Edge AI – Principles and Practices

Scope
The full course is based on the development of 4 module, 9 units and 11 labs (L0-L10), which will cover the fundamental algorithms and typical applications in Edge AI, following a case-study format and fitting a typical semester course.

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Platform
BeagleBone AI 64 board running Imagination's Neural Compute Software Development Kit (NC-SDK-AC)

Audience
3rd year BSc EE and CS Students

Languages
English, Chinese (simplified) to follow

Week	Lecture Topic	Details
Module 1. Introduction to Edge AI	1. Introduction and Getting Started	Introduction to Edge AI and the experimental platform
		Lab 0: Getting started with the Pumpkin board
	2. Data acquisition and processing on the Edge	Image processing fundamentals
		Lab 1: Image acquisition and processing with OpenCV
	3. Introduction to Machine Learning on the Edge	Introduction to Machine Learning, the IMG Neural Compute SDK and the IMGDNN library
		Lab 2: First steps with the NCSDK
		Lab 3: My first Neural Network on the Pumpkin board
		Lab 4: My first Neural Network with imgDNN
Module 2. Image vision	4.Image classification	Image classification on edge device
		Lab 5: Image classifier example on the Pumpkin board
	5. Image segmentation	Image segmentation on Edge devices
		Lab 6: Semantic image segmentation on the Pumpkin board
	6. Object detection	Object detection on Eedge devices
		Lab 7: SSD person detection on the Pumpkin board
Module 3. Speech and natural language processing	7. Automatic Speech Recognition (ASR)	Automatic Speech Recognition for Edge Devices
		Lab 8: Voice control of the Pumpkin board
	8. Natural Language Processing (NLP)	NLP Fundamentals
		Lab 9: Automatic question answering on the Pumpkin board
Module 4. Advanced topics	9: Advanced NCSDK and OpenCL usage.	Advanced NCSDK and OpenCL usage.
		Lab 10: OpenCL-based pre- and post-processing

Imagination university programme

Imagination

IUP Website

The focal point to access our services is the IUP website: teaching materials, video tutorials, forums, suggested hardware, recommended textbooks, pictures, news, and workshop + event listings.

Joining the IUP

Visit Imagination University Programme website: university.imgtec.com

Click Register on the menu bar

Fill in the registration form. Please make sure you fill in the items with green star

After submission, you will receive an email to set up your password

Requesting teaching materials

Request the materials you want

Tell us what you plan to do

We will assess and respond to your request within 3 working days
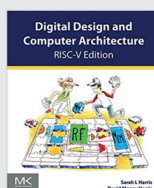
Once approved, you will receive an email with the download link. Be quick - this link is only valid for 3 days
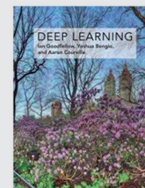
Useful Textbooks

Computer Graphics: Principles and Practice (3rd Edition)

John F. Hughes & Andries van Dam
Available in Chinese and English

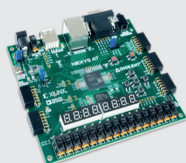### Digital Design & Computer Architecture (RISC-V Edition)

Sarah Harris & David Harris - Sept'21
Available in Chinese and English

### Deep Learning (Adaptive Computation and Machine Learning series)

Ian Goodfellow, Yoshua Bengio, Aaron Courville
Available in Chinese and English

Hardware Tools

Digilent Nexys A7-100T

Based on Xilinx Artix®-7 FPGA. The -100T can ahold the Western Digital SweRV softcore. 7-segment digital displays & rich I/O make it a great fit for computer architecture labs. The older Nexys 4 DDR is also suitable.
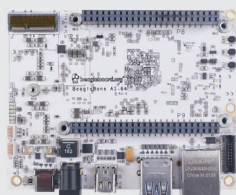
BeagleBone® AI-64

This new BeagleBoard.org® features a PowerVR 8XE (GE8430) GPU, an Arm A72 CPU and a C7x DSP. Based around a TI Jacinto TDA4VM SoC, running Yocto or Debian, it's an easy way to access an Imagination GPU running full Open CL. Together with Imagination's Neural Compute SDK Academic Edition, it is an excellent platform to explore Edge AI applications.
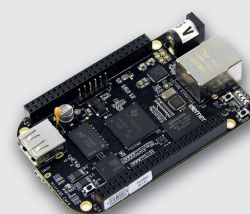
BeagleBone® Black

The BeagleBone Black from beagleboard.org is based on the TI AM335x Arm Cortex-A8 processor 512MB DDR3 RAM, PowerVR SGX530 GPU with 3D graphics accelerator, microSD card,HDMI, Ethernet, USB 2.0, 2x PRU 32-bit microcontrollers