

J. FELICIEN IHIRWE

Software engineering & Low-code engineering

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BIO

I'm Felicien, a final year Ph.D. candidate in the Department of Information Engineering, Computer Science, and Mathematics (DISIM) at the University of L'Aquila/Italy. I work as a model-based software engineer as part of Intecs Solutions S.p.A's Research and Development team (Pisa-Italy). I have a Master's degree in Electrical and Computer Engineering from Carnegie Mellon University. As a Ph.D. candidate, I'm interested in areas such as Low-code Engineering (LCE), and the Internet of Things (IoT) at the Edge/Fog/Cloud. Low-code software engineering approaches integrate theoretical and technical research in low-code software development platforms, MBSE, cloud computing, and machine learning to automate the development of more advanced software in the domains such as system engineering, IoT, and cyber-physical systems. My current work focuses on developing a robust model-driven environment for developing, analyzing, and deploying engineering IoT systems leveraging low-code software engineering concepts.

EDUCATION



P.h.D in Information Science and Engineering

 Nov 2019 – Ongoing  [University of L'Aquila](#)
Interest: Low-code engineering & Domain-specific languages & IoT

M.Sc. in Electrical and Computer Engineering

 July 2017 – June 2019  [Carnegie Mellon University](#)
Interest: Software engineering & Machine Learning

B.Sc. in Electronics and Telecommunication Engineering

 Oct 2012 – June 2016  [College of Science and Technology-University of Rwanda](#)
Interest: Embedded Systems

PROFESSIONAL EXPERIENCE

Model-based software engineer

Intecs Solutions S.p.A

 December 2019-Current  Pisa,Italy

- Computer Science applications in Low-code engineering with MDE practices for engineering IoT systems.
 - Main developer of CHESIoT framework; an MDE environment for developing, analysis, and deployment of engineering IoT systems.
 - Model-based safety analysis of engineering IoT systems employing Fault Tree Analysis approaches.
 - Platform-specific code generators (C++/Arduino/ThingML).
 - Automatic deployment and monitoring of generated services.
- Technologies: Java, UML, EMF, Acceleo, Qvto, Xtext, ETL, Docker.*

Software Developer

WYS ltd

 Jan 2019 - June 2019  Kigali, Rwanda

- Software development with a Java-based development stack.
 - System integration framework with different multipurpose consumer services.
 - Reporting and software documentation.
- Technologies: Java, SpringBoot, JPA, Security, Thymleaf, JQuery and Bootstrap Docker,Postgres, MySQL*

Co-Founder & Developer

TaagMind Ltd

📅 September 2018 - October 2020

📍 Kigali, Rwanda

- TaagMind aim is to offer Augmented & Virtual reality (AR&VR) experience to client.
 - **Technologies used:** C#, Python, Unity3D, Node.js, React Frameworks, SparkAR Studio.
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Data Scientist (Internship)

Rwanda Revenue Authority

📅 May 2018 – September 2018

📍 Kigali, Rwanda

- Worked on Electronic Billing Machine (EBM) data to improve VAT tax payment compliance and service quality.
 - Developed a Machine Learning model to predict reporting behavior of EBM machines.
 - **Technologies used:** Python, Data-manipulation, Jupiter-notebook, Tableau, Flask
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Administrative Support Officer

Carnegie Mellon University - Africa

📅 Jan 2018 – May 2018

📍 Kigali, Rwanda

- General office support for various administrative functions of the organization.
-

Electronics & Repair Engineer

BBOXX Capital

📅 May 2016 – August 2017

📍 Kigali, Rwanda

- Efficiently provided a great working commitment to the company product refurbishment processes, unshipping, product quality check, and deployment to the market.
 - Close collaboration with the ongoing product design team to improve client satisfaction.
-

IT & Automation officer (Internship)

BRALIRWA - Part of Heineken

📅 May 2015 – August 2015

📍 Kigali, Rwanda

- Contributed to the design and implementation of new system wiring optimization of brewery expansion.
 - Effectively identified and fixed faults that arose in the company's electrical and automotive network.
-

RESEARCH EXPERIENCE

PAPERS

📅 2023

- "Comparison of Tree-based Machine Learning Algorithms to Predict Reporting Behavior of Electronic Billing Machines". Belle Fille Murorunkwere, Felicien Ihirwe, Idrissa Kayijuka, Joseph Nzabanita, and Dominique Haughton. 21 Pages. February 2023 *Journal: Information 2023*; Paper:140, Vol:14, Issue:3 DOI:<https://doi.org/10.3390/info14030140>
- "Supporting the model-based safety analysis for safety-critical IoT systems". Felicien Ihirwe, Katia Di Blasio, Davide Di Ruscio, Simone Gianfranceschi, and Alfonso Pierantonio. 23 Pages. May 2022 [\[UNDER REVIEW: Journal of Computer Languages\]](#) Pre-print available on request.
- "A model-driven environment for engineering multi-layered IoT systems". Felicien Ihirwe, Davide Di Ruscio, Simone Gianfranceschi, and Alfonso Pierantonio. 36 Pages. Feb 2023 [\[TO BE SUBMITTED: Journal of System and Software\]](#) Pre-print available on request.

📅 2022

- "Assessing the Quality of Low-Code and MDE Platforms for Engineering IoT Systems". Felicien Ihirwe, Davide Di Ruscio, Simone Gianfranceschi, and Alfonso Pierantonio. In *Proceedings of the 22nd IEEE International Conference on Software Quality, Reliability, and Security (QRS22)*. 12 Pages. November 2022. Available at SSRN: DOI: <http://dx.doi.org/10.2139/ssrn.4267269> [\[Online\]](#)

📅 2021

- "Cloud-based modeling in IoT domain: a survey, open challenges, and opportunities". Felicien Ihirwe, Arsene Indamutsa, Davide Di Ruscio, Silvia Mazzini, and Alfonso Pierantonio. In *the Proceedings of 2021 ACM/IEEE International Conference on Model Driven Engineering Languages and Systems Companion (MODELS 2021)*. October 2021 DOI: [10.1109/MODELS-C53483.2021.00018](https://doi.org/10.1109/MODELS-C53483.2021.00018).

- "A domain-specific modeling and analysis environment for complex IoT applications". Felicien Ihirwe , Davide Di Ruscio, Silvia Mazzini, and Alfonso Pierantonio. In the 7th Italian Conference on ICT for Smart Cities And Communities (I-CiTies'21). September 2021. [\[Online\]](#)
- "Towards an MQTT5 geo-location extension for location-aware applications". Felicien Ihirwe, Giovanni Iovino, and Davide Di Ruscio. In the 44th IEEE International Conference on Telecommunications and Signal Processing (TSP'21). DOI: [10.1109/TSP52935.2021.9522590](#). July 2021 [\[Online\]](#)
- "Towards a modeling and analysis environment for industrial IoT systems". Felicien Ihirwe , Davide Di Ruscio, Silvia Mazzini, and Alfonso Pierantonio. In the International Workshop on MDE for Smart IoT Systems co-located with Software Technologies: Applications and Foundations (MESS@STAF21) conferences. June 2021. [\[Online - DOI\]](#)
- "Model-based Analysis Support for Dependable Complex Systems in CHeSS". Alberto Debiasi, Felicien Ihirwe , Pierluigi Pierini, Silvia Mazzini, and Stefano Tonetta. In Proceedings of the 9th International Conference on Model-Driven Engineering and Software Development - MODELSWARD'21. ISBN 978-989-758-487-9; ISSN 2184-4348, pages 262-269. DOI: [10.5220/0010269702620269](#). February 2021 [\[Online\]](#)

📅 2020

- "Low-code Engineering for the Internet of things: A state of research". Felicien Ihirwe , Davide Di Ruscio, Silvia Mazzini, Pierluigi Pierini, and Alfonso Pierantonio. In Proceedings of the 23rd ACM/IEEE International Conference on Model Driven Engineering Languages and Systems: Companion Proceedings (MODELS'20). Article No.: 74 Pages 1–8 DOI:[10.1145/3417990.3420208](#). October 2020 [\[Online\]](#)

TEACHING EXPERIENCE

Carnegie Mellon University

📅 Fall 2018

📍 Kigali-Rwanda

- **Graduate Teaching Assistant:** 04-330 Foundations of Software Engineering and Problem Solving.

📅 July-Aug 2018, 2019, 2021 and 2022

📍 Kigali-Rwanda

- **Graduate Teaching Assistant:** Introduction to Linux-Java programming orientation course.

The African Centre of Excellence in Data Science (ACEDS)

📅 Fall 2019 and 2020

📍 Remote

- **Graduate Teaching Assistant:** DSC6231 Computer Systems and Data Analytics.

High school teaching (ACEC)

📅 February 2012 - June 2015

📍 Nyabihu-Rwanda (Part-time)

- **Teacher:** Mathematics and Physics for Advanced level studies.

PAPER REVIEWS CONTRIBUTIONS

- **External Reviewer:** [Journal of Object Technology \(JOT\)](#)
Topics: MDE, IoT, communication protocols, QoS.
- **Invited Reviewer:** [IET Software journal](#)
Topics: IoT and Machine learning applications, edge computing, communication protocols.
- **Shadow Program Committee:** [Mining Software Repositories conference \(MSR'21\)](#)
Topics: Mining android apps software repositories.

VOLUNTEER

- **Student Volunteer:** The 49th ACM SIGPLAN Symposium on Principles of Programming Languages ([POPL 2022](#)). 📅 Sun 16 - Sat 22 January 2022
- **Student Volunteer:** The 36th IEEE/ACM Int. Conf. on Automated Software Engineering ([ASE 2021](#)). 📅 Sun 14 - Sat 20 November 2021
- **Student Volunteer:** ACM / IEEE 24rd Int. Conf. on Model Driven Engineering Languages and Systems ([MODELS'21](#)) 📅 10-15 October 2021
- **Student Volunteer:** 25th ACM International Systems and Software Product Line Conference ([SPLC 2021](#)) 📅 Sept 6-11, 2021
- **Vice-president:** Energy and embedded system community - Carnegie Mellon university-Africa 📅 Dec 2017-Feb 2019

SPEAKER AT CONFERENCES

- "Cloud-based modeling in IoT domain: a survey, open challenges and opportunities" at the ACM/IEEE 24th Intl. Conf. on Model Driven Engineering Languages and Systems ([MODELS'21](#)) (**Speaker**) 📅 October 10 - 15, 2021
- "A domain-specific modeling and analysis environment for complex IoT applications" 7th" at the Italian Conference on ICT for Smart Cities and Communities ([I-CITIES 2021](#)) (**Speaker**) 📅 22-24 September 2021

- "Towards an MQTT5 geo-location extension for location-aware applications" at the 44th IEEE International Conference on Telecommunications and Signal Processing (TSP'21) (Speaker) 📅 July 26-28, 2021.
- "Towards a modeling and analysis environment for industrial IoT systems" at Software Technologies: Applications and Foundations conferences (MESS@STAF21'21) (Speaker) 📅 21-25 June 2021.
- "Low-code Engineering for the Internet of things: A state of research" at the ACM/IEEE 23rd Intl. Conf. on Model Driven Engineering Languages and Systems (MODELS'20) (Speaker) 📅 Oct 16-23, 2020

PROJECTS

Lowcomote (EU H2020-ITN n. 813884)

📅 November 2019-Current

📍 Pisa, Italy

Lowcomote aims to train a generation of professionals in the design, development, and operation of new LCDPs, that overcome the limitations above, by being scalable (i.e., supporting the development of large-scale applications, and using artifacts coming from a large number of users), open (i.e., based on interoperable and exchangeable programming models and standards), and heterogeneous (i.e., able to integrate with models coming from different engineering disciplines).

TECHNICAL SKILLS[*:BASIC]

Programming Language

Java, Python (Flask), Arduino, Node.js*, SQL, C/C++, Assembly*, MATLAB, EMF/UML/SysML, ETL, Aceleo, Xtext/Xtend*/Qvto*

SWD Framework

SpringMVC, SpringBoot, Flask, Django, PyTorch, Keras*, Unity3D

Data Science

Python/Matlab, Applied Machine Learning, Deep learning

Front-end

JQuery, Bootstrap, Thymeleaf, React360*, AngularJS*

Deployment

Docker(DockerFile, Docker Compose), Kubernetes*

Editor

Eclipse, IntelliJ IDEA, VS Code, Sublime, Vi

Linux

Linux Administration, Bash Scripting

OS

MacOS, Linux (Ubuntu, Kali), Windows

Database

MySQL, Postgres, MongoDB*

Languages

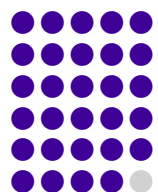
English, French, Italian*, Kinyarwanda, Kiswahili*

Driving Licence

B(EU)

INTEREST

Software Development Engineer
Research Scientist
Post-doctoral research
Model-based software engineer
Java Developer
Embedded System developer



ACADEMIC REFERENCES

Davide Di Ruscio

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University of L'Aquila
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[For more information, please visit <http://fhirwe.github.io/>] - Last Updated: February 2023