**EfficientNetv2\_s,** training batch size=**128**, testing bs=**128,** optimizer=**SGD, lr=0.02**, **epoch=100**

+ RandomHorizontalFlip() + RandomCrop(32, padding=4)

epoch 1, loss 2.3707, train acc 0.223, test acc 0.335, time 154.4 sec

epoch 2, loss 0.9238, train acc 0.361, test acc 0.417, time 163.6 sec

epoch 3, loss 0.5498, train acc 0.416, test acc 0.466, time 165.6 sec

epoch 4, loss 0.3838, train acc 0.450, test acc 0.486, time 166.0 sec

epoch 5, loss 0.2853, train acc 0.492, test acc 0.481, time 166.4 sec

epoch 6, loss 0.2228, train acc 0.524, test acc 0.538, time 167.0 sec

epoch 7, loss 0.1809, train acc 0.552, test acc 0.560, time 166.6 sec

epoch 8, loss 0.1481, train acc 0.579, test acc 0.607, time 166.9 sec

epoch 9, loss 0.1243, train acc 0.605, test acc 0.616, time 168.2 sec

epoch 10, loss 0.1050, train acc 0.629, test acc 0.640, time 169.1 sec

epoch 11, loss 0.0902, train acc 0.650, test acc 0.640, time 169.7 sec

epoch 12, loss 0.0782, train acc 0.672, test acc 0.671, time 169.6 sec

epoch 13, loss 0.0679, train acc 0.689, test acc 0.647, time 167.9 sec

epoch 14, loss 0.0596, train acc 0.711, test acc 0.701, time 168.3 sec

epoch 15, loss 0.0528, train acc 0.721, test acc 0.710, time 167.3 sec

epoch 16, loss 0.0488, train acc 0.727, test acc 0.730, time 167.7 sec

epoch 17, loss 0.0430, train acc 0.744, test acc 0.652, time 168.2 sec

epoch 18, loss 0.0392, train acc 0.754, test acc 0.734, time 166.8 sec

epoch 19, loss 0.0355, train acc 0.765, test acc 0.744, time 169.4 sec

epoch 20, loss 0.0326, train acc 0.771, test acc 0.755, time 168.6 sec

epoch 21, loss 0.0305, train acc 0.776, test acc 0.758, time 168.4 sec

epoch 22, loss 0.0284, train acc 0.780, test acc 0.759, time 168.5 sec

epoch 23, loss 0.0260, train acc 0.791, test acc 0.770, time 168.4 sec

epoch 24, loss 0.0242, train acc 0.796, test acc 0.760, time 167.3 sec

epoch 25, loss 0.0233, train acc 0.796, test acc 0.646, time 167.6 sec

epoch 26, loss 0.0214, train acc 0.804, test acc 0.786, time 166.1 sec

epoch 27, loss 0.0200, train acc 0.811, test acc 0.764, time 167.7 sec

epoch 28, loss 0.0193, train acc 0.810, test acc 0.717, time 165.7 sec

epoch 29, loss 0.0193, train acc 0.805, test acc 0.787, time 165.5 sec

epoch 30, loss 0.0176, train acc 0.815, test acc 0.781, time 166.7 sec

epoch 31, loss 0.0167, train acc 0.819, test acc 0.762, time 165.6 sec

epoch 32, loss 0.0164, train acc 0.817, test acc 0.790, time 165.6 sec

epoch 33, loss 0.0158, train acc 0.818, test acc 0.786, time 167.0 sec

epoch 34, loss 0.0149, train acc 0.822, test acc 0.794, time 167.3 sec

epoch 35, loss 0.0142, train acc 0.829, test acc 0.765, time 167.0 sec

epoch 36, loss 0.0137, train acc 0.828, test acc 0.769, time 167.3 sec

epoch 37, loss 0.0135, train acc 0.827, test acc 0.774, time 167.2 sec

epoch 38, loss 0.0129, train acc 0.830, test acc 0.802, time 167.3 sec

epoch 39, loss 0.0122, train acc 0.836, test acc 0.804, time 167.2 sec

epoch 40, loss 0.0120, train acc 0.832, test acc 0.807, time 166.4 sec

epoch 41, loss 0.0117, train acc 0.834, test acc 0.801, time 165.6 sec

epoch 42, loss 0.0122, train acc 0.822, test acc 0.799, time 166.4 sec

epoch 43, loss 0.0112, train acc 0.833, test acc 0.748, time 165.8 sec

epoch 44, loss 0.0112, train acc 0.829, test acc 0.803, time 166.8 sec

epoch 45, loss 0.0104, train acc 0.839, test acc 0.807, time 167.7 sec

epoch 46, loss 0.0102, train acc 0.836, test acc 0.792, time 167.3 sec

epoch 47, loss 0.0100, train acc 0.836, test acc 0.740, time 167.4 sec

epoch 48, loss 0.0097, train acc 0.838, test acc 0.795, time 167.1 sec

epoch 49, loss 0.0097, train acc 0.834, test acc 0.792, time 166.3 sec

epoch 50, loss 0.0096, train acc 0.833, test acc 0.812, time 165.4 sec

epoch 51, loss 0.0089, train acc 0.843, test acc 0.791, time 165.8 sec

epoch 52, loss 0.0088, train acc 0.843, test acc 0.808, time 167.0 sec

epoch 53, loss 0.0087, train acc 0.841, test acc 0.793, time 167.1 sec

epoch 54, loss 0.0084, train acc 0.843, test acc 0.810, time 167.5 sec

epoch 55, loss 0.0082, train acc 0.843, test acc 0.812, time 167.9 sec

epoch 56, loss 0.0080, train acc 0.845, test acc 0.821, time 167.5 sec

epoch 57, loss 0.0079, train acc 0.844, test acc 0.812, time 168.1 sec

epoch 58, loss 0.0077, train acc 0.845, test acc 0.807, time 167.2 sec

epoch 59, loss 0.0075, train acc 0.846, test acc 0.824, time 167.5 sec

epoch 60, loss 0.0072, train acc 0.850, test acc 0.816, time 167.7 sec

epoch 61, loss 0.0071, train acc 0.849, test acc 0.807, time 167.7 sec

epoch 62, loss 0.0070, train acc 0.850, test acc 0.800, time 168.3 sec

epoch 63, loss 0.0067, train acc 0.854, test acc 0.822, time 167.3 sec

epoch 64, loss 0.0066, train acc 0.853, test acc 0.823, time 167.4 sec

epoch 65, loss 0.0066, train acc 0.852, test acc 0.822, time 167.9 sec

epoch 66, loss 0.0064, train acc 0.854, test acc 0.823, time 167.9 sec

epoch 67, loss 0.0064, train acc 0.853, test acc 0.792, time 168.1 sec

epoch 68, loss 0.0063, train acc 0.852, test acc 0.824, time 168.0 sec

epoch 69, loss 0.0061, train acc 0.855, test acc 0.817, time 167.9 sec

epoch 70, loss 0.0060, train acc 0.855, test acc 0.816, time 167.5 sec

epoch 71, loss 0.0057, train acc 0.860, test acc 0.818, time 168.0 sec

epoch 72, loss 0.0057, train acc 0.858, test acc 0.818, time 167.4 sec

epoch 73, loss 0.0056, train acc 0.858, test acc 0.822, time 167.2 sec

epoch 74, loss 0.0055, train acc 0.859, test acc 0.833, time 166.8 sec

epoch 75, loss 0.0054, train acc 0.862, test acc 0.828, time 167.4 sec

epoch 76, loss 0.0053, train acc 0.862, test acc 0.823, time 166.7 sec

epoch 77, loss 0.0052, train acc 0.862, test acc 0.824, time 166.4 sec

epoch 78, loss 0.0051, train acc 0.863, test acc 0.822, time 166.6 sec

epoch 79, loss 0.0050, train acc 0.864, test acc 0.815, time 167.4 sec

epoch 80, loss 0.0048, train acc 0.865, test acc 0.827, time 166.6 sec

epoch 81, loss 0.0048, train acc 0.867, test acc 0.831, time 167.2 sec

epoch 82, loss 0.0047, train acc 0.866, test acc 0.825, time 167.4 sec

epoch 83, loss 0.0046, train acc 0.866, test acc 0.828, time 167.0 sec

epoch 84, loss 0.0046, train acc 0.867, test acc 0.838, time 167.0 sec

epoch 85, loss 0.0045, train acc 0.869, test acc 0.842, time 167.4 sec

epoch 86, loss 0.0044, train acc 0.867, test acc 0.830, time 166.9 sec

epoch 87, loss 0.0043, train acc 0.869, test acc 0.824, time 167.6 sec

epoch 88, loss 0.0042, train acc 0.871, test acc 0.829, time 167.0 sec

epoch 89, loss 0.0041, train acc 0.874, test acc 0.824, time 166.4 sec

epoch 90, loss 0.0041, train acc 0.871, test acc 0.839, time 167.2 sec

epoch 91, loss 0.0040, train acc 0.873, test acc 0.842, time 167.2 sec

epoch 92, loss 0.0039, train acc 0.875, test acc 0.834, time 167.3 sec

epoch 93, loss 0.0039, train acc 0.876, test acc 0.821, time 167.4 sec

epoch 94, loss 0.0038, train acc 0.876, test acc 0.844, time 167.6 sec

epoch 95, loss 0.0038, train acc 0.878, test acc 0.835, time 167.0 sec

epoch 96, loss 0.0038, train acc 0.875, test acc 0.845, time 167.3 sec

epoch 97, loss 0.0037, train acc 0.876, test acc 0.841, time 167.5 sec

epoch 98, loss 0.0035, train acc 0.879, test acc 0.845, time 166.9 sec

epoch 99, loss 0.0036, train acc 0.877, test acc 0.836, time 167.3 sec

epoch 100, loss 0.0035, train acc 0.878, test acc 0.840, time 167.3 sec

Validation: Accuracy of the network: 83.36 %

Testing: Accuracy of the network: 83.96 %

Brier before calibration 0.23251128460906906

ECE before calibration: 0.032426411618292274

calibrating...

Closed Brier temperature\_scaling 0.23075401983433022

ECE temperature\_scaling calibration: 0.012198341868817833

**epoch=70**

epoch 1, loss 2.2977, train acc 0.255, test acc 0.392, time 148.9 sec

epoch 2, loss 0.8842, train acc 0.383, test acc 0.424, time 152.2 sec

epoch 3, loss 0.5374, train acc 0.440, test acc 0.476, time 160.5 sec

epoch 4, loss 0.3656, train acc 0.482, test acc 0.502, time 164.2 sec

epoch 5, loss 0.2718, train acc 0.516, test acc 0.540, time 164.3 sec

epoch 6, loss 0.2120, train acc 0.548, test acc 0.556, time 164.3 sec

epoch 7, loss 0.1716, train acc 0.576, test acc 0.584, time 165.7 sec

epoch 8, loss 0.1403, train acc 0.603, test acc 0.609, time 165.8 sec

epoch 9, loss 0.1185, train acc 0.625, test acc 0.613, time 166.2 sec

epoch 10, loss 0.0985, train acc 0.651, test acc 0.667, time 166.2 sec

epoch 11, loss 0.0857, train acc 0.670, test acc 0.665, time 166.7 sec

epoch 12, loss 0.0740, train acc 0.689, test acc 0.687, time 166.7 sec

epoch 13, loss 0.0647, train acc 0.706, test acc 0.701, time 167.8 sec

epoch 14, loss 0.0569, train acc 0.722, test acc 0.721, time 167.3 sec

epoch 15, loss 0.0514, train acc 0.732, test acc 0.659, time 167.2 sec

epoch 16, loss 0.0452, train acc 0.747, test acc 0.706, time 167.4 sec

epoch 17, loss 0.0410, train acc 0.758, test acc 0.672, time 167.5 sec

epoch 18, loss 0.0384, train acc 0.758, test acc 0.734, time 167.4 sec

epoch 19, loss 0.0347, train acc 0.770, test acc 0.745, time 167.3 sec

epoch 20, loss 0.0318, train acc 0.778, test acc 0.750, time 166.9 sec

epoch 21, loss 0.0292, train acc 0.784, test acc 0.764, time 167.2 sec

epoch 22, loss 0.0285, train acc 0.778, test acc 0.720, time 167.5 sec

epoch 23, loss 0.0260, train acc 0.791, test acc 0.787, time 167.6 sec

epoch 24, loss 0.0243, train acc 0.797, test acc 0.735, time 167.3 sec

epoch 25, loss 0.0223, train acc 0.805, test acc 0.751, time 167.4 sec

epoch 26, loss 0.0208, train acc 0.813, test acc 0.777, time 166.9 sec

epoch 27, loss 0.0202, train acc 0.808, test acc 0.789, time 166.5 sec

epoch 28, loss 0.0191, train acc 0.812, test acc 0.786, time 167.0 sec

epoch 29, loss 0.0181, train acc 0.818, test acc 0.781, time 167.6 sec

epoch 30, loss 0.0176, train acc 0.818, test acc 0.750, time 167.7 sec

epoch 31, loss 0.0166, train acc 0.822, test acc 0.778, time 167.7 sec

epoch 32, loss 0.0158, train acc 0.823, test acc 0.788, time 167.2 sec

epoch 33, loss 0.0150, train acc 0.826, test acc 0.801, time 167.0 sec

epoch 34, loss 0.0144, train acc 0.830, test acc 0.789, time 167.0 sec

epoch 35, loss 0.0138, train acc 0.832, test acc 0.766, time 167.0 sec

epoch 36, loss 0.0133, train acc 0.833, test acc 0.799, time 167.2 sec

epoch 37, loss 0.0129, train acc 0.833, test acc 0.713, time 166.7 sec

epoch 38, loss 0.0123, train acc 0.839, test acc 0.791, time 167.2 sec

epoch 39, loss 0.0120, train acc 0.837, test acc 0.795, time 166.6 sec

epoch 40, loss 0.0118, train acc 0.836, test acc 0.792, time 167.2 sec

epoch 41, loss 0.0113, train acc 0.838, test acc 0.801, time 166.1 sec

epoch 42, loss 0.0111, train acc 0.837, test acc 0.795, time 167.3 sec

epoch 43, loss 0.0106, train acc 0.842, test acc 0.807, time 167.0 sec

epoch 44, loss 0.0104, train acc 0.842, test acc 0.817, time 167.2 sec

epoch 45, loss 0.0100, train acc 0.846, test acc 0.802, time 167.7 sec

epoch 46, loss 0.0099, train acc 0.842, test acc 0.804, time 167.5 sec

epoch 47, loss 0.0096, train acc 0.845, test acc 0.775, time 167.4 sec

epoch 48, loss 0.0093, train acc 0.845, test acc 0.795, time 167.3 sec

epoch 49, loss 0.0092, train acc 0.844, test acc 0.778, time 167.0 sec

epoch 50, loss 0.0089, train acc 0.846, test acc 0.808, time 167.8 sec

epoch 51, loss 0.0087, train acc 0.846, test acc 0.821, time 167.5 sec

epoch 52, loss 0.0083, train acc 0.849, test acc 0.821, time 166.9 sec

epoch 53, loss 0.0083, train acc 0.849, test acc 0.802, time 167.5 sec

epoch 54, loss 0.0079, train acc 0.853, test acc 0.825, time 167.6 sec

epoch 55, loss 0.0078, train acc 0.850, test acc 0.824, time 167.6 sec

epoch 56, loss 0.0076, train acc 0.853, test acc 0.818, time 168.0 sec

epoch 57, loss 0.0077, train acc 0.847, test acc 0.817, time 167.5 sec

epoch 58, loss 0.0075, train acc 0.850, test acc 0.822, time 167.7 sec

epoch 59, loss 0.0071, train acc 0.856, test acc 0.825, time 167.2 sec

epoch 60, loss 0.0070, train acc 0.856, test acc 0.820, time 166.3 sec

epoch 61, loss 0.0069, train acc 0.855, test acc 0.812, time 166.7 sec

epoch 62, loss 0.0066, train acc 0.858, test acc 0.820, time 166.8 sec

epoch 63, loss 0.0064, train acc 0.860, test acc 0.828, time 166.3 sec

epoch 64, loss 0.0063, train acc 0.860, test acc 0.812, time 167.6 sec

epoch 65, loss 0.0062, train acc 0.860, test acc 0.825, time 167.5 sec

epoch 66, loss 0.0061, train acc 0.863, test acc 0.821, time 167.5 sec

epoch 67, loss 0.0059, train acc 0.862, test acc 0.825, time 168.4 sec

epoch 68, loss 0.0058, train acc 0.862, test acc 0.832, time 167.5 sec

epoch 69, loss 0.0058, train acc 0.863, test acc 0.838, time 167.7 sec

epoch 70, loss 0.0056, train acc 0.866, test acc 0.836, time 169.0 sec

Validation: Accuracy of the network: 82.66 %

Testing: Accuracy of the network: 83.6 %

Brier before calibration 0.2335767859706384

ECE before calibration: 0.025621874958276742

calibrating...

Closed Brier temperature\_scaling 0.23651780436788136

ECE temperature\_scaling calibration: 0.03879920639991763

**epoch=10**

epoch 1, loss 2.3593, train acc 0.237, test acc 0.328, time 153.0 sec

epoch 2, loss 0.9361, train acc 0.357, test acc 0.405, time 161.9 sec

epoch 3, loss 0.5784, train acc 0.401, test acc 0.271, time 164.9 sec

epoch 4, loss 0.4013, train acc 0.433, test acc 0.482, time 166.0 sec

epoch 5, loss 0.2964, train acc 0.478, test acc 0.500, time 166.5 sec

epoch 6, loss 0.2309, train acc 0.509, test acc 0.510, time 167.4 sec

epoch 7, loss 0.1866, train acc 0.537, test acc 0.550, time 167.3 sec

epoch 8, loss 0.1538, train acc 0.566, test acc 0.577, time 165.8 sec

epoch 9, loss 0.1287, train acc 0.589, test acc 0.606, time 166.4 sec

epoch 10, loss 0.1092, train acc 0.613, test acc 0.625, time 166.5 sec

Validation: Accuracy of the network: 60.5 %

Testing: Accuracy of the network: 62.55 %

Brier before calibration 0.5066463263388

ECE before calibration: 0.024824089694023155

calibrating...

Closed Brier temperature\_scaling 0.5100982251807163

ECE temperature\_scaling calibration: 0.05699703435897827

**epoch=5**

training on cuda:0

epoch 1, loss 2.2935, train acc 0.253, test acc 0.355, time 147.6 sec

epoch 2, loss 0.8565, train acc 0.392, test acc 0.460, time 155.7 sec

epoch 3, loss 0.5288, train acc 0.441, test acc 0.486, time 161.7 sec

epoch 4, loss 0.3614, train acc 0.489, test acc 0.509, time 163.8 sec

epoch 5, loss 0.2691, train acc 0.527, test acc 0.536, time 164.8 sec

Validation: Accuracy of the network: 51.82 %

Testing: Accuracy of the network: 53.64 %

Brier before calibration 0.601293822232402

ECE before calibration: 0.032589839935302733

calibrating...

Closed Brier temperature\_scaling 0.601046715277733

ECE temperature\_scaling calibration: 0.03464422683715818