Schluenzen, H. Cwieka, D. Krüger, B. Zeller-Plumhoff, F. Wieland, J. Hammel, F. Beckmann, and J. Moosmann, “An active learning approach for the interactive and guided segmentation of tomography data,” in *SPIE*, vol. 12242, p. 122420F, 2022.
- [3] B. Kazimi, *Self Supervised Learning for Detection of Archaeological Monuments in LiDAR Data*. PhD thesis, Leibniz Universität Hannover, 2021.
- [4] R. Satari, B. Kazimi, and M. Sester, “Extraction of linear structures from digital terrain models using deep learning,” *AGILE: GIScience Series*, vol. 2, p. 11, 2021.
- [5] B. Kazimi, K. Malek, F. Thiemann, and M. Sester, “Effectiveness of dtm derivatives for object detection using deep learning,” in *International Conference on Cultural Heritage and New Technologies 2019*, 2019.
- [6] B. Kazimi, K. Malek, F. Thiemann, and M. Sester, “Semi supervised learning for archaeological object detection in digital terrain models,” in *International Conference on Cultural Heritage and New Technologies 2020*, 2020.
- [7] B. Kazimi, F. Thiemann, and M. Sester, “Detection of terrain structures in airborne laser scanning data using deep learning,” *ISPRS Annals of Photogrammetry, Remote Sensing & Spatial Information Sciences*, vol. 5, no. 2, 2020.
- [8] B. Kazimi, F. Thiemann, and M. Sester, “Semantic segmentation of manmade landscape structures in digital terrain models,” *ISPRS Annals of Photogrammetry, Remote Sensing and Spatial Information Sciences*, vol. IV-2/W7, pp. 87–94, 09 2019.
- [9] B. Kazimi, F. Thiemann, and M. Sester, “Object instance segmentation in digital terrain models,” in *Computer Analysis of Images and Patterns* (M. Vento and G. Percannella, eds.), (Cham), pp. 488–495, Springer International Publishing, 2019.

- [10] B. Kazimi, F. Thiemann, K. Malek, M. Sester, and K. Khoshelham, “Deep learning for archaeological object detection in airborne laser scanning data,” in *Proceedings of the 2nd Workshop On Computing Techniques For Spatio-Temporal Data in Archaeology And Cultural Heritage co-located with 10th International Conference on Geographical Information Science*, 09 2018.
- [11] F. Politz, B. Kazimi, and M. Sester, “Classification of laser scanning data using deep learning,” *38th Scientific Technical Annual Meeting of the German Society for Photogrammetry, Remote Sensing and Geoinformation*, vol. 27, 2018.
- [12] B. Kazimi and M. Costa-jussà, “Coverage for character based neural machine translation,” *Procesamiento del Lenguaje Natural*, vol. 59, no. 0, pp. 99–106, 2017.