Dr.-Ing. Bashir Kazimi

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SUMMARY

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

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 superivsed 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

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 Supervisoin: 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

Languages: Persian (Native), Turksih (Advanced), English (Advanced), German (B2, Goethe Certificate)
Technical Skills: Python, PyTorch/Lightning, Tensorflow/Keras, Pandas, Scikit-Learn, ArcGIS, Osgeo/Gdal, Git, Docker, SQL, Linux, Matploblib, Wandb
Machine Learning: Linear/Logistic Regression, Clustering, Convolutional Neural Networks, Classification, Semantic Segmentation, Object Detection, Instance Segmentation, Prototyping, GANs, Autoecnoders, Vision Transformers, Diffusion Models

Awards and Fundings

Helmholtz Foundation Models Initiative (HFMI) Funding
2024

- HMFI-funded project called SOLAI (A symbiotic modular foundation model for accelerating solar energy materials development). In collaboration with KIT, HZB and Hereon. Coordinated by FZJ. Funding of 4M euros for three years. Project started in May 2024.

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 diseaeses such as anemia or leukemia. We used domain adaptation techniques and won the 3rd place among all participating teams

PRESENTATIONS/TALKS

- 37th Umbrella Symposium at Forschungszentrum Jülich themed as Advancing energy materials with state-of-the-art analytics and AI, Juelich, Germany, Sep. 2024. Invited Talk on *Self-Supervised Learning in Electron Microscopy*.

- 17th European Microscopy Congress (EMC), Copenhagen, Denmark, Aug. 2024. Poster presentation on *Comparative Analysis of Self-Supervised Learning Techniques for Electron Microscopy Images*.

- IEEE / CVF Computer Vision and Pattern Recognition Conference (CVPR), Computer Vision for Materials Science Workshop, Seattle, WA, USA, June, 2024. Oral presentation on *Self-Supervised Learning with Generative Adversarial Networks for Electron Microscopy*

- The Eighth Conference on Frontiers of Aberration Corrected Electron Microscopy (PICO24), Vaals, Netherlands, Apr. 2024. Poster presentation on *Enhancing Semantic Segmentation in High-Resolution TEM Images: A Comparative Study of Batch Normalization and Instance Normalization*

- 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

[1] B. Kazimi and S. Sandfeld, "Enhancing Semantic Segmentation in High-Resolution TEM Images: A Comparative Study of Batch Normalization and Instance Normalization," *Microscopy and Microanalysis*, 2024, Accepted.

[2] B. Kazimi, K. Ruzaeva, and S. Sandfeld, "Self-supervised learning with generative adversarial networks for electron microscopy," in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops*, pp. 71–81, 2024.

[3] A. Lopes Marinho, B. Kazimi, H. Ćwieka, R. Marek, F. Beckmann, R. Willumeit-Römer, J. Moosmann, and B. Zeller-Plumhoff, "A comparison of deep learning segmentation models for synchrotron radiation based tomograms of biodegradable bone implants," *Frontiers in Physics*, vol. 12, p. 1257512, 2024.

[4] 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.

[5] 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.

[6] B. Kazimi, *Self Supervised Learning for Detection of Archaeological Monuments in LiDAR Data*. PhD thesis, Leibniz Universität Hannover, 2021.

[7] 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.

[8] 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.

[9] 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.

[10] 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.

[11] 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.

[12] 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.

[13] 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.

[14] 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.

[15] 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.