

## PERSONAL INFORMATION

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## PROFESSIONAL SUMMARY

A PhD degree graduate, dedicated and hardworking experienced senior engineer and researcher in the area of nonlinear multi-agent systems control, robotics, machine learning and computer vision. He has ample experience on image processing and recognition, data pre-processing, classification and visualization, deep neural networks, recurrent neural networks(RNN) learning, convolutional neural network (CNN), signal processing, digital circuit design and related areas with five publications, about one year experience as a postdoctoral researcher and five and half years' experience as a lecturer and leadership positions.

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## WORK EXPERIENCE

**Starting August 2023**

### Visiting Assistant Professor

Informatics and Analytics Programs(PHIT), Jackson State University, Jackson, Mississippi, USA

**September 2021 to July 2022**

### Post-doctoral Fellow

Department of Electrical Engineering, National Taiwan University of Science and Technology, Taipei, Taiwan.

**Fall Semesters 2018, 2019, 2020**

### Teaching Assistant

Department of Electrical Engineering, National Taiwan University of Science and Technology, Taipei, Taiwan.

**August 2011 to February 2017**

### Lecturer, Dean, Acting Vice President

Department of Electrical and Computer Engineering, Adigrat University, Adigrat, Tigray, Ethiopia

- Taught more than 10 undergraduate courses, November 2011-February 2017
- Served as a dean of College of Engineering & Technology at Adigrat University for more than 3 years, January 2012-November 2013 & November 2015-February 2017

- Served as Acting Vice President for Administration of Adigrat University for about 2 years, November 2013-August 2015.
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## EDUCATION & TRAINING

August 2022 to April 2023

### Online Bootcamps and Courses Trainings

While waiting for approval of Employment Authorization Document(EAD) card, used the time to take the following Bootcamps and courses

1. Five Weeks Data Science Bootcamp
  - a. Accomplished health related projects and challenges
    - Predicting heart disease using Logistic Regression
      - ✓ Data set: Residents of the town of Framingham, Massachusetts.
    - Performance Evaluation, Cross Validation and Hyper-Parameter Tuning of Machine Learning Models
      - ✓ Data set: Diabetes data set of the University of California, Irvine.
    - Prediction of survival of passengers using decision tree
      - ✓ Data set: Titanic disaster data set from kaggle.
    - An AI/ML model that predict the chances of survival of a patient after 1 year of treatment of a hospital in Greenland.
      - ✓ Data set: the patient records collected from a hospital in Greenland.
  - b. Accomplished business and human resources related projects
    - Predicting Retention of employees using Logistic Regression
      - ✓ Data set: HR\_Comma\_sep.csv from kaggle.
    - Predicting E-Commerce Product Recommendation Ratings from Reviews
      - ✓ Data set: Women's Clothing E-Commerce dataset from kaggle.
    - Fraud Detection of debt and credit cards using Random Forest
      - ✓ Data set: IEEE-CIS Fraud Detection
2. Data Visualization with Matplotlib Bootcamp
  - Data analysis and visualization on the effect of COVID-19 on world happiness
    - ✓ Data set: The World Happiness Report 2021 that focuses on the effects of COVID-19 on the structure and quality of people's lives, and evaluate how governments all over the world have dealt with the

pandemic.

### 3. Data Science with Python

- Predicting diabetes using Logistic Regression
  - ✓ Data set: Pima Indians Diabetes Database available on kaggle.
- Car Price Prediction using Linear Regression
  - ✓ Data set: 1985 Automobile dataset available on kaggle.

### 4. Unsupervised Learning Bootcamp

- Facebook Live selling clustering using k-means clustering
  - ✓ Data set: Facebook Live Sellers in Thailand curated in UCI Machine Learning Datasets.
- Hierarchical Clustering on Violent Crime Rates of US states
  - ✓ Data set: Arrests per 100,000 residents for assault, murder, and rape in each of the 50 US states in 1973.

### 5. Pandas Bootcamp

- Exploratory Data Analysis (EDA) on COVID-19 Data
  - ✓ Data set: COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University.

### 6. SQL for Data Science

#### February 2017 to June 2021 **PhD in Electrical Engineering**

National Taiwan University of Science and Technology, Taipei, Taiwan

- Title of PhD dissertation: *Formation and Cooperative Adaptive Tracking Designs of Nonlinear Dynamic Multi-agent Systems and Their Applications*

#### September 2009 to September 2011 **M.Sc. in Microelectronic Engineering**

Addis Ababa University, Addis Ababa, Ethiopia

- Title of MSc. Thesis: *Carbon Nanotube Field Effect Transistors-based Ternary Logic Gates and Combinational Circuits Design*

#### October 2005 to July 2009 **B.Sc. in Electrical Engineering**

Mekelle University, Mekelle, Tigray, Ethiopia

- Title of B.Sc. Degree Final year project: *Eye Movement Communication for Physically Disabled Persons*
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## JOB RELATED SKILLS

- Analytical and problem solving skills
- Experience with deep neural networks, vision processing, recurrent neural networks(RNN) learning, convolutional neural network (CNN), multilayer perceptron(MLP)
- Excellent at data pre-processing, classification and visualization using Python modules such as NumPy, Pandas, Matplotlib, seaborn, Scikit-learn
- Advanced knowledge of machine learning best practices and evaluation metrics
- Firm grasp of mathematics, probability and statistics
- Fluent in multiple programming languages, including Python, C, C++, Matlab, HSPICE, PSPICE, VHDL, Verilog HDL
- Solid understanding of adaptive control methods such as nonlinear, fuzzy and PID
- Solid knowledge on signal processing, image processing and recognition
- Excellent at digital circuit design and simulation
- Teaching
- Team work
- Leadership
- Preparation of strategic plan

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## SUMMARY OF WORKS ON HEALTH APPLICATIONS

1. Predicting heart disease using Logistic Regression
  - Data set: Residents of the town of Framingham, Massachusetts.
2. An AI/ML model that predict the chances of survival of a patient after 1 year of treatment of a hospital in Greenland using Random Forest and XGB Classifiers.
  - Data set: the patient records collected from a hospital in Greenland.
3. Data analysis and visualization on the effect of COVID-19 on world happiness
  - Data set: The World Happiness Report 2021 that focuses on the effects of COVID-19 on the structure and quality of people's lives, and evaluate how governments all over the world have dealt with the

pandemic.

4. Predicting diabetes using Logistic Regression

- Data set: Pima Indians Diabetes Database available on kaggle.

5. Performance Evaluation, Cross Validation and Hyper-Parameter Tuning of Machine Learning Models

- Data set: Diabetes data set of the University of California, Irvine.

6. Exploratory Data Analysis (EDA) on COVID-19 Data

- Data set: COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University.

7. Prediction of survival of passengers using decision tree

- Data set: Titanic disaster data set from kaggle.

8. Screening retinal damage from diabetes by deep learning

- Data set: high-resolution retina images taken under a variety of imaging conditions available on kaggle.

9. Eye Movement Communication for Physically Disabled Persons

- The objective of this project is to help physically disabled patients who do not have moveable body parts except their eye. In this case, the patients can use their eye movement to express their needs. After getting the output of the movement of their eye using image-processing techniques, someone can assist them to fulfil their needs.

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**LANGUAGE SKILLS**

Mother tongue(s)

Tigriyna

Other language(s)

English

Full Professional Proficiency

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**TEACHING EXPERIENCE**

1. Department of Electrical and Computer Engineering, Adigrat University, Adigrat, Ethiopia

- Taught about 10 under graduate courses such as Fundamental of Electrical Engineering, Applied Electronics I & II, Digital Logic Design, Signal and Systems, Electrical Engineering Materials, Microelectronics Circuits, Research Methods, VLSI Design and Embedded Systems.
- Prepared course plan for all of the courses.

- Assessed the students continuously and gave feedback on time
  - Prepared teaching material for the course of Electrical Engineering Materials and laboratory manual for Digital Logic Design course.
  - Participated as a core member of national modular curriculum development team for Ethiopian Universities
  - Carried out laboratory sessions and additional tutorial classes
2. Department of Electrical Engineering, National Taiwan University of Science and Technology
- Assisted my professor for the course digital design in solving and correcting assignment and exam problems for third year students keeping record of the assessment for the course.
  - Carried out a weekly two-hour face-to-face tutorial class for the students.
  - Assigned consultation hour for the students to ask any difficulty on the course

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## LEADERSHIP EXPERIENCE

Adigrat University, Adigrat, Tigray Ethiopia

### 1. As a dean of College of Engineering and Technology

- Managed the day to day academic activities of the college by preparing annual plan and strategic plan for
  - ✓ about 400 students with more than 45 employees, 01/2012-09/2012
  - ✓ about 2,000 students with more than 200 employees, 10/2012-11/2013
  - ✓ about 6,000 students with more than 500 employees, 11/2015-02/2017
- Worked hard for the establishment of laboratories for the departments under the college

### 2. As an Acting Vice President for Development of Adigrat University

- Managed the day to day administrative activities of the university by preparing strategic plan and annual plan of the office with intake capacity of the university was doubled to
  - ✓ More than 16,000 students (regular more than 12,000 and extension more than 4000) with about 2,000 employees.
- Prepared balanced score card strategic plan for the university
- Prepared bid document of the university based on procurement manual

- Managed the overall financial flow of the university.

### 3. Membership of different committee

- Served as chair and member of more than 15 standing and ad-hoc committee of the university, 10/2011-02/2017

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## RESEARCH EXPERIENCE

### 1. Addis Ababa University, Addis Ababa, Ethiopia, 2009-2011

- Designed Carbon Nano-tube Field Effect Transistors(CNFET)-based Ternary logic gates and combinational circuits
- Implemented simulation work of the thesis using HSPICE.
- Carried out weekly progress report and final thesis write-up

### 2. Adigrat University, Adigrat, Tigray, Ethiopia, 2011-2017

- Advised graduating class students on their final year projects and mini projects
- Participated in web page development team for Adigrat city administration in 2012
- Prepared conference paper as continuation of the M.Sc. thesis study and presented at Wollega University, Nekemte, Ethiopia in 2016.
- Worked as university level research proposal evaluator committee

### 3. National Taiwan University of Science and Technology, Taipei, Taiwan

#### **Ph.D. Student, 02/2017-06/2021**

- Published four papers in total during the Ph.D. study, three of them are included in the Ph.D. dissertation.
- Developed the corresponding codes of the papers in C, C++, Matlab and Python.
- Carried out simulation work and article write-up of all the papers given on the publication list section.
- Presented weekly progress report of the research work.
- Reviewed two research articles.
- Supported M.Sc. students on their research work.

#### **Postdoctoral research fellow, 09/2021-07/2022**

- Developed programming codes for fractional order nonlinear control of

formation of multi-agent UAVs using C, C++ and Matlab.

- Conducted simulation and wrote research articles for publication.
- Supported M.Sc. students on their research work.
- Reviewed more than five research articles from the IEEE and other publishers
- Active participation on monthly presentation of research collaboration work among universities and industries in Taiwan.

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## PUBLICATIONS

1. C.-L. Hwang and **H. B. Abebe**, "Generalized and Heterogeneous Nonlinear Dynamic Multiagent Systems Using Online RNN-Based Finite-Time Formation Tracking Control and Application to Transportation Systems," *IEEE Transactions on Intelligent Transportation Systems*, vol. 23, no. 8, pp. 13708-13720, Aug. 2022.
2. **H. B. Abebe**, C.-L. Hwang, B.-S. Chen, F. Wu, and C. Jan, "Recurrent neural network with fractional learning-based fixed-time formation tracking constrained control for a group of quadrotors," *IEEE Access*, vol. 9, pp. 81399-81411, May 2021.
3. C.-L. Hwang, **H. B. Abebe**, B. S. Chen, and F. Wu, "Fuzzy adaptive finite-time formation tracking saturated control of nonlinear multiagent systems and its application," *IEEE Access*, vol. 8, pp. 105507-105520, Jun. 2020.
4. **H. B. Abebe** and C.-L. Hwang, "RGB-D face recognition using LBP with suitable feature dimension of depth image," *IET Cyber-Phys. Syst., Theory Appl.*, vol. 4, no. 3, pp. 189–197, Oct. 2019.
5. **H. B. Abebe** and C. -L. Hwang, "A Finite-Time Trajectory Tracking Control for a Hexa-rotor with Uncertainty and Actuator Fault," *2022 International Conference on System Science and Engineering (ICSSE)*, 2022, pp. 094-099.

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## ACCOMPLISHED RELATED PROJECTS

1. **Project name:** Human Robot Interaction  
**Funding amount:** NTD 1,500,000 (about \$50,000) from Ministry of Science and Technology, Taiwan (R.O.C).  
**Funding Period:** 08/2018-07/2020.



**Project Owner:** Professor Chih-Lyang Hwang, Intelligent Robot Laboratory (IRL), Department of Electrical Engineering, National Taiwan University of Science and Technology(NTUST)

**Task:** Face recognition from low-resolution red, green, and blue-depth (RGB-D) cameras acquired images

**Data set:** More than 23,000 RGB-D face images of the IIIT-D RGB-D database, the VAP RGB-D-T facial database, the EURECOM database and the authors' database.

- Published article number 4 in the publication list during his PhD study by accomplishing the following activities of the article
  - Built NTUST\_IRL RGBD of 45 different subjects consists of 2953 images under various conditions using visual studio and OpenCV.
  - Conducted pre-processing images of the four data bases used in the experiment.
  - Developed the necessary C++ and Matlab codes for the task.
  - Performed face recognition task using local binary pattern (LBP) for feature extraction and multiclass support vector machines (MSVMs) for the off-line training and validation, and then the online classification, which is a remarkable example of machine learning.
  - Carried out write up of the research article.
  - The results obtained in this paper was excellent and served as a benchmark for successful accomplishment of other tasks of the project.

2. **Project name:** Nonlinear Multi-agent Systems and their Applications

**Funding amount:** NTD 2,000,000 (about \$69,000) from Ministry of Science and Technology, Taiwan (R.O.C).

**Funding Period:** 08/2020-07/2022.

**Project Owner:** Professor Chih-Lyang Hwang, Intelligent Robot Laboratory (IRL), Department of Electrical Engineering, National Taiwan University of Science and Technology(NTUST)

**Task:** Formation control of multi-agent systems with recurrent neural network (RNN) adaptive learning.

- Published article 1 and 2 & carried out the following tasks

- Developed the C++ and Matlab codes for the two papers including the RNN adaptive learning.
- Performed simulation task for the two papers.
- Wrote the result and discussion part of the two papers.

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**ACCOMPLISHED RELATED  
AI/ML CHALLENGE**

**Boot Camp:** Five weeks of Data Science (AI planet)

**Challenge Overview:** A hospital in the province of Greenland has been trying to improve its care conditions by looking at historic survival of the patients. They tried looking at their data but could not identify the main factors leading to high survivals.

**Task:** Hired as the best data scientist in Greenland to solve this problem and develop a model that predict the chances of survival of a patient after 1 year of treatment.

**Data set:** The data set contains the patient records collected from a hospital in Greenland.

- Procedures followed to solve the AI/ML challenge
  - Pre-processing for missing values of nominal categorical data (replacing missing values by the most frequent value)
  - Dropping variables that don't have any impact on the target variable from the list of predictors
  - Solving the problem using RandomForestClassifier and XGBClassifier (From experience these are excellent classifiers)
  - Based on F1 validation score XGBClassifier performed better and the trained model was used to predict the test data set.

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**ACCOMPLISHED RELATED  
MINI PROJECTS**

1. **Course name:** Computer Vision (National Taiwan University of Science and Technology)

**Mini projects carried out**

- Gender Classification based on Facial Attribute
- Object detection
- Age Estimation

2. **Course name:** Deep Learning with convolutional neural network (CNN) (National Taiwan University of Science and Technology)

### **Mini projects carried out**

- Handwritten digits recognition for the MNIST dataset
- Screening retinal damage from diabetes by deep learning

3. **Course name:** Machine Learning Algorithms (National Taiwan University of Science and Technology)

### **Mini projects carried out**

- Data classification using clustering and perceptron algorithms
- Linear regression weights estimation using Genetic Algorithm

4. **Course name:** Neural Fuzzy System (National Taiwan University of Science and Technology)

### **Mini projects carried out**

- Face Recognition using Principal Component Analysis (PCA) & Neural Network
- Modelling of data obtained from sensor using Multilayer Perceptron (MLP)

5. **Course name:** Data Science with Python (Great learning online course)

### **Mini projects carried out using Jupyter notebook**

- Diabetes prediction using Logistic Regression
  - ✓ Data set: Pima Indians diabetes
- Car Price prediction using Linear Regression
  - ✓ Data set: Automobile data set of the University of California, Irvine.

6. **Boot camp:** Five weeks Data Science (AI planet)

### **Mini projects carried out using Jupyter notebook**

- Predicting Heart Disease using Logistic Regression
  - ✓ Data set: Residents of the town of Framingham, Massachusetts
- Performance Evaluation, Cross Validation and Hyper-Parameter Tuning
  - ✓ Data set: Diabetes data set of the University of California, Irvine.
- Prediction of survival of passengers using decision tree

✓ Data set: Titanic disaster data set from kaggle

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**PRIZES, AWARDS AND FELLOWSHIPS**

1. Postdoctoral Research Fellow, Ministry of Science and Technology, Taiwan (R.O.C), 09/2021-07/2022.
2. Living Grant for International Graduate Students of CTCI Foundation Science and Technology Scholarship for Research and Academic Excellence in 2020: Award amount NTD 100,000(about \$3500).
3. Full Scholarship from National Taiwan University of Science and Technology for Ph.D. study, 02/2017-06/2021.
4. Received commendation letter for the acting vice president role from the president of Adigrat University in 2016.

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**INVITED PRESENTATIONS**

1. **Title:** A Finite-Time Trajectory Tracking Control for a Hexa-rotor with Uncertainty and Actuator Fault  
**Authors:** H. B. Abebe and C. -L. Hwang  
**Name of the conference:** 2022 International Conference on System Science and Engineering  
**Place:** National Chung Hsing University, Taichung, Taiwan.  
**Date of the conference:** May 26-29/2022
2. **Title:** Design and Simulation of Carbon Nanotube Field Effect Transistor (CNFET)-based Ternary Combinational Circuits with reduced Power Delay Product (PDP)  
**Author:** H.B. Abebe  
**Name of the conference:** Advancing and Shaping the Future of Science, Technology and Innovation in Ethiopia  
**Place:** Wollega University, Nekemte, Ethiopia  
**Date of the conference:** May 13 & 14/2016

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**REFERENCES**

1. Professor Chih-Lyang Hwang, Professor, National Taiwan University of Science and Technology, E-mail: [clhwang@mail.ntust.edu.tw](mailto:clhwang@mail.ntust.edu.tw)
2. Teklemariam Tesfay (Ph.D.), Cybersecurity Engineer, NASA Jet Propulsion Laboratory Pasadena, CA 91109, E-mail: [tesfay@jpl.nasa.gov](mailto:tesfay@jpl.nasa.gov)
3. Fitwi, Alem H. (Ph.D.), SW & Algorithm Engineer for RL Manufacturing

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