REPORT-CS_RESEARCH-CSOT

-Mehul Shakya(2024MT10305)

This is regarding the CNN based tumor classifier built entirely from scratch. Tried out various architectural settings- trying to balance representational ability, low-bias, overfitting tendencies, and large-ness of model- being the key components.

Choosing the architecture on Pg-2 was more of a trial and error process, mixed with understanding of general workflow in a CNN. Settled with this architecture when it showed significant growth within nearly 10-15 epochs.

The Kaggle dataset(5k) images has a priors-bias of 67% which led to model to always collapsing towards predicting 1 for all images, to fix which, half of YES images were removed to balance the dataset to 1:1 with nearly 3700 images. Gradually model kept learning and hyperparameters changed, after 4^{th} image in history, all data was reintroduced (with the bias) but a smaller learning rate, from where onwards there was a steady growth without encountering collapsing problem. There were similar problems faced, but of less importance, the one mentioned being the biggest one.

Peak achieved performance was nearly 93% on validation set at 52th cycle over the data.

Peak training accuracy reached near 99%, I believe with further improvements the model can reach 97-98%+ accuracy, this was what I was able to achieve in the given time.

Model Architecture:

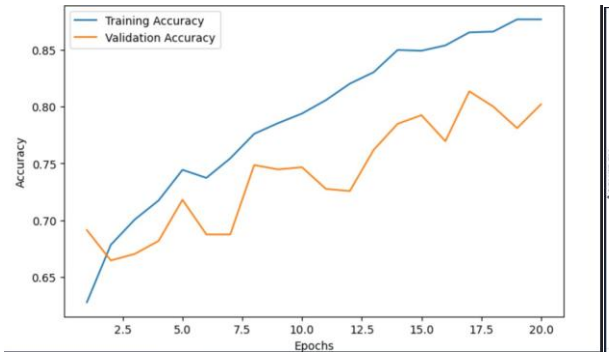
Layer (type)	Output Shape	Param #
conv2d_41 (Conv2D)	(None, 148, 148, 32)	896
batch_normalization_36 (BatchNormalization)	(None, 148, 148, 32)	128
max_pooling2d_39 (MaxPooling2D)	(None, 74, 74, 32)	0
conv2d_42 (Conv2D)	(None, 72, 72, 64)	18,496
batch_normalization_37 (BatchNormalization)	(None, 72, 72, 64)	256
max_pooling2d_40 (MaxPooling2D)	(None, 36, 36, 64)	0
conv2d_43 (Conv2D)	(None, 34, 34, 128)	73,856
batch_normalization_38 (BatchNormalization)	(None, 34, 34, 128)	512
max_pooling2d_41 (MaxPooling2D)	(None, 17, 17, 128)	0
conv2d_44 (Conv2D)	(None, 15, 15, 128)	147,584
batch_normalization_39 (BatchNormalization)	(None, 15, 15, 128)	512
max_pooling2d_42 (MaxPooling2D)	(None, 7, 7, 128)	0
flatten_12 (Flatten)	(None, 6272)	0
dense_29 (Dense)	(None, 128)	802,944
dense_30 (Dense)	(None, 64)	8,256
dense_31 (Dense)	(None, 64)	4,160
dense_32 (Dense)	(None, 1)	65

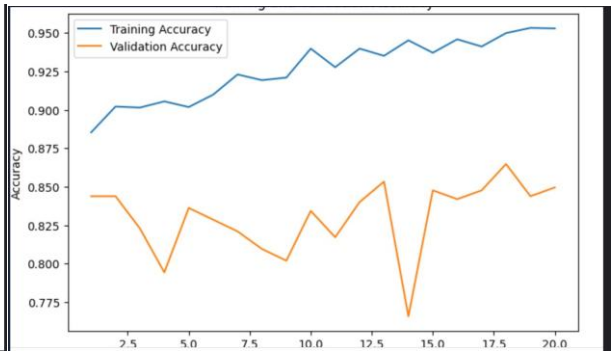
Total params: 1,057,665 (4.03 MB)

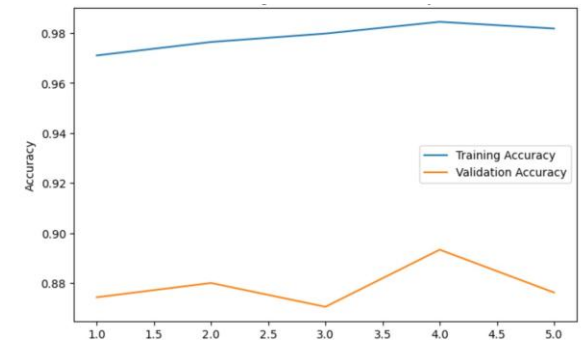
Trainable params: 1,056,961 (4.03 MB)

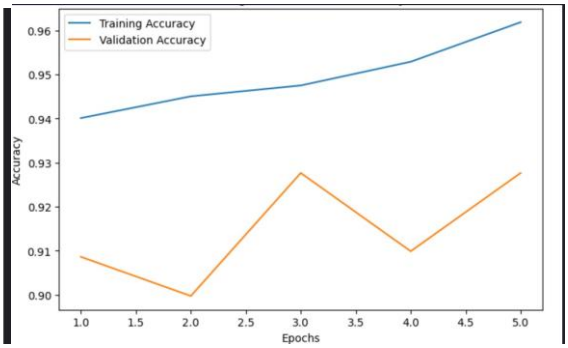
Non-trainable params: 704 (2.75 KB)

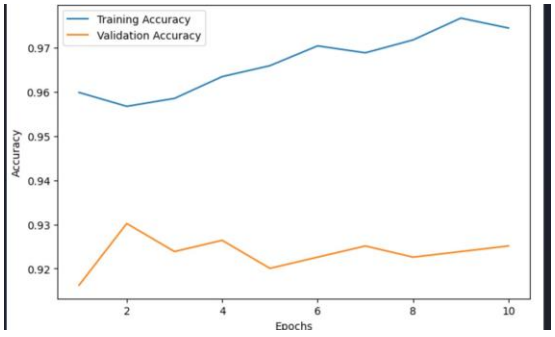
Model Performance:











Pictures attached in order of successive training sessions (left-right). Peak performance achieved at 52th epoch.