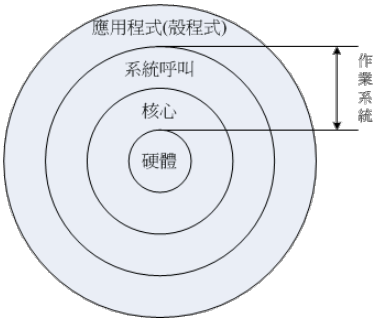
Getting Started in HCLab

Our experimental equipments are based on **Linux**.
So we need to know how to use this operating system well, including computer architectures, the concept of OS, building and being skilled in **Linux** environment.
There are three research objectives of our lab: **machine learning**, **internet of things** and **parallel computing**.

Linux

Computer Architecture



- Hardware - CPU, RAM, HDD... (DIY computer)
  - 原價屋
- Software - OS...
  - The concept of OS
  - 鳥哥

Building the Environment

- VirtualBox, VMware...
- Raspberry Pi...
- Server...

Being Skilled in the Environment

- Commonly used instructions
  - cd, ls, cat, grep, mv, cp , mkdir, rm, ssh, scp...
- Text editors
  - vim, nano, sublime, notepad++...
- Programming
  - C, Python, compile (gcc, g++, cmake), execute...
- Managing file and directory permissions
- Reference
  - 鳥哥

Exercise

- create a directory and change to it
- write, compile and execute a C program
- remove the entire directory (not root)

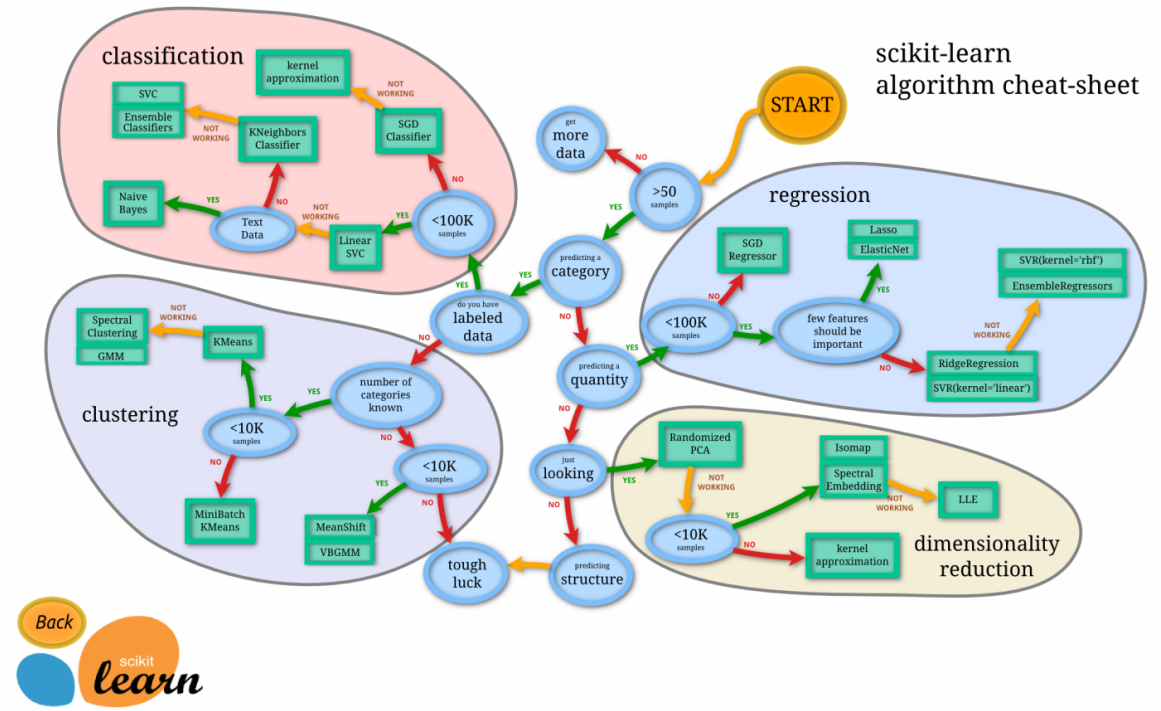
Machine Learning

Prerequisites: Python

Basic Knowledge

- Regression, MLP, CNN...
- Recommended course
  - 李宏毅, 周莫烦, 林軒田
- API
  - Keras, PyTorch, (TensorFlow)...

Method Selection



- Reference
  - scikit-learn

Application

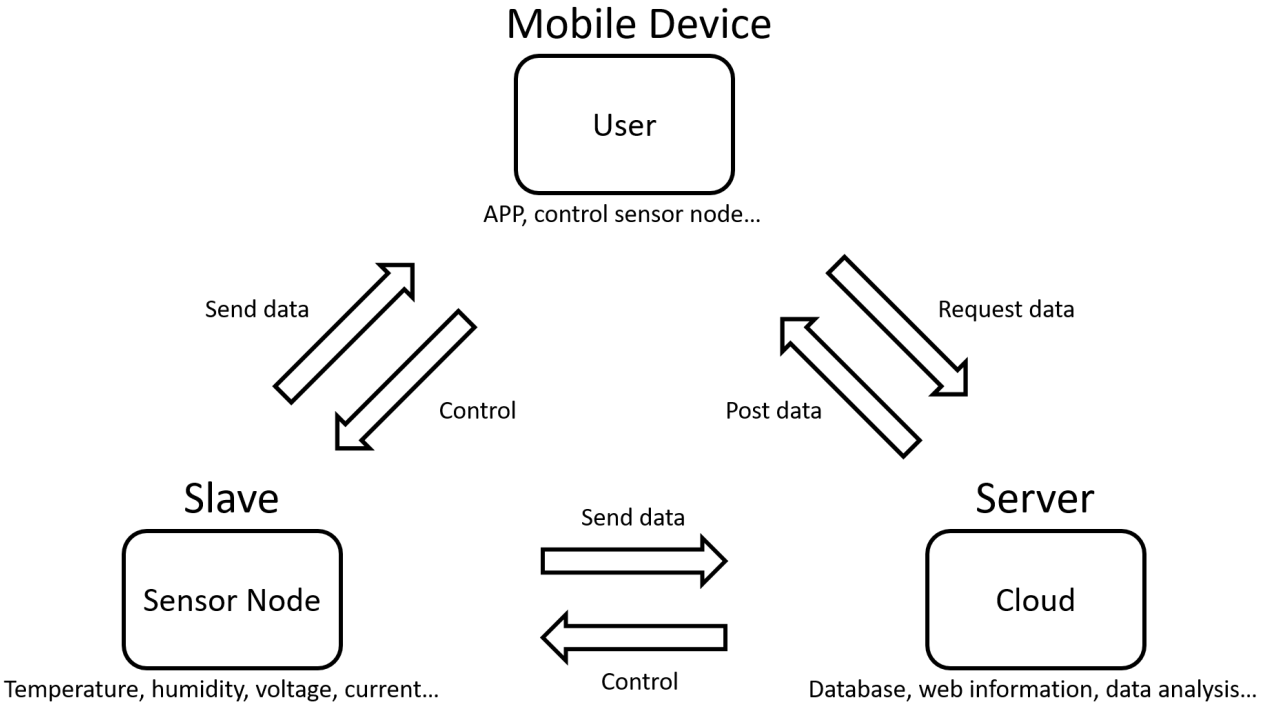
- Object detection
  - Two stage: RCNN, Fast RCNN, Faster RCNN, Mask RCNN...
  - One stage: YOLO, SSD...
- Speech recognition
- Semantic analysis
- Data prediction
  - PM2.5...

Exercise

- Regression - PM2.5...
- MLP, CNN - MNIST(handwritten digits), CIFAR-10...

Internet of Things (IoT)

Architecture



Tools

- Sensor Node
  - Arduino, Raspberry Pi...
- Cloud
  - AWS, Google Cloud...
- User
  - Android, iOS, Ionic...

Exercise

- Arduino
  - LED on/off, motor control, temperature, humidity, RF, blue tooth...
- Raspberry Pi
  - Linux-based exercises(C, Python), connection with Arduino...
- Cloud Server
  - HTTP POST and REQUEST, MQTT...

Parallel Computing

Prerequisites: C language

Method

- OpenMP
- Pthreads
- CUDA
- MPI

Exercise

- Matrix computation...
- Image processing...