

# JACKET DEMBY'S

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## TECHNICAL SKILLS

**Operating Systems:** Linux, Windows, MacOS  
**Programming languages:** Python, MATLAB, C/C++,  
Arduino, Processing, CUDA, Lyx/LaTex  
**Software and libraries:**  
▪ **Robotics:** Robot Operating System (ROS/ROS 2)  
▪ **Computer Vision:** OpenCV, Point Cloud Library  
▪ **Machine Learning:** Keras, PyTorch, TensorFlow  
▪ **Others:** Kubernetes, Docker, Anaconda

## EDUCATION

<b>Doctor of Philosophy (Ph.D.)</b> Still attending GPA: 3.724/4	University of Missouri, Columbia, Missouri, USA <b>Electrical and Computer Engineering</b> Ready for Graduation (Spring 2025 - Official)
<b>Master of Science (MS)</b> Graduated July 2020 GPA: 3.696/4	University of Missouri, Columbia, Missouri, USA <b>Computer Engineering</b>
<b>Master of Engineering (M)</b> Graduated July 2015 GPA: 15.06/20	Ucac-Icam Institute, Douala, Cameroon <b>Generalist Engineering</b> Top of class

## RECENT WORK EXPERIENCE

**Display HWT Intern (Deep Learning)** | May 2024 – September 2024

**Apple – Cupertino, California, United States of America**

- Investigated objective functions to enhance super image resolution models for display technology.
- Explored machine learning-based image regression models to assess native panel performance.

**Skills:** Deep Learning · Super Image Resolution · Image Regression · Applied Research · Interpersonal Communication · Presentation Skills · MATLAB · Python · Pandas · Numpy · Matplotlib · PyTorch

**Display Electrical Engineer Intern (Deep Learning)** | May 2023 – August 2023

**Apple – Cupertino, California, United States of America**

- Utilized state-of-the-art super resolution deep learning methods to improve display technology.
- Explored alternative hyper parameters and evaluation metrics tailored for display technology.

**Skills:** Deep Learning · Data Collection · Data Preparation · Super Image Resolution · Applied Research · Interpersonal Communication · Presentation Skills · MATLAB · Python · Pandas · Numpy · PyTorch

## RESEARCH EXPERIENCE

**August 2017 – Present: Research Assistant (Vision Guided and Intelligent Robotics Lab – ViGIR Lab)**

- Behavior-based mobile robotics algorithms using multiple sensors (RGB, Intel RealSense, Sonars, Velodyne) and SLAM (gmapping/Cartographer)
- Accuracies of approximate solutions provided by analytical, data-driven (deep learning-based), numerical, and hybrid inverse kinematics solvers for robotic manipulators.
- Choosing the correct generalized inverse for the numerical solution of the inverse kinematics of incommensurate robotic manipulators.
- Object detection and pose estimation based on stereo vision and deep learning algorithms in resource-limited embedded hardware.

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## PUBLICATIONS

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### To-Be-Submitted Articles:

1. **J. Demby's**, Ramy Farag, and G. N. DeSouza, "OMG-IK: Is One Model Good Enough to Learn the Inverse Kinematics of Multiple Robots". (*Journal Paper*)
2. **J. Demby's**, and G. N. DeSouza, "Recent Advances in Data-Driven Inverse Kinematics Solvers for Serial Robots: A Survey". (*Journal Paper*)
3. **J. Demby's**, J. Uhlmann and G. N. DeSouza, "Use of Generalized Inverses in Robotics and Machine Learning: A Survey and the Related Issues". (*Journal Paper*)

### Preprint Articles:

1. R. Farag, P. Upadhyay, Y. Gao, **J. Demby's**, K. G. Montoya, S. M. A. Tousi, G. Omotara, and G. N. DeSouza, "Covid-19 Detection from CT Scans Using EfficientNet and Attention Mechanism". 2024 preprint arXiv: 2403.11505. (*Preprint*)
2. **J. Demby's**, J. Uhlmann and G. N. DeSouza, "Achieving Unit-Consistent Pseudo-Inverse-based Path-Planning for Redundant Incommensurate Robotic Manipulators". 2023 preprint arXiv:2308.02954. (*Preprint*)
3. **J. Demby's**, J. Uhlmann and G. N. DeSouza, "Choosing the Correct Generalized Inverse for the Numerical Solution of the Inverse Kinematics of Incommensurate Robotic Manipulators". 2023 preprint arXiv:2308.02964. (*Preprint*)

### Peer-Reviewed and Accepted Articles:

1. **J. Demby's**, R. Farag, and G. N. DeSouza, "Inverse Kinematics of Robotic Manipulators Using a New Learning-by-Example Method ". In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IEEE/RSJ IROS 2024)*, Abu Dhabi, UAE, 2024. (*Accepted*).
2. R. Farag, P. Upadhyay, **J. Demby's**, Y. Gao, K. G. Montoya, S. M. A. Tousi, G. Omotara, and G. N. DeSouza, " EfficientNet-SAM: A Novel EfficientNet with Spatial Attention Mechanism for COVID-19 Detection in Pulmonary CT Scans". In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (IEEE/CVF CVPR 2024)*, Seattle, WA, USA, 2024. (*Accepted*)
3. R. Farag, **J. Demby's**, and G.N. DeSouza, "XMNet: XGBoost with Multitasking Network for Classification and Segmentation of Ultra-Fine Grained Dataset". In *Proceedings of the IEEE International Joint Conference on Neural Networks (IEEE IJCNN 2024)*, Yokohama, Japan, 2024. (*Accepted*)
4. **J. Demby's**, A. Shafiekhani, F.B Fritschi and G. N. DeSouza, "Spatio-Temporal Reconstruction and Visualization of Plant Growth for Phenotyping," in *2021 IEEE Symposium Series on Computational Intelligence (IEEE SSCI 2021)*, Orlando, FL, USA, December 2021. (*Accepted*)
5. **J. Demby's**, Y. Gao, A. Shafiekhani, G.N. DeSouza, "Object Detection and Pose Estimation Using CNN in Embedded Hardware for Assistive Technology, " in *2019 IEEE Symposium Series on Computational Intelligence (IEEE SSCI 2019)*, Xiamen, China, December 2019. (*Accepted*)
6. **J. Demby's**, Y. Gao and G. N. DeSouza, "A Study on Solving the Inverse Kinematics of Serial Robots using Artificial Neural Network and Fuzzy Neural Network," in *2019 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE 2019)*, New Orleans, LA, USA, 2019, pp. 1-6. (*Accepted*)

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## TEACHING EXPERIENCE

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**Teaching Assistant**, University of Missouri-Columbia, Columbia, Missouri, United-States

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|---|---|
| ▪ <b>Spring 2020</b>                    | : <b>Neural Networks</b>  |
| ▪ <b>Fall 2020 / 2021 / 2022 / 2023</b> | : <b>Building Intelligent Vision-Guided Robots</b>                |
| ▪ <b>Spring 2021 / 2024</b>             | : <b>Introduction to Machine Learning and Pattern Recognition</b> |
| ▪ <b>Spring 2022</b>                    | : <b>Power Electronics I</b>                                      |
| ▪ <b>Spring 2023</b>                    | : <b>Architectural Robotics</b>                                   |

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## SOME COURSEWORK

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| ▪ Introduction to Mechatronic and Robotic Vision           | ▪ Digital Image Processing          |
| ▪ Probability and Stochastic Processes for Engineers       | ▪ Computer Vision                   |
| ▪ Introduction to Machine Learning and Pattern Recognition | ▪ Supervised Learning               |
| ▪ Parallel Programming for High Performance Computing      | ▪ Neural Networks and Deep Learning |
| ▪ Introduction to Computational Intelligence               | ▪ Real-Time Embedded Systems        |
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## ACHIEVEMENTS AND ACTIVITIES

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May 2019 – present	IEEE (Institute of Electrical and Electronics Engineer) Student Member.
December 2017	Best 3 <sup>rd</sup> final project in Digital Image Processing class ( <a href="#">Fall 2017</a> ).
August 2017 – present	Member of the University of Missouri Fulbright Organization ( <b>MUFO</b> ).
July 2017 – present	Recipient of the <b>Fulbright Scholarship</b> in Congo Brazzaville to pursue a M.Sc. in Computer Engineering at the University of Missouri-Columbia, USA.
January 2017	Participant for the Business and Entrepreneurship Track of the Young African Leaders Initiative (YALI Program) in Nairobi, Kenya.
April 2016	2 <sup>nd</sup> prize (\$13,000) of the <a href="#">2015-2016 National Startup Challenge</a> of Total E&P in Congo Brazzaville.
January 2015 – June 2015	Participant of the internal Icam exchange program to conduct an industrial mission on Computational Fluid Dynamics (CFD) in Lille, France.
June 2012 – July 2013	Recipient of the <b>Sogea-Satom scholarship</b> to study at Ucac-Icam Cameroon.
August 2010 – June 2012	Recipient of the <b>Total E&amp;P scholarship</b> to study at Ucac-Icam Congo.

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## SOME COURSEWORK PROJECTS INVOLVING FINAL PRESENTATIONS

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### **Class: Real-Time Embedded Systems (Spring 2020)**

**Project:** Data generation for supervisory control and data acquisition system (DataGen-SCADA)

**Main objective, results and tools:** Build a real-time data generation simulator for distributed SCADA systems using IoT devices; to gather and analyze data in real-time industrial settings and behaviors. Python, Processing, Arduino and ESP8266 devices were used.

### **Class: Neural Networks (Spring 2019)**

**Project:** Solving the inverse kinematics of a 4 DoF SCARA robot using extreme learning machines and radial basis function networks

**Main objective, results and tools:** Conduct a comparative study between extreme learning machines and radial basis function networks in solving the inverse kinematics of the chosen robotic arm. Lowest MSE (Mean-Squared Error) results were obtained with extreme learning machines. MATLAB and Python were used.

### **Class: Introduction to Computational Intelligence (Fall 2018)**

**Project:** Solving the inverse kinematics of a 6 DoF Kinova robot using artificial and fuzzy neural networks

**Main objective, results and tools:** Conduct a comparative study between artificial and fuzzy neural networks in solving the inverse kinematics of the chosen robotic arm. A trade-off was observed in terms of precision of the predicted joint configuration depending on the workspace. MATLAB and Python were used.

### **Class: Computer Vision (Spring 2018)**

**Project:** Hardware integration of a real time object detection CNN (Yolo V2)

**Main objective, results and tools:** Develop an android mobile application based on YOLO V2 to recognize and pronounce objects in real-time. Android, Darknet and a pretrained Yolo V2 model were used.

**Class: Introduction to Mechatronics and Robotic Vision (Fall 2017)****Project:** Investigating the control of a robotic arm with a real-time tracking of human hand motions**Main objective, results and tools:** Track human hand motions using a Kinect sensor and control the robotic arm with the hand motions tracking information. C/C++ and ROS were used.**Class: Digital Image Processing (Fall 2017)****Project:** Super Image Restoration (SIR)**Main objective, results and tools:** Develop a MATLAB application with a friendly Graphical User Interface (GUI) to restore old, damaged images with cracks in only three click steps. MATLAB, Python and Algorithmia Colorization API were used.

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**PREVIOUS WORK EXPERIENCE**

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**Junior Project Engineer** | December 2016 – July 2017**Total E&P Congo - Pointe-Noire, Republic of Congo**

- Prepared, supervised and generated daily reports for construction activities of the Floating Production Unit (FPU) Likouf alongside contracted companies.
- Worked on Pressure Safety Valves (PSV) Recalibration Campaign, managed a database of the PSV joint stocks, and ensured team members compliance with on-site safety measures.

**Maintenance Engineer** | September 2015 – October 2016**Sogea-Satom - Brazzaville, Republic of Congo**

- Monitored the computer-assisted supply chain and maintenance management software and produced monthly analysis reports.
- Developed and maintained Excel VBA (Visual Basic for Applications) programs for monthly stocks' management analysis, optimization and periodic inventories follow up.

**Intern Maintenance Engineer by Alternance** | January 2013 – December 2014**Sogea-Satom - Brazzaville, Republic of Congo**

- Monitored the computer-assisted supply chain and maintenance management software.
- Continually improved methods and procedures for processes, stocks' management, documenting and workflow techniques.

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**LANGUAGES AND INTERESTS**

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Languages**French:** native language**English:** fluent (speaking, reading, writing)Interests**Sport:** Walking, Running, Volleyball, Swimming**Board games:** Scrabble, Ludo, Chess, Checkers

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**VOLUNTEER WORK**

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**Intervarsity at University of Missouri-Columbia** | Volunteer photographer and events' organizer

- Organize events (games, discoveries, English clubs, shopping, etc.) to help international students feel welcome at the university.
- Take pictures during the events and share them with all the members.

**University of Missouri Fulbright Organization (MUFO)** | Volunteer

- Work with the International Center to provide rides to new international sponsored students.
- Lead scavenger hunt activities to help international sponsored students discover and locate key facilities and resources on campus.