Daniel Omeiza

Post-Doctoral Researcher, Oxford Robotics Institute, University of Oxford
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Research Interests

Fields: Explainability, Machine Learning, Deep Learning, Autonomous Systems, Human Factors in AI
Programming Languages: Python (including PyTorch & TensorFlow), C++, Java, TypeScript, MATLAB

Education

University of Oxford — Oct. 2019 – Nov. 2022
Doctor of Philosophy in Computer Science — *Advisors: Dr. Lars Kunze & Prof. Marina Jirotka*

Carnegie Mellon University — Aug. 2017 – Jun. 2019
Master of Science in Information Technology — *Advisor: Prof. David Vernon*

University of Ilorin — Sept. 2011 – Aug. 2015
Bachelor of Science in Computer Science (First Class Honors) — *Advisor: Dr. Kayode Adewole*

Research Experiences

Post-Doctoral Research Assistant — Jan. 2023 – Present
Oxford Robotics Institute — *University of Oxford, UK*

- Managing a research project where I am developing and implementing quantitative metrics (e.g., sustainability index, robustness index, etc.) for estimating the overall functional and non-functional performance of autonomous driving agents trained on large heterogeneous datasets. This is in collaboration with AWS and the Embodied AI Foundation.
- Extending Carla Leaderboard platform and incorporating these metrics 'Responsible AI Index' as an additional dimension to performance assessment.
- Working with graph neural networks, knowledge graphs, and scene graphs for scene understanding and corner-case driving scenario generation.
- Maintaining our developed commentary driving system codebase and running demos.
- Co-supervising masters students and collaborating with software engineers.
- Assisting in teaching Artificial Intelligence and Software Engineering courses.

Graduate Research Assistant — Oct. 2019 – Sept. 2022
Cognitive Robotics Group — *University of Oxford, UK*

- Coordinated the collection, curation and systematic annotation/labelling of a novel dataset in a field trial that involved different sensor modalities of an automated vehicle. This dataset is the richest dataset so far for developing interpretable models for autonomous driving. I effectively transformed the multimodal unstructured large dataset into a structured one for training highly interpretable models.
- Developed novel transparent explainer models using trees and scene graphs for natural language explanation generation in complex AI agents using this dataset.
- Developed an automated commentary driving system (powered by the explainer model), which we exhibited in one of the largest motorcar sports festivals in the world (the Goodwood Festival of Speed). **This work placed me on the 2023 MIT TR 35 Innovators Under 35 list.**
- Investigated driver and passenger behaviour through driving simulator user studies and surveys.
- Supported existing projects and contributed to the groups' code base.
- Co-advised master's students.

Graduate Research Assistant — Jan. 2019 – May 2019
Carnegie Mellon University — *Kigali, Rwanda*

- Conducted research around applied machine learning. I developed an efficient machine learning approach for large-scale urban land-use forecasting in sub-Saharan Africa, which was featured in popular podcasts, e.g., DataSkeptics.

Research Intern Sep. 2018 – Dec. 2018

IBM Research; one of the 5 IBM Great Minds Winners from EMEA

- Investigated new and efficient algorithms for detecting and explaining anomalous patterns in datasets and neural network activations.
- Developed a novel technique (Smooth Grad-CAM++) to provide visual explanations for anomalous patterns in deep neural networks.

Professional Software Engineering Experiences

Co–founder and AI Lead Feb. 2022 – Nov. 2022

N6 Labs *Remote*

- As a co-founding member at N6 Labs' Tilly Intelligence startup, I contributed to the efforts in building a robust AI-powered credit infrastructure for the African market. This led us to securing a place in the highly selective South Park Commons Founders Fellowship with $400K funding.

Digital Technology and Communication Lead Jun. 2021 – Apr. 2022

Weidenfeld Hoffmann Trust *Oxford, UK*

- Setup a better IT infrastructure; developed an efficient digital communication pipeline which led to improved internal and external engagements.

Software Engineering Intern Jun. 2018 – Aug. 2018

Oltranz *Kigali, Rwanda*

- Developed efficient API monitoring systems for multiple microservices in the company.

Software Engineer May 2017 – Jul. 2017

SimplePay (now ThankUCash) *Lagos, Nigeria*

- Developed two payment dashboards for payment applications that managed data from over 50,000 users.

Grants, Scholarships & Award

Grants

- ACM SIGCOMM Grant Apr. 2021
- Black in AI Travel Grant Dec. 2019
- Black in AI Travel Grant Dec. 2018

Scholarships

- UK's Engineering and Physical Sciences Research Council (EPSRC) RoboTIPS Fund Oct. 2019 – Nov. 2022
- Mandela Institute for Development Studies Scholarship Aug. 2017 – Jun. 2019
- MTN Foundation Science & Technology Scholarship Sept. 2013 – Aug. 2015

Award

- 2023 MIT TR Innovators 35 Under 35 Honouree 2023
- Best Student Paper: Privacy Papers for Policymakers Award by the Future of Privacy Forum Jan. 2022
- Jeremiah Mpagazehe Rising Researcher Award Jun. 2019

Teaching & Research Mentoring

Instructor

- Summer Course: AI and ML: Theory and Practice, *University of Oxford*
- CS Masters Course: Design Patterns, *University of Oxford*
- CS Undergraduate course: Ethics and Responsible Innovation, *University of Oxford*
- CS & Engineering Masters Course: Academic Skills, *Carnegie Mellon University, Africa*

Research Mentoring

- Select Erasmus Mundus Masters Graduate students at Universite de Lorraine Oct. 2020 – Present
- Select Undergraduate students at the Federal University of Technology, Akure, the University of Kigali, and the Federal University of Petroleum Resource, Effurun Sept. 2017 – Present

Academic Services

Organising Committees

- Co-organiser, IEEE IV 2023 Workshop on Socially Interactive Autonomous Mobility (SIAM) — Jun. 2023
- Co-organiser, NeurIPS 2022 Workshop on Machine Learning for Autonomous Driving (ML4AD) — Dec. 2022
- Co-organiser, ICML 2022 Workshop on Artificial Intelligence for Autonomous Driving (AI4AD) — Jul. 2022
- Co-organiser, IJCAI 2022 Workshop on Artificial Intelligence for Autonomous Driving (AI4AD) — Jul. 2022
- Co-organiser, HRI 2022 Workshop on Fairness and Transparency — Mar. 2022
- Co-organiser, NeurIPS 2021 Workshop on Machine Learning for Autonomous Driving (ML4AD) — Dec. 2021
- Co-organiser, IJCAI 2021 workshop on Artificial Intelligence for Autonomous Driving (AI4AD) — Aug. 2021
- Student Volunteer, IJCAI 2021 Conference — Aug. 2021
- Lead-organiser, CHI 2021 workshop on Trustworthy and Explainable Autonomous Physical Systems — May 2021
- Programme Committee, AI in Africa for Sustainable and Development Goals Workshop — Nov. 2021
- Co-organiser, NeurIPS 2020 Workshop on Machine Learning for Autonomous Driving (ML4AD) — Dec. 2020
- Programme Committee, AI in Africa for Sustainable and Development Goals Workshop — Nov. 2020
- Student volunteer, NeurIPS Black in AI Workshop — Dec. 2019
- Student volunteer, NeurIPS Black in AI Workshop — Dec. 2018

Invited Talks

- NeurIPS Workshop on Progress and Challenges in Building Trustworthy Embodied AI — Dec. 2022
- IV 2022 Workshop on Human Factors in Intelligent Vehicles — Jun. 2022
- IV 2022 Workshop on Naturalistic Driving Data Analytics (NDDA) — Jun. 2022
- UK Robotics & Autonomous Systems Network Talk Series — Feb. 2022
- IEEE ARSO 2021 Workshop on Ethics and Responsible Design in Robotics — Jul. 2021

Paper Review

- AAAI Conference
- International Conference on Intelligent Robots and Systems (IROS)
- Robotics: Science and Systems Conference (RSS)
- IEEE Intelligent Vehicles
- Transportation Research, Part C
- International Conference on Advanced Robotics and Its Social Impacts (ARSO)
- Cognitive Systems Research Journal
- CHI Conference on Human Factors in Computing

University Activities

- Member, HCC Symposium Organising Committee — Jun. 2020
- Volunteering member, RoboTIPS Project — Oct. 2019 – 2022
- Member, Explainable AI (XAI) Reading Group — Oct. 2020 – Present
- Member, Cognitive Robotics Group (CRG) Reading group — Oct. 2020 – Present

Publications

Conference and Journal Papers

1. CC-SGG: Corner Case Scenario Generation using Learned Scene Graphs
   George Drayson, Efimia Panagiotaki, **Daniel Omeiza**, Lars Kunze
   Submitted to the 2024 International Conference on Robotics and Automation (ICRA)
   PDF
2. Explainable Action Prediction through Self-Supervision on Scene Graphs
   Pawit Kochakarn, Daniele De Martini, **Daniel Omeiza**, Lars Kunze
   2023 International Conference on Robotics and Automation (ICRA)
   PDF
3. Textual Explanations for Automated Commentary Driving
   Marc Alexander Kühn, **Daniel Omeiza**, Lars Kunze
   2023 IEEE Intelligent Vehicles Symposium (IV)
   PDF

4. Effects of Explanation Specificity on Passengers in Autonomous Driving
   Daniel Omeiza, Raunak Bhattacharyya, Nick Hawes, Marina Jirotka, Lars Kunze
   In preparation for Transportation Research: Part F
5. From Spoken Thoughts to Automated Driving Commentary: Predicting and Explaining Intelligent Vehicles' Actions
   Daniel Omeiza, Helena Webb, Marina Jirotka, and Lars Kunze
   In the Proceedings of the 2022 IEEE Intelligent Vehicles Symposium (IV)
   PDF
6. Effects of Explanation Specificity and Autonomous Vehicles' Perception System Errors on Passengers' Perceived Safety
   Daniel Omeiza, Raunak Bhattacharyya, Marina Jirotka, Lars Kunze
   Submission for Transportation Research Part F Journal
7. Context-based Image Explanations for Deep Neural Networks
   Sule Anjomshoae, **Daniel Omeiza**, and Lili Jiang
   Journal of Image and Vision Computing, 2021
   PDF
8. Assessing and Explaining Collision Risk in Dynamic Environments for Autonomous Driving Safety
   Richa Nahata, **Daniel Omeiza**, Rhys Howard, Lars Kunze
   In Proceedings of the IEEE 2021 International Conference on Intelligent Transportation Systems (ITSC)
   PDF
9. Towards Accountability: Providing Intelligible Explanations in Autonomous Driving
   Daniel Omeiza, Helena Webb, Marina Jirotka, Lars Kunze
   In Proceedings of the IEEE 2021 Intelligent Vehicles Symposium (IV)
   PDF
10. Explanations in Autonomous Driving: A Survey
    Daniel Omeiza, Helena Webb, Marina Jirotka, Lars Kunze
    In the IEEE Transactions on Intelligent Transportation Systems (T-ITS)
    PDF
11. *Why Not Explain?* Effects of Explanations on Human Perceptions of Autonomous Driving
    Daniel Omeiza, Helena Webb, Konrad Kollnig, Marina Jirotka, Lars Kunze
    In Proceedings of the IEEE 2021 International Conference on Advanced Robotics and Its Social Impacts (ARSO)
    PDF
12. Towards Explainable and Trustworthy Autonomous Physical Systems
    Daniel Omeiza, Sule Anjomshoae, Konrad Kollnig, Oana-Maria Camburu, Kary Främling, Lars Kunze
    In the Proceedings of the CHI 2021 Conference on Human Factors in Computing Systems
    PDF
13. Fairness and Transparency in Human-Robot Interaction
    Houston Claure, Mai Lee Chang, Seyun Kim, **Daniel Omeiza**, Martim Brandão, Min Kyung Lee, Malte Jung
    In the Proceedings of the ACM/IEEE International Conference on Human-Robot Interaction (HRI)
    PDF
14. A Fait Accompli? An Empirical Study into the Absence of Consent to Third-Party Tracking in Android Apps
    Konrad Kollnig, Reuben Binns, Pierre Dewitte, Max Van Kleek, Ge Wang, **Daniel Omeiza**, Helena Webb, Nigel Shadbolt
    In the Proceedings of the 2021 Symposium on Usable Privacy and Security
    PDF
15. Realizing the Potential of AI in Africa: It All Turns on Trust
    Charity Delmus Alupo, **Daniel Omeiza**, David Vernon

In Towards Trustworthy Artificial Intelligent Systems. Springer, Cham.
PDF

Workshop Papers

16. Towards Explainable and Trustworthy Collaborative Robots through Embodied Question Answering
Lars Kunze, Omer Gunes, Dylan Hillier, Matthew Munks, Helena Webb, Pericle Salvini, **Daniel Omeiza**, and Marina Jirotka
Presented in the ICRA 2022 Workshop on the Collaborative Robots and the Work of the Future
PDF
17. A Step Towards Exposing Bias in Trained Deep Convolutional Neural Network Models
Daniel Omeiza
Presented at the NeurIPS Workshop on Machine Learning for Developing World, 2019
arXiv:1912.02094
18. Deep Convolutional Neural Network for Plant Seedlings Classification
Daniel Nkemelu, **Daniel Omeiza**, Nancy Lubalo
Presented at the NeurIPS Black in AI workshop, 2018
arXiv:11811.08404

Other Publications

19. Smooth Grad-Cam++: An Enhanced Inference Level Visualization Technique for Deep Convolutional Neural Network Models
Daniel Omeiza, Skyler Speakman, Celia Cintas, Komminist Weldermariam
arXiv:1908.01224
20. Efficient Machine Learning for Large-Scale Urban Land-Use Forecasting in Sub-Saharan Africa
Daniel Omeiza
arXiv:1908.00340
21. EEG-based Communication with a Predictive Text Algorithm
Daniel Omeiza, kayode Adewole, Daniel Nkemelu
arXiv:1812.05945