

## nearbAI, the flexible AI accelerator

*nearbAI* is easics' flexible AI engine that efficiently runs your Deep Neural Networks (DNNs): both Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs). It is semiconductor IP ready to be integrated right next to your sensor(s). It outputs structured data with the lowest possible latency and power consumption.

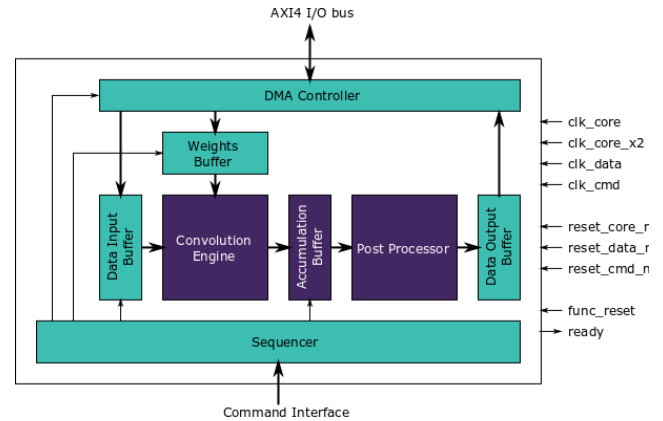
Today's embedded systems rely on ever more data from sensors. The bandwidth required to send this growing amount of raw data to a central processor —be it on premise or in the cloud— has become an acute bottleneck.

The solution is to process this data already at the point of data collection. Transferring such processed data requires much less bandwidth than sending raw data. *nearbAI* is ideally suited to enable this efficiency gain.

With *nearbAI*, easics offers an optimized accelerator for the DNNs in today's and tomorrow's applications. *nearbAI* is highly parameterizable so it can match your precise requirements. It comes with an extensive development software suite. In addition, easics' *nearbAI* support team is available to discuss your application needs and to customize and integrate *nearbAI* in your application.

### nearbAI internals

The *DMA Controller* loads sensor data and quantized weights in buffers. Both data and weights are then shifted through the *Convolution Engine*. The results are sent to the *Accumulator* and are finalized in the *Post Processor*. The *Sequencer* manages the execution of the subsequent layers of the DNN. It generates a continuous flow of tensors through all layers of the DNN. The final output tensors are returned as results —structured data— to your application microcontroller (*MCU*).



### nearbAI highlights

optimization through parameterization of easics' baseline *nearbAI* core, taking into account your application-specific needs:

- standard or custom DNN models
- performance (inference rate), power consumption, hardware cost (silicon area), latency and silicon technology
- DNN accuracy: 6, 8, 12 or 16 bit data and weights
- custom-tailored interfaces

supported operations include:

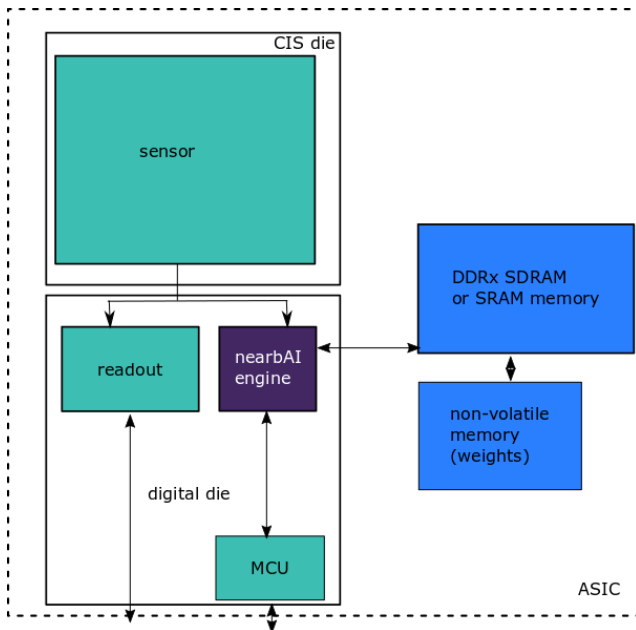
- *Convolution Engine*
  - 2D convolution
  - depthwise convolutions
  - matrix multiplications for LSTM optimization
  - fully connected layers
  - bias
- configurable *Post Processor*
  - max pooling, average pooling
  - ReLU, ReLU6, Leaky ReLU
- CNNs: ResNet, YOLO, MobileNet, ...
- RNNs: DeepSpeech, ...

[contact us](#) for *nearbAI* benchmarks!

### nearbAI deployment

- digital or mixed-signal ASIC
- Intel FPGA
- Xilinx FPGA
- FPGA System-on-Module (SoM)

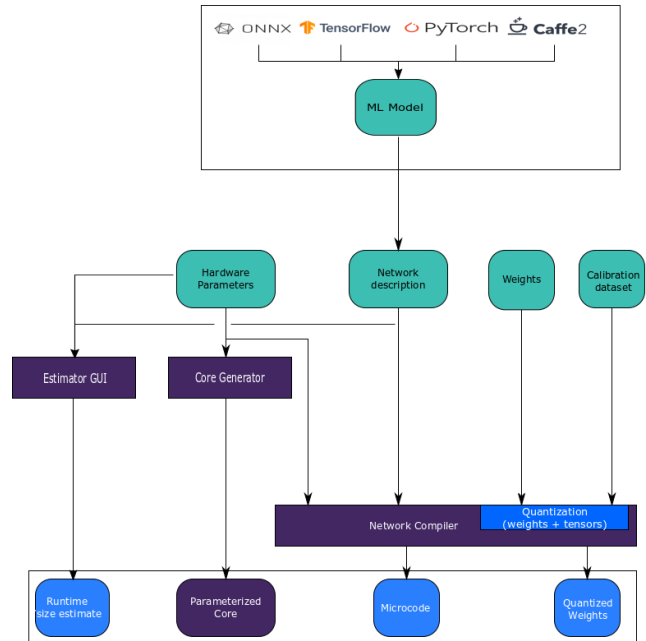
nearbAI close to your sensor(s)



- image sensor
  - visual, near-IR, thermal IR, X-ray
  - hyperspectral
  - Time-of-Flight (ToF), 3D stereo
  - LiDAR, radar
  - ultrasound
- audio sensor
- [contact us](#) to discuss your sensor application!

nearbAI development software suite

- *Estimator*: estimates resource utilization and inference time for your selected DNN model(s) and parameters
- *Core Generator*: generates a parameterized VHDL-core, simulation and synthesis scripts, and customized tools
- *Network Compiler*: performs quantization, memory allocation, and sequencing through the microcode
- *Run-time Library*: controls the hardware and implements hardware / software interaction



why nearbAI?

- customize your *nearbAI* instance according to your DNN model(s), performance requirements, latency, power consumption, silicon area (number of multiplier units) and memory throughput constraints
- let the *Estimator* tool assist you with making trade-offs and guiding you to the hardware platform that is best suited for your *nearbAI* deployment <http://nearbai.easics.com>
- benefit from *nearbAI*'s low hardware cost, thanks to its MAC efficiency of above 95%
- *nearbAI* supports both CNNs and RNNs on the same instance, resulting in unmatched flexibility
- perform early optimizations on a real-time FPGA prototype, for a smooth transition to ASIC
- entrust easics' *nearbAI* support team with on-demand integration support of the *nearbAI* core in your application

[let us know](#) your AI requirements and we will propose a dedicated *nearbAI* engine tailored precisely to your application needs!