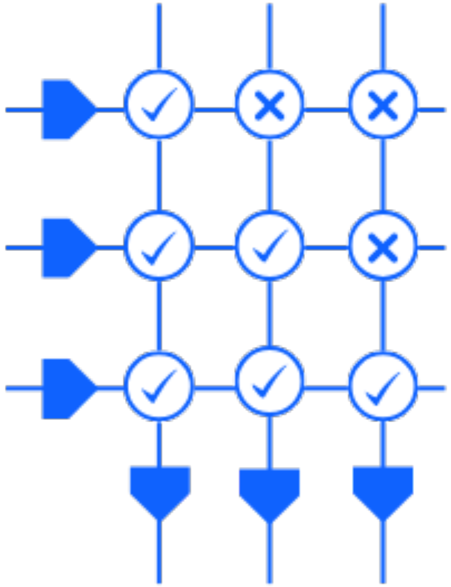

AnalogNAS

https://github.com/IBM/analog-nas

AnalogNAS

- Automatically design resilient deep learning architectures for Analog In-memory Computing.
- In-memory computing is a promising technology for AI accelerators. It significantly allows for reduced energy consumption.
- Fully written in Python on top of AIHWkit.
- IBM-managed open-source project.

Technologies

IBM AIHWKit

dmlc XGBoost + scikit learn

PyTorch

pymoo

GitHub: https://github.com/IBM/analog-nas

AIHWKit Github: https://github.com/IBM/aihwkit

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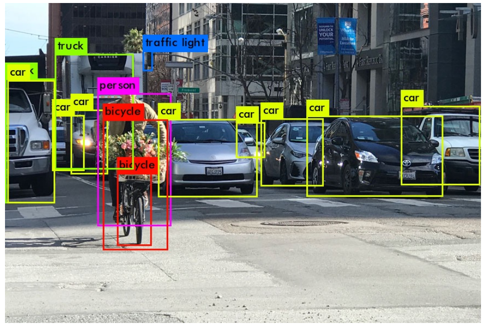
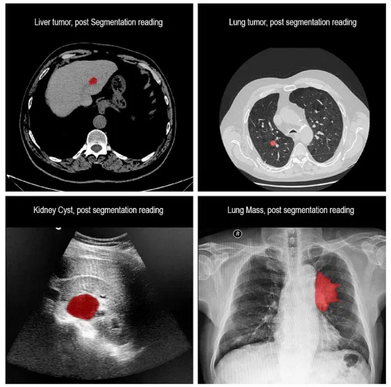
(Hadjer.benmeziane1@ibm.com, kelmaghr@us.ibm.com)

Automation is key for Deep Learning 2.0

Novel Applications

Extend the search space definition with other neural networks for Object detection, image segmentation, or language modelling.

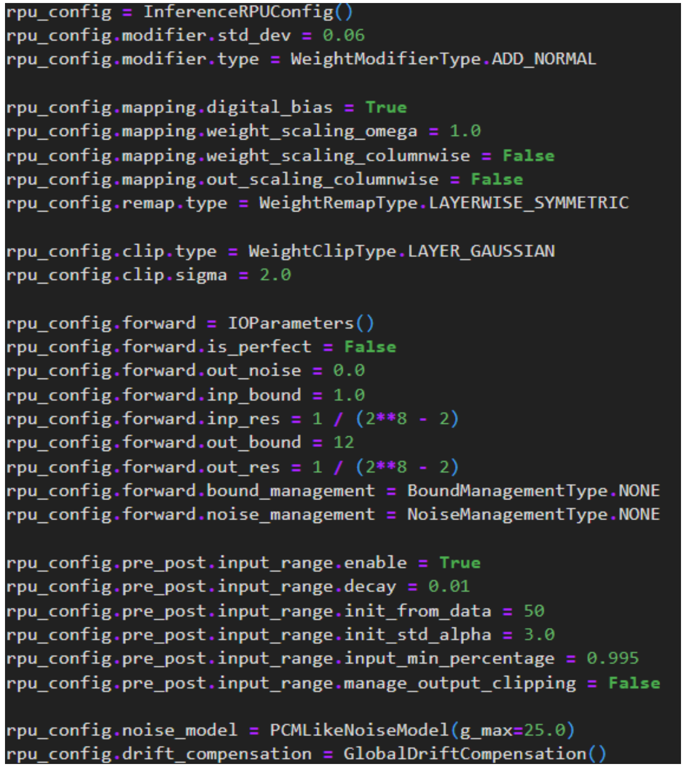




Liver tumor, post Segmentation reading
Lung tumor, post segmentation reading
Kidney Cyst, post segmentation reading
Lung Mass, post segmentation reading

Hyperparameter Optimization

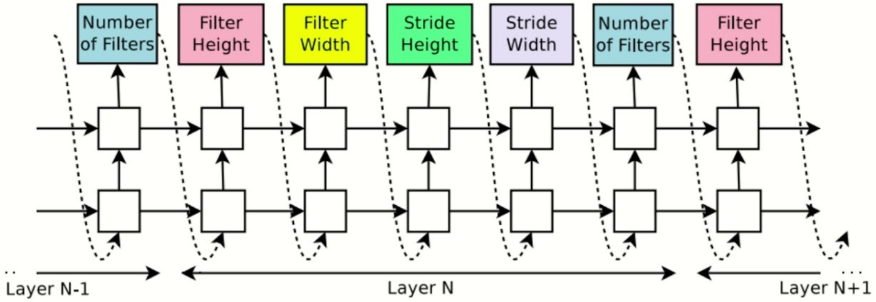
Allow developers to run Bayesian optimization for hyperparameter optimization, including hardware parameters.



```
rpu_config = InferenceRPUConfig()
rpu_config.modifier.std_dev = 0.06
rpu_config.modifier.type = WeightModifierType.ADD_NORMAL

rpu_config.mapping.digital_bias = True
rpu_config.mapping.weight_scaling_omega = 1.0
rpu_config.mapping.weight_scaling_columnwise = False
rpu_config.mapping.out_scaling_columnwise = False
rpu_config.remap.type = WeightRemapType.LAYERWISE_SYMMETRIC

rpu_config.clip.type = WeightClipType.LAYER_GAUSSIAN
rpu_config.clip.sigma = 2.0

rpu_config.forward = IOParameters()
rpu_config.forward.is_perfect = False
rpu_config.forward.out_noise = 0.0
rpu_config.forward.inp_bound = 1.0
rpu_config.forward.inp_res = 1 / (2**8 - 2)
rpu_config.forward.out_bound = 12
rpu_config.forward.out_res = 1 / (2**8 - 2)
rpu_config.forward.bound_management = BoundManagementType.NONE
rpu_config.forward.noise_management = NoiseManagementType.NONE

rpu_config.pre_post.input_range.enable = True
rpu_config.pre_post.input_range.decay = 0.01
rpu_config.pre_post.input_range.init_from_data = 50
rpu_config.pre_post.input_range.init_std_alpha = 3.0
rpu_config.pre_post.input_range.input_min_percentage = 0.995
rpu_config.pre_post.input_range.manage_output_clipping = False

rpu_config.noise_model = PCMLikeNoiseModel(g_max=25.0)
rpu_config.drift_compensation = GlobalDriftCompensation()
```

Reinforcement learning-based search strategy

Contribute to core components of AnalogNAS by implementing a reinforcement learning agent.



AnalogNAS IBM Research

GitHub

Get started !