MÉMOIRE

En vue de l'obtention du diplôme de **Master**

Filière : **Informatique**

Spécialité : **Ingénierie des Systèmes Informatiques (ISI)**

Thème :

Artificial Intelligence and Embedded Systems

Présenté par **:**

M BOUNAB Abdelmounaim

Soutenu le : **10/09/2023**   Devant le jury composé de :

- M RAHMOUN Abdellatif   Président
- M BENSENANE Hamdane   Encadreur
- M BENDAOUD Fayssal   Examinateur

Année Universitaire : 2022 / 2023

Acknowledgment

First and foremost we sincerely thank the almighty God for his guidance, grace, knowledge and Sustenance during this academic journey, so that I have been finally able to accomplish this thesis.

I would like to express my deepest gratitude and appreciation to all those who have contributed to my journey as a Computer Science Engineer, culminating in the achievement of not just one, but two prestigious diplomas: a Master's Degree (Master 2) and an Engineering Degree (Ingéniorat). This significant accomplishment would not have been possible without the support, guidance, and encouragement of numerous individuals and institutions.

First and foremost, I extend my heartfelt thanks to my advisors, professors, especially supervisors Prof. RAHMOUN Abdellatif and Dr. BENSENANE Hamdane and Dr. ABIB Ghalid and Prof. AFIFI Hossam who have imparted their knowledge and expertise throughout my academic pursuit. Their unwavering commitment to excellence, their dedication to teaching, and their willingness to guide and challenge me have been instrumental in shaping my intellectual growth and shaping my future as a Computer Science Engineer.

I am deeply grateful to my family for their unconditional love, unwavering belief in my abilities, and constant encouragement especially my Father, my Mother, my Brother and Sisters, my uncles. Their support has been a constant source of strength and motivation during challenging times , and I am truly fortunate to have them by my side , i would also like to extend my appreciation to my classmates and friends .

Additionally , I am indebted to the academic institutions that have provided me with the opportunity to pursue my education and earn these esteemed diplomas . The faculty , staff, and administration have worked tirelessly to create an environment conducive to learning and innovation, and I am honored to have been a part of their academic community.

Finally, I would like to express my gratitude to the broader computer science community, both locally and globally. The ever-evolving field of computer science constantly inspires me, and the advancements and breakthroughs made by researchers and practitioners continue to push the boundaries of what is possible. I am humbled and grateful to be a part of this vibrant and dynamic discipline.

Thank you all for your unwavering support and for being an integral part of my academic and personal growth.

Bounab Abdelmounaim

IV Acronyms

AI	Artificial Intelligence
LSTM	Long Short Term Memory
NNs	Neural Networks
TL	Transfer Learning
RNNs	Recurrent Neural Networks
MCU	Microcontroller Unit
IoT	Internet of Things
SoC	System on Chip
ESP-IDF	Espressif IoT Development Framework
BLE	Bluetooth Low Energy
GPIOs	General Purpose Inputs/Outputs
ADC	Analog to Digital Conversion
SDK	Software Development Kit
FPGAs	Field Programmable Gate Arrays
TinyML	Tiny Machine Learning
IDE	Integrated Development Environment
VS Code	Visual Studio Code
ASICs	Application Specific Integrated Circuits
RTOS	Real Time Operating System
ASMP	Asynchronous Multiprocessing
PULP	Parallel Ultra Low Power
ISA	Instruction Set Architecture
VPU	Vector Processing Unit
CNN	Convolutional Neural Network
MAC	Multiplication and Accumulation

BNN	Binary Neural Networks
MLP	Multilayer Perceptrons
GRU	Recurrent Gate Unit
DNN	Deep Neural Networks
MAE	Mean Absolute Error
FPU	Floating Point Unit
BLE	Bluetooth Low Energy
QLR-CL	Quantified Latent proofreading with Continuous Learning
SVM	Support Vector Machines
RL	Logistic Regression
KNN	K-Nearest Neighbors
NB	Naïve Bayes
DTC	Decision Tree Classification
ReLU	Rectified Linear Units
mLSTM	Multiplicative LSTM
mRNN	multiplicative recurrent neural network
BLSTM	Bidirectional Long Short-Term Memory
DLSTM	Dense LSTM
GRU	Gated Recurrent Unit
RMSE	Root Mean Square Error
KPI	Key Performance Indicator
BP	Backpropagation