# Himanka Kalita

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PhD Researcher CV
Guwahati, India
LinkedIn
contact[at]himankalita[dot]one
Github
www[dot]himankalita[dot]one
(+91) 9365569248

## Summary

At present I am a Ph.D. researcher (expected European Doctorate Label) with Biometric Systems and Multimedia Forensics Lab in the Department of Industrial, Electronic, and Mechanical Engineering of Roma Tre University, Rome, Italy. I received my Bachelor of Technology degree in Computer Science and Engineering from Assam Don Bosco University, Guwahati, India, and my Master of Technology degree in Information Technology from North Eastern Regional Institute of Science and Technology, Itanagar, India. During my PhD, I was an Early Stage Researcher (ESR) for the project ENCASE, a H2020 Marie Curie RISE funded project, and has been associated as an ESR with CyRIC and Signal Generix, industries located in Cyprus. Between that, I was an ESR with Telefonica I + D premises in Spain. Apart from my ESR secondments, I was also involved in research, as an Erasmus+ UI/UX researcher intern for a startup named Time Village, which is based in Sweden. Earlier to my PhD, I worked as a simulations developer in the Department of Computer Science and Engineering of Indian Institute of Technology, Guwahati, India, for the research and development project, Integration and Maintenance of Virtual Lab, with the task of various engineering and science departments' lab experiments simulation development, code conversion, testing, and deployment.

## Research and Technical Interests

Currently during my PhD, I am invested in the research of state-of-the-art machine learning (ML) and deep learning (DL) models for mobile user recognition through behavioural biometrics, which comprises of traits such as touch dynamics, swipes, gait, signature, etc. Study and improvement of verification and identification systems' performance by tweaking ML/DL models, which analyses human behavioural data on mobile devices, is also included in my research. Quality mobile behavioural biometric research datasets are rare and I am contributing my solutions to this open research area. My broad research and technical areas of interests are mentioned below.

- Machine Learning, deep learning, behavioural biometrics
- Mobile behavioural profile and data analysis, synthetic data generation
- Image processing, image sharing and reconstruction, natural language processing,
- Android applications, VCS (Git), RESTful APIs, Advanced data analytics, Web component development
- Single-board computers, real time embedded systems, microprocessors

## Education

**Doctor of Philosophy** | ***Applied Electronics*** — Nov. 2017 – Nov. 2022
Università degli Studi Roma Tre — Rome, Italy

**Master of Technology** | ***Information Technology*** — Jul. 2013 – Jun. 2015
North Eastern Regional Institute of Science and Technology — Nirjuli, India

**Bachelor of Technology** | ***Computer Science and Engineering*** — Jul. 2009 – Jun. 2013
Assam Don Bosco University — Guwahati, India

## Work Experience

**Erasmus+ UI/UX Research Intern** — Jul. 2020 – Feb. 2021
Time Village — Stockholm, Sweden

- Defined personas including motivation, actions, channels.
- Defined journey sketch and empathy map, analysis of touchpoints.
- Selection of appropriate UX/UI tool, definition of the optimal UX was done.
- Analysed current UI and its implementation in the front end.
- Designed and defined new UI with verification, testing, and implementation of UI.

**Early Stage Researcher for ENCASE (EU H2020 Project)** Jul. 2019 – Aug. 2019
Signal Generix Limassol, Cyprus

- Our designed CNN architecture was fed with real but anonymized OSN data.
- OSN is online social networks. The output from CNN was logged and analyzed.
- We captured extreme cases that fell outside our real OSN activity using CNN.
- The system also relied on synthetically generated input data. ENCASE website.

**Early Stage Researcher for ENCASE (EU H2020 Project)** Sep. 2018 – Dec. 2018
Telefonica I+D Barcelona, Spain

- Provided security to personal and sensitive text content sharing in online websites.
- Part of PhD research was conducted on EEG brainwave data acquisition and analysis.
- We developed fake posts from a user's friend in social media specifically Facebook.
- While viewing fake post (good/bad news) by the user, we recorded their EEG data.

**Early Stage Researcher for ENCASE (EU H2020 Project)** May 2018 – Aug. 2018
CyRIC Nicosia, Cyprus

- Provided security to personal and sensitive text content sharing in online websites.
- Researched an NLP module to filter sensitive content from text to be posted online.
- Input text is supposedly the user's comment or message or any form of text.
- Successfully implemented a spring based RESTful API service for the NLP module.

**Administration Assistant** Mar. 2017 – Nov. 2017
Indian Institute of Technology Guwahati Guwahati, India

- Provided remote-access to virtual labs in various disciplines. VLabs website.
- Worked on code conversion, analysis, and testing based on C++ and CPPUnit.

**Computer Science Teacher** Mar. 2016 – Mar. 2017
Kendriya Vidyalaya IIT Guwahati Guwahati, India

- I taught HTML5, CSS, JavaScript, C++, Algorithms, and Computers Systems.
- Guided a high school science project with title "Disaster Management".

**Developer Summer Intern** Jun. 2012 – Jul. 2012
Indian Oil Corporation Limited Guwahati, India

- Developed a network subnet calculator with input, a sub-netted IP and its subnet mask.
- Output provides the detailed information of the whole subnet to which the IP belongs.

## Projects and Research

**Deep Learning for Biometric Recognition in Mobile Devices in Python** 2019 – 2022
Università degli Studi Roma Tre

**Biometric Recognition in Handheld Devices using GMM in Python** 2019 – 2020
Università degli Studi Roma Tre

**Classification of online social network (OSN) activity using CNN in Python**[1] 2019 – 2019
Signal Generix

**Study and classification of EEG brainwave using CNN in Python** 2018 – 2018
Telefonica I+D

**Development/integration of NLP module for filtering sensitive text content in Python**[1] 2018 – 2018
CyRIC

**Virtual Labs Integration Project Phase 2 using HTML5, CSS3, JavaScript, and C++** 2017 – 2017
Indian Institute of Technology Guwahati

**Reversible Secret Image Sharing in MATLAB, Master's thesis project** 2014 – 2015
North Eastern Regional Institute of Science and Technology

**Android based GSM Home Security System in JAVA/C++, Bachelor's thesis project** 2012 – 2013
Assam Don Bosco University

**IPv4/v6 Network Subnet calculator in JAVA, Bachelor's internship project** 2012 – 2012
Assam Don Bosco University

[1] Modules of ENCASE project

## Publications


[1] H. Kalita, E. Maiorana, and P. Campisi. "Keystroke Dynamics for Biometric Recognition in Handheld Devices". In: *2020 43rd International Conference on Telecommunications and Signal Processing (TSP)*. Paper **link**. 2020, pp. 410–416. DOI: 10.1109/TSP49548.2020.9163524.

[2] H. Kalita, M.M. Singh, and T. Tuithung. "A Reversible Secret Image Sharing Scheme in Matrix Projection Using Discrete Haar Wavelet Transform". In: *2015 National Conference on Computing, Communication and Information Processing (NCCCIP)*. Paper **link**. 2015, pp. 105–111.

[3] E. Maiorana, H. Kalita, and P. Campisi. "Deepkey: Keystroke Dynamics and CNN for Biometric Recognition on Mobile Devices". In: *2019 8th European Workshop on Visual Information Processing (EUVIP)*. Paper **link**. 2019, pp. 181–186. DOI: 10.1109/EUVIP47703.2019.8946206.

[4] Emanuele Maiorana, Himanka Kalita, and Patrizio Campisi. "Mobile keystroke dynamics for biometric recognition: An overview". In: *IET Biometrics* 10.1 (2021). Paper **link**, pp. 1–23. DOI: https://doi.org/10.1049/bme2.12003.

[5] R. K. Sharma et al. "Android interface based GSM home security system". In: *2014 International Conference on Issues and Challenges in Intelligent Computing Techniques (ICICT)*. Paper **link**. 2014, pp. 196–201. DOI: 10.1109/ICICICT.2014.6781278.


## Skills

**Operating System**: Windows, Linux
**Languages**: Assamese (Native), Hindi (B2), English (C2), Italian (A1)
**Programming**: Python, Kotlin, C, C++, MATLAB, Java
**Web Technologies**: HTML5, CSS3, JavaScript, JSON, RESTful APIs
**Database**: MySQL, Firebase for Android, MongoDB
**Document Creation**: LaTex, Microsoft Office Suite, Swagger UI
**Machine/Deep Learning Frameworks**: SciKitLearn, CUDA, Tensorflow, PyTorch, Keras

## References

References available upon request.