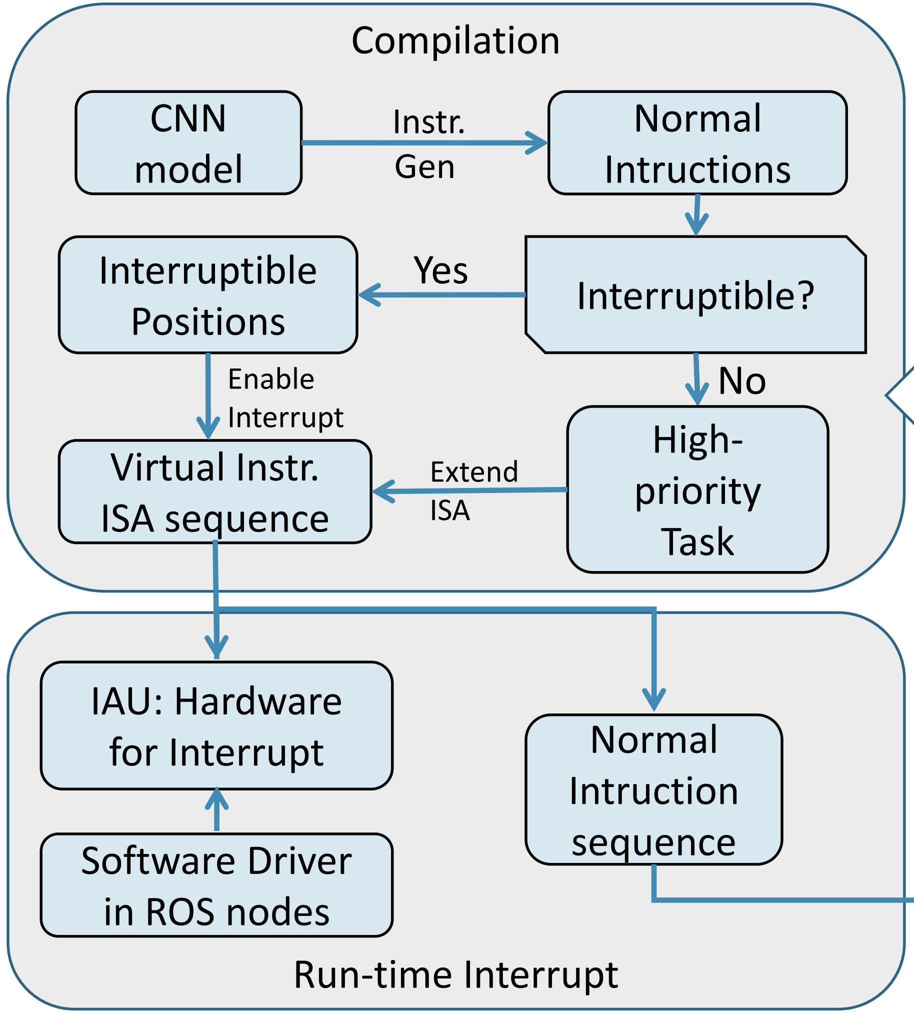
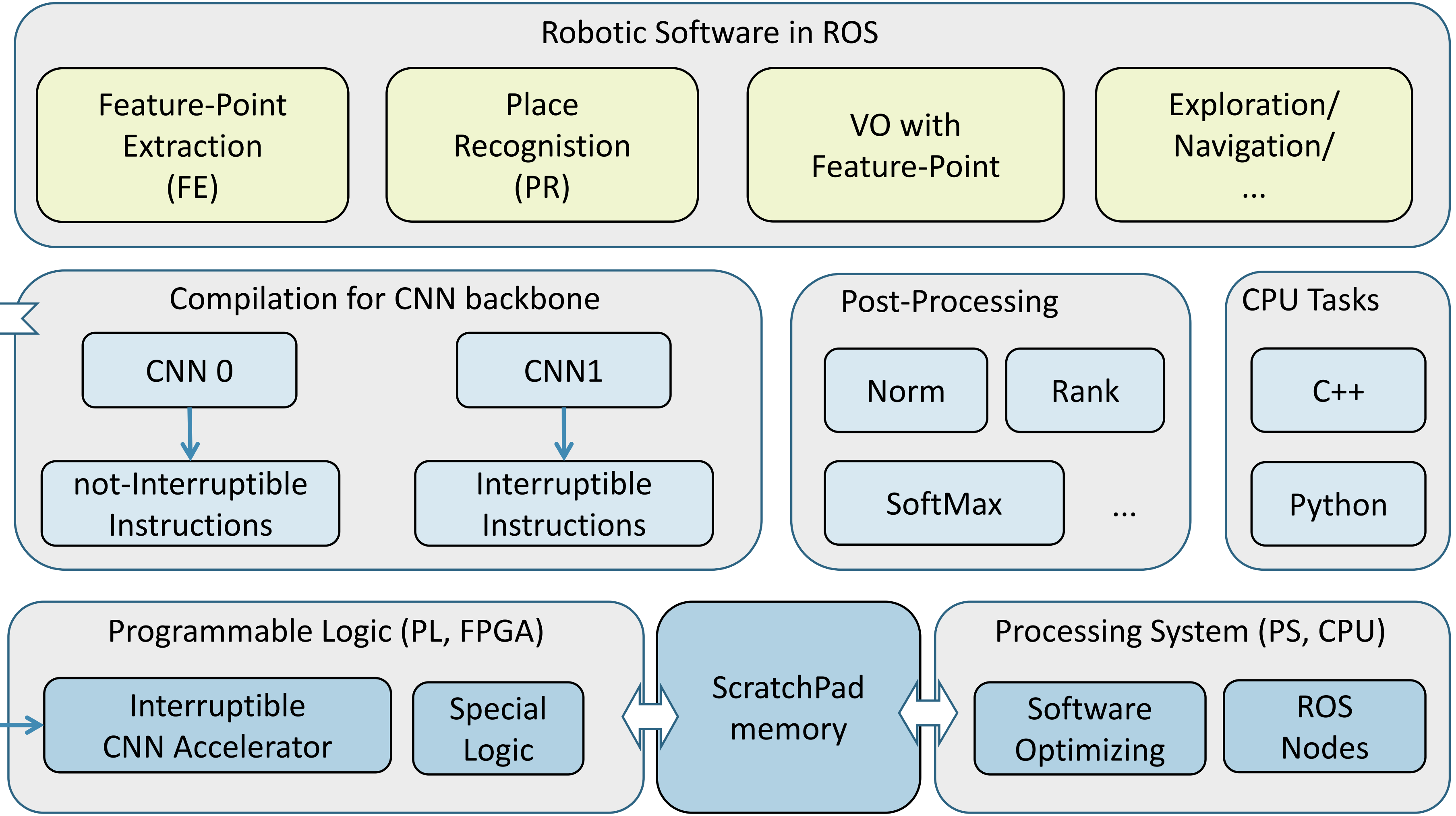


(a) The offline compilation with virtual-instruction ISA and the online interrupt between tasks. The normal instructions are generated from the CNN model, and then translated to virtual instruction ISA sequence. IAU translate the virtual instruction ISA sequence to normal sequence executed on the accelerator.


Robotic Software in ROS
Feature-Point Extraction (FE)
Place Recognition (PR)
VO with Feature-Point
Exploration/ Navigation/ ...
Compilation for CNN backbone
CNN 0
CNN1
not-Interruptible Instructions
Interruptible Instructions
Post-Processing
Norm
Rank
SoftMax
...
CPU Tasks
C++
Python
Programmable Logic (PL, FPGA)
Interruptible CNN Accelerator
Special Logic
ScratchPad memory
Processing System (PS, CPU)
Software Optimizing
ROS Nodes

(b) The INCAME framework. The tasks (FE/PR/VO) are in different ROS nodes. The CNN backbone are translated to instrucitons, which enable runtime interrupt on the accelerator. The post-processing is accelerated by the special logic. Different modules on FPGA and CPU side share data through scrachpad memory.