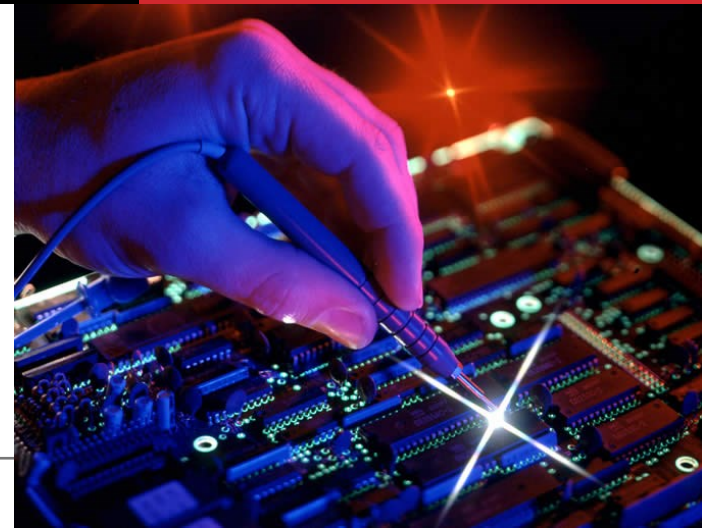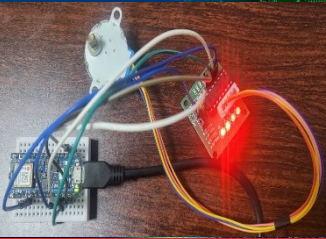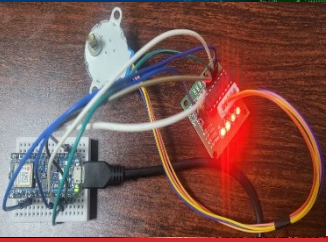# Robotics

INTRODUCTION

Dennis A. N. Gookyi
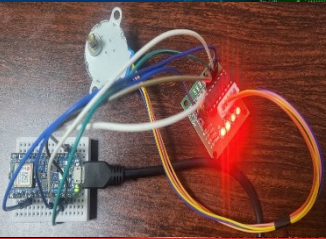
CONTENTS

❖ **Course Organization and Syllabus**

INSTRUCTOR

❖ Instructor

☐ Name: Dennis Agyemanh Nana Gookyi

☐ Email: dennisgookyi@gmail.com

☐ Phone: 0203493435

☐ Research Portals:

- https://www.researchgate.net/profile/Dennis-Gookyi
- https://sites.google.com/view/eisedlab

INSTRUCTOR

❖ Instructor

Education

- Ph.D. in Information and Communication Engineering, Hanbat National University, South Korea, 2021.

- M.Eng. in Information and Communication Engineering, Hanbat National University, South Korea, 2017.

- B.Sc. in Computer Engineering, Kwame Nkrumah University of Science and Technology, Ghana, 2009.

Employment

- Research Scientist, CSIR-INSTI, Ghana, 2022 – Present.

- Researcher, Korea Electronics Technology Institute (KETI), South Korea, 2021 – 2022.

- Research and Teaching Assistant, SoC Design Lab, Hanbat National University, South Korea, 2014 – 2021.

- RTL Design Engineer, Future Systems, South Korea, 2015 – 2016.

- Teaching Assistant, Computer Engineering Department, Kwame Nkrumah University of Science and Technology, Ghana, 2013 – 2014.
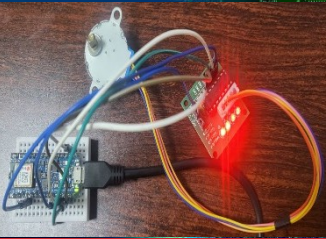
LEARNING OUTCOMES

❖ Expected Learning Outcomes

- ☐ Learn about an approach to lowering the cost of robotics by leveraging recent advances in edge machine learning (ML) using low-cost microcontrollers

- ☐ Learn about how to enable modern ML-powered robotics stacks to run on ultra-low-cost tiny robots

- ☐ Learn to develop techniques to run sophisticated algorithms on ultra-low-cost robot hardware
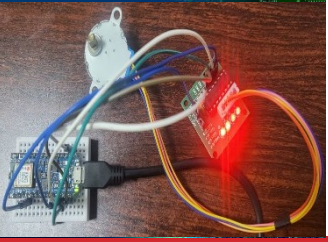
PREREQUISITES AND GRADING

❖ Prerequisite

  ☐ Inclination toward computer programming

  ☐ Inclination towards Digital Systems Design

  ☐ Engineering mindset

  ☐ Inquisitive about the physical world

❖ Grading scheme: Homework (10%), Participation (5%), Project (15%), Exam (70%)

  ☐ Homework: hybrid grading show your work in class

  ☐ Participation: attendance, ask questions, answer questions, be active

  ☐ Project: non-trivial implementation of something useful by applying knowledge including and beyond what's learned in class
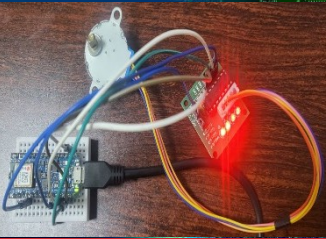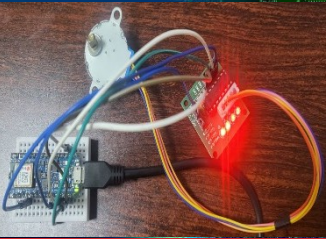
LEARNING APPROACH

❖ Learning approach:

 ☐ Type up your own code, and make it work on your device

 ☐ Learn from sample code, assimilate then modify, integrate, or extend

 ☐ Be ready to show your work
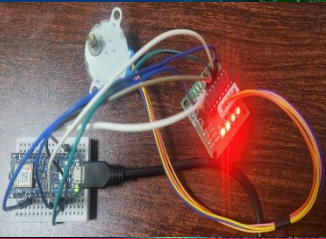
 ☐ Read manuals and product specification documents

COURSE OUTLINE

❖ Schedule

Lecture	Topic
01	Course Overview
02	Course Hardware and Software Toolchain Setup
03	Overview of Tiny Machine Learning
04	Overview of Tiny Robot Learning
05	Overview of Edge Impulse Platform for Tiny Robot Learning
06	Hands-on Project: Creating a Voice Controlled Robotic Subsystem
07	Class Project: Advanced Anomaly Detection in Robotic Systems

TEXTBOOKS AND LINKS

❖ Textbook and Links

- ☐ https://www.tensorflow.org/lite
- ☐ https://www.edgeimpulse.com/
- ☐ https://micropython.org/
- ☐ https://www.adafruit.com/
- ☐ https://www.arduino.cc/
- ☐ https://tinyml.seas.harvard.edu/SciTinyML-24/
- ☐ https://tinyml.seas.harvard.edu/

INTRODUCTION TO

AI ROBOTICS

ROBIN R. MURPHY

TinyML
Cookbook

Combine artificial intelligence and ultra-low-power
embedded devices to make the world smarter

Gian Marco Iodice
Foreword by Ronan Naughton, Senior Product Manager for Machine Learning, Arm