

# Weekly smartpix update

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# ASIC Model updates

- Implemented a model that matches the fermilab filtering model architecture better
- Modified tfrecords to have a inVectASIC, so ASIC model input is a 16x1 vector
- 3-node categorical output, with an argmax applied to select most likely category
  - The category 2 is ignored because labels never contain a 2, and model never predicts 2
  - Roc\_curve is just three points, since prediction is always 0 or 1

```
Model: "ModelASIC_quantized4"
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Layer (type)	Output Shape	Param #
inVectASIC (InputLayer)	[(None, 16)]	0
dense1 (QDenseBatchnorm)	(None, 58)	1219
relu1 (QActivation)	(None, 58)	0
dense2 (QDense)	(None, 3)	177
linear (QActivation)	(None, 3)	0

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 Total params: 1396 (5.46 KB)  
 Trainable params: 1279 (5.00 KB)  
 Non-trainable params: 117 (472.00 Byte)

inVectASIC	input:	[(None, 16)]
InputLayer	output:	[(None, 16)]

q_input_cluster	input:	(None, 16)
QActivation	output:	(None, 16)

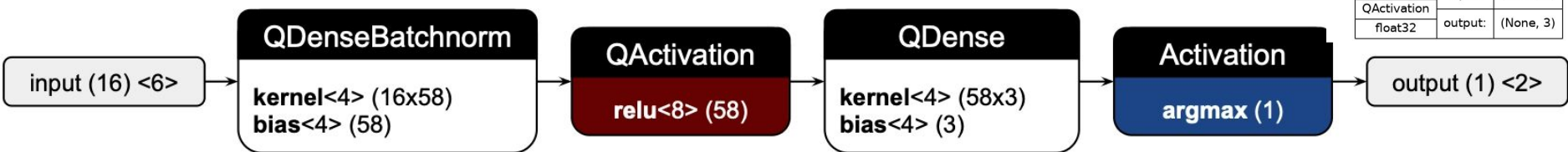
dense1	input:	(None, 16)
QDenseBatchnorm	output:	(None, 58)

relu1	input:	(None, 58)
QActivation	output:	(None, 58)

dense2	input:	(None, 58)
QDense	output:	(None, 3)

linear	input:	(None, 3)
QActivation	output:	(None, 3)

output (1) <2>
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Trainable parameters  
1163

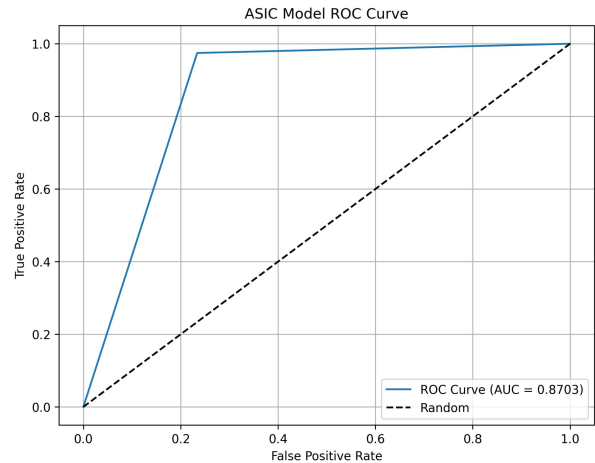
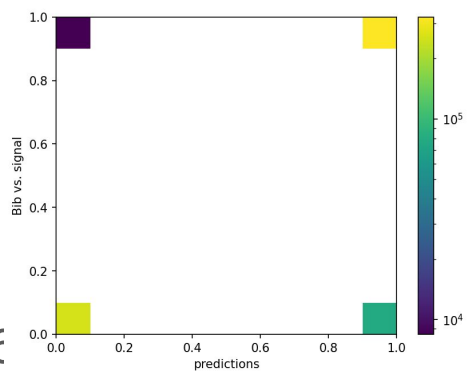
986

177

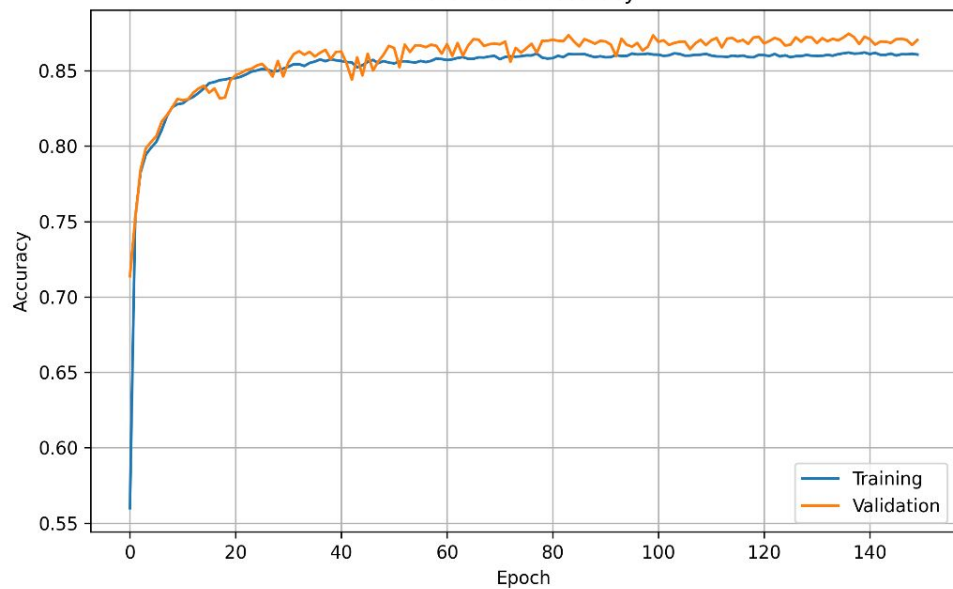
# ASIC Model Performance

(before input quantization)

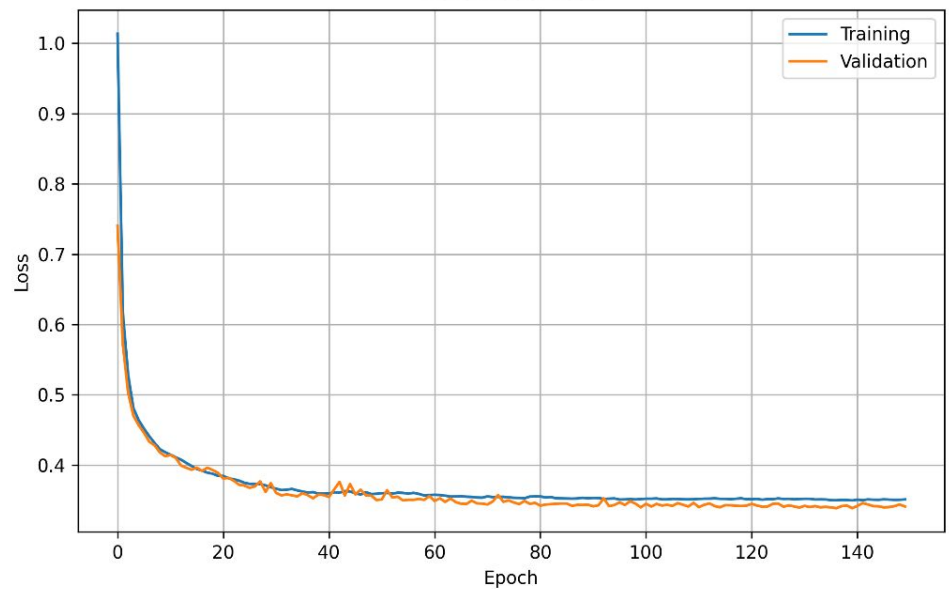
Background rejection: 0.7661977196  
at signal efficiency 0.9744966605289335.



ASIC Model Accuracy



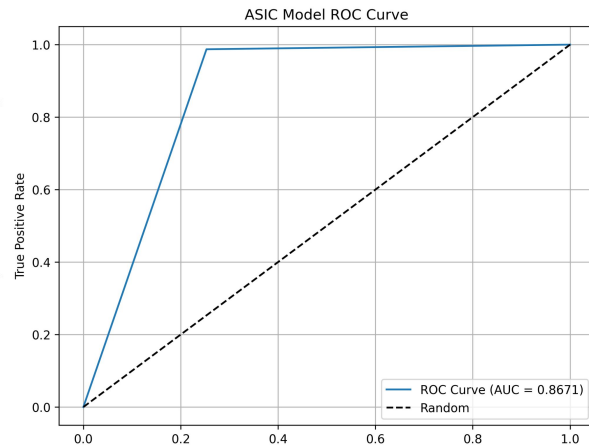
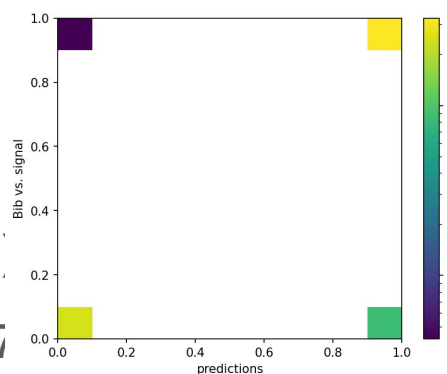
ASIC Model Loss



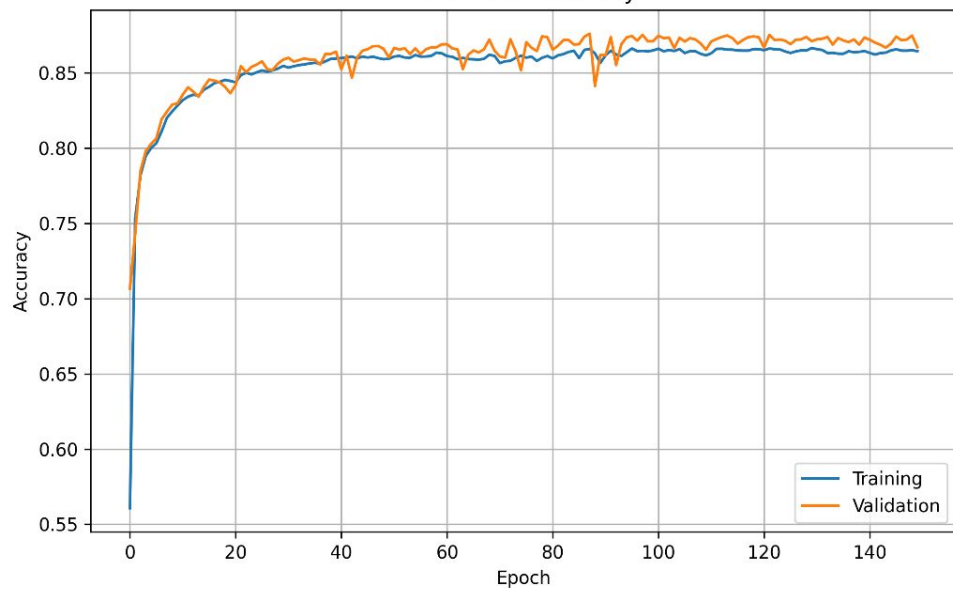
# ASIC Model Performance

(with input quantization, 150 epochs)

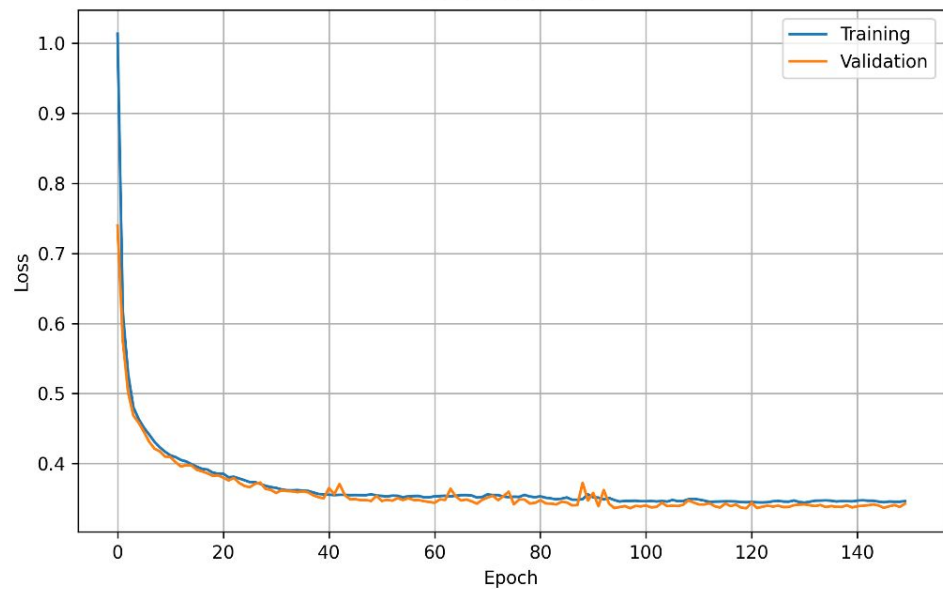
Background rejection: 0.7470286417  
signal efficiency 0.9872226303965943



ASIC Model Accuracy



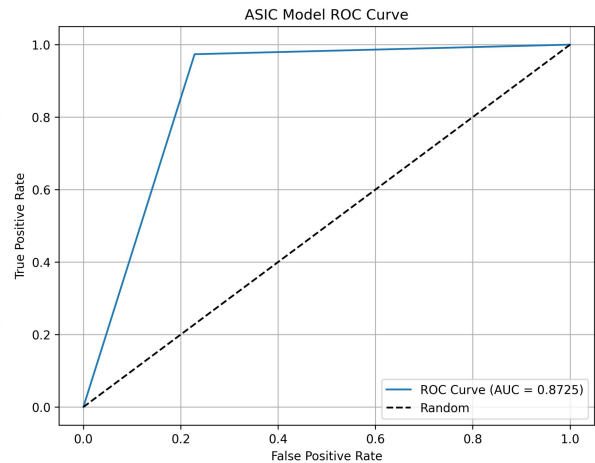
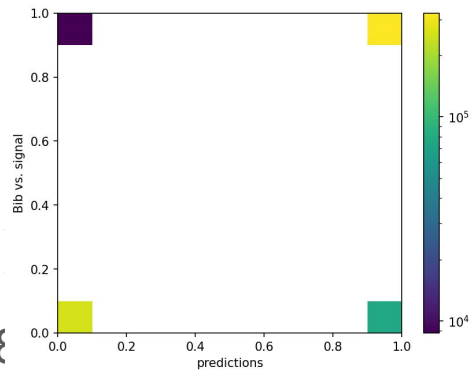
ASIC Model Loss



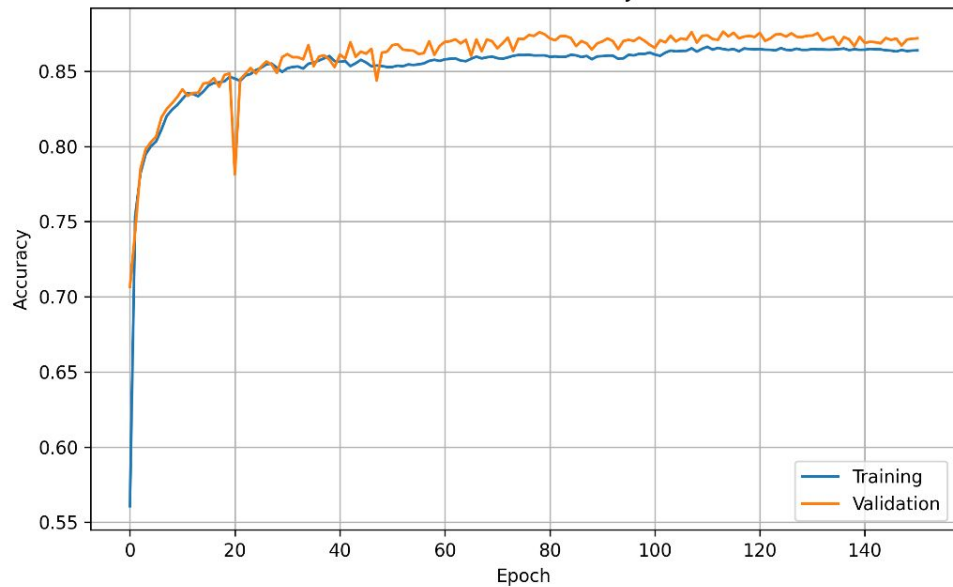
# ASIC Model Performance

(with input quantization, 151 epochs)

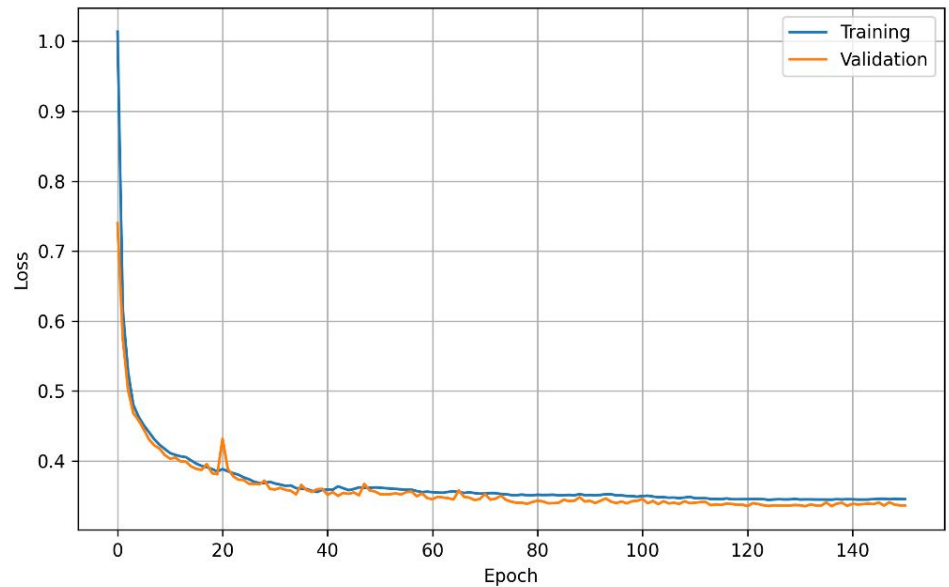
Background rejection: 0.771464680{  
at signal efficiency 0.9735775123132602



ASIC Model Accuracy



ASIC Model Loss



# ASIC model thoughts

- Training on accuracy rather than signal efficiency, and it seems like a different signal efficiency changes each time make a slight modification or train for longer
- Since there is not a roc\_curve to make an ideal signal efficiency cut, training paradigm is a little different than for other models
  - Should we somehow train on signal efficiency instead of accuracy? Is this easy to change?