

## BURHAN RASHID HUSSEIN (PhD in Computer Science)

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D.O.B: 16/11/1993

Citizenship: Tanzanian



**Research interest:** *Computer Vision; Machine Learning; Deep Learning; Medical Imaging; Data Analytics: High Performance Computing; Big Data*

[Google Scholar](#) --- [ResearchGate](#) --- [GitHub](#) --- [Stack Overflow](#) --- [Scopus](#) --- [GitLab](#) --- [Orcid](#)

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<b>Postdoctoral fellow/ Research Engineer (Deep Learning for Medical Imaging)</b> Inria centre at Rennes University, Rennes France	<b>June 2022</b> <b>Present</b>
<b>Project:</b> “Deep Learning Methods for Segmentation of Multiple Sclerosis Spinal Cord and Cortical Lesions in MRI for both Cross-Sectional and Longitudinal Study“ <b>Advisors:</b> Assoc Prof Dr. Francesca Galassi, Senior Researcher Dr. Benoit Combes	
<b>PhD in Computer Science</b> School of Digital Science, Universiti Brunei Darussalam (UBD)	<b>Jan 2019</b> <b>Dec 2021</b>
<b>PhD thesis:</b> “Segmentation and Species Identification for Digitized Herbarium Specimen Images Using Computer Vision and Machine Learning Techniques” <b>Advisors:</b> Asst. Prof Dr. Owais Ahmed Malik, Asst. Prof Dr. Wee Ong	
<b>Master of Science in Computing and Information Systems (Distinction)</b> School of Computing and Informatics, Universiti Teknologi Brunei (UTB)	<b>July 2017</b> <b>Aug 2018</b>
<b>Masters’ thesis:</b> “Inventory Forecasting at Brunei State Medical Store Using Data Mining” <b>Advisor:</b> Asst. Prof Dr. Asem Kasem	
<b>Bachelor of Science in Computer Science (Software Engineering) (GPA - 3.9/5)</b> Department of Computer Science, Ruaha Catholic University (RUCU)	<b>Sept 2013</b> <b>July 2016</b>
<b>Machine Learning Operations (MLOps) professional certificate</b> By Landing AI through Coursera	<b>Nov 2021</b> <b>Jan 2022</b>

## RESEARCH EXPERIENCE

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<b>Postdoc Researcher/Research Engineer (Inria, Rennes, France)</b> <i>Project: Developing deep learning methods for segmentation of multiple-sclerosis spinal cord and cortical lesions from MRI images: cross-sectional and Longitudinal analysis</i>	<b>June 2022</b> <b>Present</b>
<ul style="list-style-type: none"><li>Assisting clinical neuro/radiologists by developing 3D Unet models to detect/segment Multiple Sclerosis lesions from spinal cord MRI images for clinical application based on single and multiple time point</li><li>Establishment of evaluation metrics that reflect the clinical practice for clinicians</li><li>Developing a pipeline for preprocessing of spinal cord MRI data, using the latest deep learning and medical imaging frameworks such as Tensorflow, PyTorch, TorchIO and PyTorch lightning</li><li>Delivery of the deep learning solution as a production-ready prototype at an industrial scale using the latest containerization technologies such as Docker</li><li>Improving baseline models such as Spinal Cord Toolbox, and nnUNet by introducing other learning strategies such as attention gates, transformer architectures, auxiliary learning, and different loss functions</li><li>Implementation and fine-tuning of existing models and adapting them for our segmentation task</li><li>Validation of the deep learning methods for clinical-ready deployment</li><li>Fine-tuning and iterating over these steps for improvements from both clinical and computer science perspectives</li><li>Maintenance and constant improvement of the project codebase repositories as the project evolves</li><li>Orchestration of deep learning experiments on High-performance Computing (HPC) Platforms</li></ul>	

### Data scientist (Pi School, Rome, Italy) ([Link](#))

Mar 2022

*Project: Audio data to 3D face animation using Deep Learning*

May 2022

- Survey on existing work related to 3D face animation
- Developing a cleaner codebase pipeline for preprocessing the audio data
- Designing a CNN model to generate/prediction of facial key points (rigs)
- Fine-tuning the model and embedding emotional metadata to improve facial expression
- Using the CNN output of rig point to generate 3D face animation using Maya software
- Documentation of the project codebase

### Research Assistant Fellow (Islamic University of Madinah, Saudi Arabia)

Jan 2022

*Project: Smart Waste Management Using Computer Vision and Machine Learning*

Mar 2022

- Survey state-of-the-art existing works/models on waste disposal/generation prediction
- Define the research problem based on the surveyed literature (waste generation, disposal patterns, etc)
- Find an appropriate (open source) solid waste dataset to work with (the dataset must be based on the objectives of the project)
- Develop a novel ML prediction research framework/model
- Perform the validation experiments of the model (Modeling)
- Perform the hyperparameter optimization to tweak the proposed model
- Compare our model against 2/3 recent models (from literature) tackling the same research problem
- Compile the validation and comparison results
- Write the report about the experiments and prepare the manuscript for publication

### PhD research experience (Universiti Brunei Darussalam)

Jan 2019

*Project: Application of Computer Vision and Machine Learning for Biodiversity data*

Dec 2021

- Executing projects on various applications of CV and ML for digitized herbarium specimen images related to segmentation, object detection and classification.
- Proposed DL models based on segmentation to automatically extract individual leaves and proposed GANs networks to reconstruct damaged leaves for improving classification accuracy.
- Proposed to use existing deep learning models as a feature extractor and train these features with other ML algorithms such as Neural networks with their variants, SVM, RF with its variant, logistic regression, etc.

### PhD research group (Universiti Brunei Darussalam)

Jan 2019

*Projects involved:*

Dec 2021

- **Developing a new ensemble learning method on imbalanced data.** This research was done by my colleague, but I was actively involved in the discussion and provided various suggestions. Occasionally I assisted in the implementation of the whole pipeline using Python. In summary, I managed to understand the topic in its depth through simple discussion within our research group. Some of these ideals will be explored in my future research.
- **Face identification using a single training sample.** This is another PhD research conducted by my colleague in which I was also involved. The researcher proposed using Siamese networks to extract the face embeddings and apply different data augmentation to increase the training samples. Occasionally I brought up new ideas, such as using simple augmentation methods and assisting in implementing the pipeline using Python.
- **Audio signal processing for low-resource language.** This is another PhD research that my colleague has started working on. Although not involved much, I occasionally advise on improving deep learning model performance, such as adding batch normalization layers, increasing training samples, or adding more layers.

### Computer Vision and Machine Learning Researcher A collaborative research (Freelancer)

Jan 2022

*Project: Segmentation of Sandstone and Mudstone rocks using deep learning techniques*

- Performed comparative study between different deep learning segmentation models
- Report writing for manuscript publication

- Project: Estimation of antioxidant activity of ZnO using machine learning techniques* **Aug 2021**
- Performed neural architecture search to find the best network.
  - Performed neural network hyperparameter optimization using Bayesian optimization.
  - Report writing for manuscript publication

- Project: Developing deep learning model for predicting sudden cardiovascular arrest (SCA) using electrocardiogram (ECG) signals* **Feb 2021**  
**Apr 2021**
- Designed a 1D convolutional neural network for training DFT signal from raw ECG that outperforms most current state-of-the-art approaches.
  - Performed a literature review on existing approaches for predicting SCA.
  - Preparing the manuscript for possible journal publication (biomedical journal)

- Research Assistant (Universiti Brunei Darussalam)** **Mar 2019**  
*Mathematical and Computing Sciences, Faculty of Science, Universiti Brunei Darussalam* **Aug 2021**
- Applying machine learning and deep learning algorithms for biodiversity applications
  - Preparation of manuscripts for publication
  - Preparing material for data science workshops
  - Digitization of herbarium collections for Universiti Brunei Darussalam
  - Web developer (<http://ds.ubd.edu.bn/>)

- Master's Research Project (Universiti Teknologi Brunei)** **Aug 2017**  
*Department of Computing and Information System Universiti Teknologi Brunei* **Aug 2018**
- Applying various time series Machine Learning Algorithms to Forecast future demand of medicine. These ML algorithms included Gaussian processes, neural networks, a Support vector machine, and linear regression. This work was implemented using WEKA software.
  - Develop a time series Data Mining Framework that can be used by the procurement team in making decisions during the ordering process.
  - Collaborate and coordinate with faculty and fellow graduate students across departments.

## **PUBLICATIONS**

### **Journals**

- **B.R. Hussein**, C Meurée, et al. (2024). "Automatic multiple sclerosis lesion segmentation from spinal cord MRI based multiple time points T2w MRI: Longitudinal study" (draft)
- C Meurée, **B.R. Hussein**, et al. (2024). "Automatic spinal cord lesion segmentation of multiple sclerosis based on T2w MRI" (draft)
- R Walsh, **B.R. Hussein**, et al. (2024). "Multimodal automatic spinal cord lesion segmentation of multiple sclerosis based on T2w and Stir MRI" (draft)
- **B.R. Hussein**, C Meurée, et al. (2024). "Automatic spinal cord lesion segmentation of multiple sclerosis based on longitudinal study using T2w MRI" (draft)
- A Namoun, MA Humayun, O BenRhouma, **B.R. Hussein**, et al. (2023), "Service Selection Using an Ensemble Meta-Learning Classifier for Students with Disabilities", *Multimodal Technol. Interact.* 2023, 7, 42. <https://doi.org/10.3390/mti7050042> (Q2, I.F =2.5)
- **B.R. Hussein.**, et al. (2023). "Randomly Weighted CNNs for Fine-Grained Plant Species Identification" submitted to: *Artificial Intelligence in Agriculture Journal* (Q1, CiteScore=15.1)
- **B.R. Hussein.**, et al. (2021). "Automated Extraction of Phenotypic Leaf Features from Herbarium Specimen Images Using Deep Learning Based Semantic Segmentation" *Sensors MDPI Journal*, DOI <https://doi.org/10.3390/s21134549> (Q1, I.F = 3.847)
- **B.R. Hussein.**, et al. (2021). "Reconstruction of Damaged Herbarium Leaves Using Deep Learning Techniques for Improving Classification Accuracy" *Ecological Informatics*, 101243, DOI <https://doi.org/10.1016/j.ecoinf.2021.101243> (Q2, I.F = 4.498)
- **B.R. Hussein.**, et al. (2022). "Application of Computer Vision and Machine Learning for Digitized Herbarium Specimens: A Systematic Literature Review" *Ecological Informatics*, 101243, DOI <https://doi.org/10.1016/j.ecoinf.2022.101641> (Q2, I.F = 4.498)

- A Namoun, **B.R. Hussein**, et al. (2022). "An Ensemble Learning Based Classification Approach for the Prediction of Household Solid Waste Generation" *Sensors MDPI Journal*, DOI <https://doi.org/10.3390/s22093506> (Q2, I.F = 3.847)
- OA Malik, N Ismail, **B.R. Hussein**, et al. (2022). "Automated real-time identification of medicinal plant species in natural environment using deep learning models - A case study of Borneo region" *Plants MDPI Journal*, DOI <https://doi.org/10.3390/plants11151952> (Q1, I.F = 4.658)

## Conferences

- R Walsh, G Malo, C Meurée, **B.R. Hussein**, et al. (2024). "Multi-sequence learning for multiple sclerosis lesion segmentation in spinal cord MRI" (accepted at MICCAI 2024)
- R Walsh, C Meurée, A Kerbrat, A Masson, **B.R. Hussein**, et al. (2023). "Expert Variability and Deep Learning Performance in Spinal Cord Lesion Segmentation for Multiple Sclerosis Patients," 36th IEEE International Symposium on Computer-Based Medical Systems (CBMS), Jun 2023, L'Aquila, Italy. pp.1-8. <hal-04090598>
- **B.R. Hussein**, et al. (2022). "A study on Loss Functions and Decision Thresholds for the Segmentation of Multiple Sclerosis Lesions on Spinal Cord MRI," 20th IEEE International Symposium on Biomedical Imaging (ISBI 2023), April 2023, Cartagena (Colombia), Colombia. <hal-03865212v3>
- OA Malik, M Faisal, **B.R. Hussein**, et al. (2021). "Ensemble Deep Learning Models for Fine-grained Plant Species Identification" 8th IEEE Asia-Pacific Conference on Computer Science and Data Engineering (CSDE), 2021, pp. 1-6, DOI: 10.1109/CSDE53843.2021.9718387
- **B.R. Hussein**, et al. (2020). "Semantic Segmentation of Herbarium Specimens Using Deep Learning Techniques" 6th International Conference on Computational Science and Technology 2019 (ICCST2019), DOI [https://doi.org/10.1007/978-981-15-0058-9\\_31](https://doi.org/10.1007/978-981-15-0058-9_31)
- **B.R. Hussein**, other authors. (2020). "Automated Classification of Tropical Plant Species Data Based on Machine Learning Techniques and Leaf Trait Measurements" 6th International Conference on Computational Science and Technology 2019 (ICCST2019), DOI [https://doi.org/10.1007/978-981-15-0058-9\\_9](https://doi.org/10.1007/978-981-15-0058-9_9)
- **B.R. Hussein**, et al. (2020). "The Future of Artificial Intelligence and its Social, Economic and Ethical Consequences" International Conference on Advances in Computing and Technology (ICACT-2020) Proceedings, ISSN 2756-9160
- **B.R. Hussein**, et al. (2018). "A Data Mining Approach for Inventory Forecasting: A Case Study of a Medical Store" Proceedings of the Computational Intelligence in Information Systems Conference (CIIS 2018) DOI: 10.1007/978-3-030-03302-6\_16

## Posters

- **B.R. Hussein**, et al. (2023) 20th IEEE International Symposium on Biomedical Imaging (ISBI 2023), Apr 2023, Cartagena (Colombia), Colombia.
- **B.R. Hussein**, et al. (2023) Colloque Français d'Intelligence Artificielle en Imagerie Biomédicale (IABM 2023), March, 2023, Paris, France.
- **B.R. Hussein**, (2021, 8). "Reconstruction of Damaged Herbarium Leaves Using Deep Learning Techniques for Improving Classification Accuracy." PhD Poster presentation Bandar, Gadong.
- **B.R. Hussein**, (2021, 8). "Automated Extraction of Phenotypic Leaf Features from Herbarium Specimen Images Using Deep Learning Based Semantic Segmentation" Ph.D. Poster presentation Bandar, Gadong.
- **B.R. Hussein**, (2017, 10). "Inventory Forecasting Using Data Mining." Poster session presented during Graduate student Brainstorm session, Bandar, Gadong. DOI: 10.13140/RG.2.2.19581.67045
- **B.R. Hussein**, (2018, 3). Applying machine learning time series techniques to Forecasting medical demand. Poster session presented Post Graduate student Colloquium at Universiti Teknologi Brunei, Bandar, Gadong. DOI: 10.13140/RG.2.2.30891.13605
- **B.R. Hussein**, (2018, 3). Applying machine learning time series techniques to Forecasting medical demand. Poster session presented During Computational Intelligence in Information Systems (CIIS) conference 2018 at Universiti Teknologi Brunei, Bandar, Gadong. DOI: 10.13140/RG.2.2.23090.71365

## PARTICIPATION AND PRESENTATIONS

### Invited Guest talks

- Artificial Intelligence for health (AI4 Health), Universidad del Sinú - Elías Bechara Zainúm, April 2023, Cartagena (Colombia), Colombia

### Conferences

- Colloque Français d'Intelligence Artificielle en Imagerie Biomédicale (IABM 2023), March, 2023, Paris, France.
- Intelligence artificielle et santé : approches interdisciplinaires (conf\_IA\_sante2022), July, 2022, Nantes, France.

- The First International Conference on Artificial Intelligence and Data analytics (CAIDA 2021), Prince Sultan University, Riyadh, Saudi Arabia, 6<sup>th</sup> April 2021
- International Conference on Advances in Computing and Technology (ICACT 2020), University of Kelaniya, Sri Lanka, On 28<sup>th</sup> November 2020

### Workshops

- MONAI Workshop at Medical Imaging with Deep Learning, (MIDL 2023), July, 2023
- Workshop on Exploring Industries AI Use Cases, at The First International Conference on Artificial Intelligence and Data analytics (CAIDA 2021), on 7<sup>th</sup> April 2021
- Elsevier Southeast Asia Publishing Workshop: An introduction to Scholarly Publishing, On 6<sup>th</sup> October 2020
- Elsevier Research Academy: Make the most of your research: publishing your data and methods, On 8<sup>th</sup> October 2020.
- Post Graduate student Colloquium at Universiti Teknologi Brunei (UTB), Brunei Darussalam on 17<sup>th</sup> March 2018
- workshop on Software Defined Networks (SDN), at Universiti Teknologi Brunei (UTB), Brunei Darussalam on 20-21 November 2017
- “Having Fun Programming” workshop series, at Universiti Teknologi Brunei (UTB), Brunei Darussalam in October 2017
- Workshop training for “SAP Analytics Cloud software” organized by School of Computing and Informatics (UTB) on 28<sup>th</sup> August 2017

### Seminars

- Empenn Team Seminar “Overview of the past projects and ongoing Primus work”, 30<sup>th</sup> september 2022
- International Webinar on "Machine Learning with Impact" organized by GSSSIETW IEEE student branch in association with IEEE Bangalore Section and CAS Bangalore chapter on 19<sup>th</sup> March 2021.
- Deep Learning Based Video Analytics for Surveillance IOI Applications, organized by GSSSIETW IEEE student branch in association with IEEE Bangalore Section and CAS Bangalore chapter on 13<sup>th</sup> July 2020.
- Burhan R Hussein., (2019). “Semantic Segmentation with Deep Learning: A general introduction.” Faculty of science seminar for Graduate Students, Universiti Brunei Darussalam, Bandar, Gadong. DOI: 10.13140/RG.2.2.15832.85761
- Overview of Dr. Ayanna Howard’s journey in stem: Future and Perspectives on AI and Robotics, held at Universiti Brunei Darussalam on 23<sup>rd</sup> October 2019.

## PROFESSIONAL EXPERIENCE

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### Technical Reviewer at International Journals

- Computers and Biology in Medicine (Elsevier) [link](#)
- Expert Systems with Applications an International Journal (Elsevier) [link](#)
- Applied Soft Computing Journal (Elsevier) [link](#)
- Engineering Application of Artificial Intelligence (Elsevier) [link](#)
- Pattern Recognition Journal (Elsevier) [link](#)
- Applied Sciences, Brain Sciences, Diagnostics, Mathematics, Sensors, Electronics (MDPI Journals) [link](#)
- International Journal of Computers and Applications (Taylor and Francis) [link](#)
- International Journal of Machine Learning and Computing [link](#)
- PLOS ONE Journal [link](#)

### Technical Reviewer at International Conferences

- 29<sup>th</sup> Annual Meeting of the Organization for Human Brain Mapping (OHBM 2023, July 22-26, Montréal Canada)
- 20<sup>th</sup> IEEE International Symposium on Biomedical Imaging (ISBI 2023, April 18-21, Cartagena de Indias, Colombia)
- The IEEE 36<sup>th</sup> International Symposium on Computer-Based Medical Systems (CBMS 2023, June 22-24 - L'Aquila, Italy)

### Program Committee Member

- The IEEE 36<sup>th</sup> International Symposium on Computer-Based Medical Systems (CBMS 2023, June 22-24 - L'Aquila, Italy)
- The 37<sup>th</sup> IEEE International Symposium on Computer-Based Medical Systems (IEEE CBMS2024), June 26<sup>th</sup> - 28<sup>th</sup> - Tecnológico de Monterrey, Campus Guadalajara, Mexico

## TEACHING AND SUPERVISION EXPERIENCE

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### Master Students Supervision

#### Inria Center at University of Rennes, Rennes, France

*Project: Exploring Deep Neural Network Architectures and Learning Strategies for the Segmentation of MS Lesions in 3D Spinal Cord MRI*

**Oct 2022**  
**Jan 2023**

- Assisting in defining research objectives aligned with medical imaging and deep learning goals.
- Providing expertise in state-of-the-art segmentation architectures and techniques.
- Helping with data preprocessing, augmentation, and validation strategies.
- Regularly reviewing progress and providing feedback for model improvement.
- Encouraging exploration of advanced methods for better performance.
- Emphasizing interpretability for clinical decision-making.
- Keeping updated on the latest research in the field.
- Encouraging publication of findings in relevant conferences/journals.
- Ensuring adherence to ethical considerations and data privacy regulations.
- Facilitating collaboration with medical professionals for real-world insights

*Project: Performing Unit testing on deep learning solution (Prototype) for MS Lesion Segmentation*

**Jun 2023**  
**Aug 2023**

- Overseeing the creation of unit tests to verify individual components' correctness.
- Coordinating system tests to assess the solution's overall functionality and performance.
- Guiding integration tests to ensure seamless collaboration between different modules.
- Ensuring adherence to best practices and coding standards for robust testing.
- Promoting automated testing for continuous integration.
- Addressing and resolving test failures and bugs encountered during testing.
- Encouraging a test-driven development approach to enhance solution reliability.
- Verifying that all tests pass before delivering the prototype for evaluation and integration.

#### Teaching Assistant (Machine Learning Module SS-4315)

*Digital Sciences, Faculty of Science, Universiti Brunei Darussalam (15-20 students)*

**Jan 2021**  
**Aug 2021**

- Preparing tutorial classes and class notes
- Conducting tutorial classes related to python programming, from data preparation, pre-processing, feature selection and applying different Machine Learning algorithms.
- Supervising students during tutorial classes by assisting in debugging their codes
- Grading student assignments
- Invigilating class tests

#### Tutorial Assistant (Machine Perceptron module SS-4313)

*Mathematical and Computing Sciences, Faculty of Science, Universiti Brunei Darussalam*

**Aug 2019**  
**Aug 2021**

- Conducting tutorial classes for machine perceptron modules related to python programming, Machine Learning, image processing, and computer vision applications.

#### Teaching Assistant (Object Oriented Programming OOP module with Java) (10-15 students)

*Mathematical and Computing Sciences, Faculty of Science, Universiti Brunei Darussalam*

**Jan 2020**  
**Apr 2020**

- Preparing tutorial classes and class notes
- Supervising students during tutorial classes by helping in setup the IDE and debugging their codes
- Grading student assignments

- Assisting fellow Student during my academic journey** **2013**  
**2022**
- Preparing and providing an in-depth explanation of various subjects during my undergraduate and postgraduate studies. For example, graduate students who want to apply machine learning but do not have a computer science background.
  - Organizing group studies to assist one another for the duration of my study.
  - Assisting colleagues in their Final year Projects, such as Android app development and building various information systems.

- Undergraduate student final year projects evaluation** **2018**  
*School of Computing and Informatics (UTB)*
- Evaluated and graded final year projects together with feedback to help improve. These projects covered various fields of CS, including multimedia applications, networking, and information systems.
  - Career guidance for final-year CS students on options they may have after finishing the degree and choosing the best option based on their country's job market.

## **HONORS/AWARDS/SCHOLARSHIPS**

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- Fully funded scholarship at Artificial Intelligence for Biomedical Imaging conference IABM (Paris, France) **2023**
- Fully funded Pi school of Artificial Intelligence Fellowship program (Rome, Italy) **2022**
- Ph.D. scholarship at Universiti Brunei Darussalam (Brunei) **2019-2021**
- Appreciation as organizing chair for post-graduate Colloquium at Universiti Teknologi Brunei (Brunei) **2018**
- Fully funded scholarship for Masters degree at Universiti Teknologi Brunei (Brunei) **2017-2018**
- Software Consultant at Simba Technology (T) LTD (hired before my final year Graduation) **2016**
- Partially funded bachelor's degree in software engineering at Ruaha Catholic University **2013-2016**

## **INDUSTRIAL EXPERIENCE**

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- SOFTWARE CONSULTANT** **2014**  
**2017**  
*Simba Technology (T) LTD*  
*Project: Cash Deposit Machine, Cheque Deposit Machine and Queue Management System*
- Collecting user software requirements
  - System installation, configuration, and deployment
  - System integration with core banking system (CBS)
  - System testing, validation, and user acceptance test (UAT)
  - Software documentation
  - Software maintenance (Analysis of suspicious transactions)
  - Remote customer support
  - Hardware troubleshooting and maintenance
  - Remote customer support
  - CRM administrator
  - Web development

## **TECHNICAL SKILLS**

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- Python
- PyTorch Lightning
- Tensorflow
- TorchIO
- MySQL/ SQL
- Git
- Docker
- Linux