

## AlexNet8:

Epoch 1/300

49/49 [=====] - 10s 126ms/step - loss: 3.9934 - sparse\_categorical\_accuracy: 0.1513 - val\_loss: 3.8365 - val\_sparse\_categorical\_accuracy: 0.1047

Epoch 2/300

49/49 [=====] - 5s 105ms/step - loss: 2.1024 - sparse\_categorical\_accuracy: 0.2375 - val\_loss: 2.4061 - val\_sparse\_categorical\_accuracy: 0.1453

Epoch 3/300

49/49 [=====] - 5s 106ms/step - loss: 2.0328 - sparse\_categorical\_accuracy: 0.2666 - val\_loss: 2.2919 - val\_sparse\_categorical\_accuracy: 0.1719

Epoch 4/300

49/49 [=====] - 5s 106ms/step - loss: 2.0141 - sparse\_categorical\_accuracy: 0.2762 - val\_loss: 2.1829 - val\_sparse\_categorical\_accuracy: 0.2078

Epoch 5/300

49/49 [=====] - 5s 106ms/step - loss: 1.9791 - sparse\_categorical\_accuracy: 0.2810 - val\_loss: 2.7646 - val\_sparse\_categorical\_accuracy: 0.1281

Epoch 6/300

49/49 [=====] - 5s 108ms/step - loss: 1.9566 - sparse\_categorical\_accuracy: 0.2849 - val\_loss: 2.1619 - val\_sparse\_categorical\_accuracy: 0.1984

Epoch 7/300

49/49 [=====] - 5s 111ms/step - loss: 1.9162 - sparse\_categorical\_accuracy: 0.3004 - val\_loss: 2.0616 - val\_sparse\_categorical\_accuracy: 0.2328

Epoch 8/300

49/49 [=====] - 5s 105ms/step - loss: 1.8563 - sparse\_categorical\_accuracy: 0.3249 - val\_loss: 9.9185 - val\_sparse\_categorical\_accuracy: 0.1000

Epoch 9/300

49/49 [=====] - 5s 108ms/step - loss: 1.8770 - sparse\_categorical\_accuracy: 0.3258 - val\_loss: 2.7814 - val\_sparse\_categorical\_accuracy: 0.1469

Epoch 10/300

49/49 [=====] - 5s 107ms/step - loss: 1.7939 - sparse\_categorical\_accuracy: 0.3503 - val\_loss: 2.1437 - val\_sparse\_categorical\_accuracy: 0.2000

Epoch 11/300

49/49 [=====] - 5s 107ms/step - loss: 1.7616 - sparse\_categorical\_accuracy: 0.3624 - val\_loss: 2.2119 - val\_sparse\_categorical\_accuracy: 0.1961

Epoch 12/300

49/49 [=====] - 5s 105ms/step - loss: 1.7551 - sparse\_categorical\_accuracy: 0.3588 - val\_loss: 2.3355 - val\_sparse\_categorical\_accuracy: 0.1883

Epoch 13/300

49/49 [=====] - 5s 108ms/step - loss: 1.7553 - sparse\_categorical\_accuracy: 0.3687 - val\_loss: 2.4132 - val\_sparse\_categorical\_accuracy: 0.1586

Epoch 14/300

49/49 [=====] - 5s 106ms/step - loss: 1.7056 - sparse\_categorical\_accuracy: 0.3811 - val\_loss: 2.5379 - val\_sparse\_categorical\_accuracy: 0.1711

Epoch 15/300

49/49 [=====] - 5s 106ms/step - loss: 1.6975 - sparse\_categorical\_accuracy: 0.3868  
- val\_loss: 2.4659 - val\_sparse\_categorical\_accuracy: 0.2195

Epoch 16/300

49/49 [=====] - 5s 109ms/step - loss: 1.6883 - sparse\_categorical\_accuracy: 0.3861  
- val\_loss: 2.1335 - val\_sparse\_categorical\_accuracy: 0.2094

Epoch 17/300

49/49 [=====] - 5s 104ms/step - loss: 1.6772 - sparse\_categorical\_accuracy: 0.3900  
- val\_loss: 1.7761 - val\_sparse\_categorical\_accuracy: 0.3445

Epoch 18/300

49/49 [=====] - 5s 106ms/step - loss: 1.6386 - sparse\_categorical\_accuracy: 0.4083  
- val\_loss: 2.4515 - val\_sparse\_categorical\_accuracy: 0.2227

Epoch 19/300

49/49 [=====] - 5s 108ms/step - loss: 1.6515 - sparse\_categorical\_accuracy: 0.4057  
- val\_loss: 1.6542 - val\_sparse\_categorical\_accuracy: 0.4117

Epoch 20/300

49/49 [=====] - 5s 105ms/step - loss: 1.6185 - sparse\_categorical\_accuracy: 0.4156  
- val\_loss: 2.2736 - val\_sparse\_categorical\_accuracy: 0.2219

Epoch 21/300

49/49 [=====] - 5s 107ms/step - loss: 1.6154 - sparse\_categorical\_accuracy: 0.4210  
- val\_loss: 1.7264 - val\_sparse\_categorical\_accuracy: 0.3930

Epoch 22/300

49/49 [=====] - 5s 105ms/step - loss: 1.5975 - sparse\_categorical\_accuracy: 0.4253  
- val\_loss: 2.2934 - val\_sparse\_categorical\_accuracy: 0.2250

Epoch 23/300

49/49 [=====] - 5s 105ms/step - loss: 1.5912 - sparse\_categorical\_accuracy: 0.4268  
- val\_loss: 1.6928 - val\_sparse\_categorical\_accuracy: 0.4047

Epoch 24/300

49/49 [=====] - 5s 111ms/step - loss: 1.5707 - sparse\_categorical\_accuracy: 0.4407  
- val\_loss: 1.7351 - val\_sparse\_categorical\_accuracy: 0.3938

Epoch 25/300

49/49 [=====] - 5s 106ms/step - loss: 1.5550 - sparse\_categorical\_accuracy: 0.4427  
- val\_loss: 1.6962 - val\_sparse\_categorical\_accuracy: 0.3992

Epoch 26/300

49/49 [=====] - 5s 105ms/step - loss: 1.5422 - sparse\_categorical\_accuracy: 0.4500  
- val\_loss: 1.8639 - val\_sparse\_categorical\_accuracy: 0.3250

Epoch 27/300

49/49 [=====] - 5s 106ms/step - loss: 1.5121 - sparse\_categorical\_accuracy: 0.4569  
- val\_loss: 1.7665 - val\_sparse\_categorical\_accuracy: 0.3859

Epoch 28/300

49/49 [=====] - 5s 107ms/step - loss: 1.5743 - sparse\_categorical\_accuracy: 0.4408  
- val\_loss: 1.8728 - val\_sparse\_categorical\_accuracy: 0.3273

Epoch 29/300

49/49 [=====] - 5s 107ms/step - loss: 1.5110 - sparse\_categorical\_accuracy: 0.4675

- val\_loss: 1.8524 - val\_sparse\_categorical\_accuracy: 0.3375  
Epoch 30/300  
49/49 [=====] - 5s 106ms/step - loss: 1.4812 - sparse\_categorical\_accuracy: 0.4718  
- val\_loss: 1.7593 - val\_sparse\_categorical\_accuracy: 0.3859  
Epoch 31/300  
49/49 [=====] - 5s 105ms/step - loss: 1.4582 - sparse\_categorical\_accuracy: 0.4830  
- val\_loss: 2.1886 - val\_sparse\_categorical\_accuracy: 0.2469  
Epoch 32/300  
49/49 [=====] - 5s 108ms/step - loss: 1.4570 - sparse\_categorical\_accuracy: 0.4858  
- val\_loss: 1.9572 - val\_sparse\_categorical\_accuracy: 0.3187  
Epoch 33/300  
49/49 [=====] - 5s 107ms/step - loss: 1.4295 - sparse\_categorical\_accuracy: 0.4938  
- val\_loss: 1.7385 - val\_sparse\_categorical\_accuracy: 0.3883  
Epoch 34/300  
49/49 [=====] - 5s 109ms/step - loss: 1.4223 - sparse\_categorical\_accuracy: 0.4954  
- val\_loss: 1.8287 - val\_sparse\_categorical\_accuracy: 0.3859  
Epoch 35/300  
49/49 [=====] - 5s 105ms/step - loss: 1.4213 - sparse\_categorical\_accuracy: 0.5007  
- val\_loss: 1.6666 - val\_sparse\_categorical\_accuracy: 0.4391  
Epoch 36/300  
49/49 [=====] - 5s 105ms/step - loss: 1.3811 - sparse\_categorical\_accuracy: 0.5123  
- val\_loss: 1.6415 - val\_sparse\_categorical\_accuracy: 0.4492  
Epoch 37/300  
49/49 [=====] - 5s 106ms/step - loss: 1.3828 - sparse\_categorical\_accuracy: 0.5099  
- val\_loss: 1.5693 - val\_sparse\_categorical\_accuracy: 0.5039  
Epoch 38/300  
49/49 [=====] - 5s 108ms/step - loss: 1.3921 - sparse\_categorical\_accuracy: 0.5125  
- val\_loss: 1.7201 - val\_sparse\_categorical\_accuracy: 0.4187  
Epoch 39/300  
49/49 [=====] - 5s 107ms/step - loss: 1.3886 - sparse\_categorical\_accuracy: 0.5121  
- val\_loss: 1.7628 - val\_sparse\_categorical\_accuracy: 0.3992  
Epoch 40/300  
49/49 [=====] - 5s 110ms/step - loss: 1.3669 - sparse\_categorical\_accuracy: 0.5196  
- val\_loss: 1.5411 - val\_sparse\_categorical\_accuracy: 0.5000  
Epoch 41/300  
49/49 [=====] - 5s 108ms/step - loss: 1.3460 - sparse\_categorical\_accuracy: 0.5238  
- val\_loss: 1.5597 - val\_sparse\_categorical\_accuracy: 0.5188  
Epoch 42/300  
49/49 [=====] - 5s 106ms/step - loss: 1.3635 - sparse\_categorical\_accuracy: 0.5261  
- val\_loss: 2.0562 - val\_sparse\_categorical\_accuracy: 0.3094  
Epoch 43/300  
49/49 [=====] - 5s 105ms/step - loss: 1.3371 - sparse\_categorical\_accuracy: 0.5304  
- val\_loss: 2.0174 - val\_sparse\_categorical\_accuracy: 0.3070  
Epoch 44/300

49/49 [=====] - 5s 106ms/step - loss: 1.3011 - sparse\_categorical\_accuracy: 0.5460  
- val\_loss: 1.4743 - val\_sparse\_categorical\_accuracy: 0.5367  
Epoch 45/300  
49/49 [=====] - 5s 107ms/step - loss: 1.3033 - sparse\_categorical\_accuracy: 0.5458  
- val\_loss: 1.5846 - val\_sparse\_categorical\_accuracy: 0.4531  
Epoch 46/300  
49/49 [=====] - 5s 111ms/step - loss: 1.2679 - sparse\_categorical\_accuracy: 0.5534  
- val\_loss: 1.6230 - val\_sparse\_categorical\_accuracy: 0.4914  
Epoch 47/300  
49/49 [=====] - 5s 106ms/step - loss: 1.2731 - sparse\_categorical\_accuracy: 0.5562  
- val\_loss: 1.5113 - val\_sparse\_categorical\_accuracy: 0.4781  
Epoch 48/300  
49/49 [=====] - 5s 107ms/step - loss: 1.2845 - sparse\_categorical\_accuracy: 0.5556  
- val\_loss: 1.7069 - val\_sparse\_categorical\_accuracy: 0.4297  
Epoch 49/300  
49/49 [=====] - 5s 107ms/step - loss: 1.2399 - sparse\_categorical\_accuracy: 0.5618  
- val\_loss: 1.4734 - val\_sparse\_categorical\_accuracy: 0.5070  
Epoch 50/300  
49/49 [=====] - 5s 107ms/step - loss: 1.2304 - sparse\_categorical\_accuracy: 0.5623  
- val\_loss: 1.5051 - val\_sparse\_categorical\_accuracy: 0.5203  
Epoch 51/300  
49/49 [=====] - 5s 107ms/step - loss: 1.2168 - sparse\_categorical\_accuracy: 0.5773  
- val\_loss: 1.6544 - val\_sparse\_categorical\_accuracy: 0.4422  
Epoch 52/300  
49/49 [=====] - 5s 108ms/step - loss: 1.2274 - sparse\_categorical\_accuracy: 0.5644  
- val\_loss: 2.3349 - val\_sparse\_categorical\_accuracy: 0.2656  
Epoch 53/300  
49/49 [=====] - 5s 109ms/step - loss: 1.2187 - sparse\_categorical\_accuracy: 0.5735  
- val\_loss: 1.5795 - val\_sparse\_categorical\_accuracy: 0.4859  
Epoch 54/300  
49/49 [=====] - 5s 108ms/step - loss: 1.2265 - sparse\_categorical\_accuracy: 0.5717  
- val\_loss: 2.1113 - val\_sparse\_categorical\_accuracy: 0.3016  
Epoch 55/300  
49/49 [=====] - 5s 107ms/step - loss: 1.1907 - sparse\_categorical\_accuracy: 0.5793  
- val\_loss: 2.0578 - val\_sparse\_categorical\_accuracy: 0.2781  
Epoch 56/300  
49/49 [=====] - 5s 109ms/step - loss: 1.1680 - sparse\_categorical\_accuracy: 0.5830  
- val\_loss: 1.4509 - val\_sparse\_categorical\_accuracy: 0.5258  
Epoch 57/300  
49/49 [=====] - 5s 105ms/step - loss: 1.1559 - sparse\_categorical\_accuracy: 0.5879  
- val\_loss: 1.4022 - val\_sparse\_categorical\_accuracy: 0.5531  
Epoch 58/300  
49/49 [=====] - 5s 107ms/step - loss: 1.1475 - sparse\_categorical\_accuracy: 0.5911  
- val\_loss: 1.5029 - val\_sparse\_categorical\_accuracy: 0.4938

Epoch 59/300

49/49 [=====] - 5s 107ms/step - loss: 1.1394 - sparse\_categorical\_accuracy: 0.5965  
- val\_loss: 1.5722 - val\_sparse\_categorical\_accuracy: 0.4875

Epoch 60/300

49/49 [=====] - 5s 106ms/step - loss: 1.1328 - sparse\_categorical\_accuracy: 0.5971  
- val\_loss: 1.3587 - val\_sparse\_categorical\_accuracy: 0.5688

Epoch 61/300

49/49 [=====] - 5s 105ms/step - loss: 1.1108 - sparse\_categorical\_accuracy: 0.6036  
- val\_loss: 1.5831 - val\_sparse\_categorical\_accuracy: 0.4531

Epoch 62/300

49/49 [=====] - 5s 107ms/step - loss: 1.0932 - sparse\_categorical\_accuracy: 0.6097  
- val\_loss: 1.9669 - val\_sparse\_categorical\_accuracy: 0.2969

Epoch 63/300

49/49 [=====] - 5s 109ms/step - loss: 1.1600 - sparse\_categorical\_accuracy: 0.5934  
- val\_loss: 1.4532 - val\_sparse\_categorical\_accuracy: 0.5078

Epoch 64/300

49/49 [=====] - 5s 108ms/step - loss: 1.0952 - sparse\_categorical\_accuracy: 0.6109  
- val\_loss: 1.6210 - val\_sparse\_categorical\_accuracy: 0.4563

Epoch 65/300

49/49 [=====] - 5s 104ms/step - loss: 1.1042 - sparse\_categorical\_accuracy: 0.6062  
- val\_loss: 1.5902 - val\_sparse\_categorical\_accuracy: 0.4711

Epoch 66/300

49/49 [=====] - 5s 108ms/step - loss: 1.0816 - sparse\_categorical\_accuracy: 0.6164  
- val\_loss: 1.5453 - val\_sparse\_categorical\_accuracy: 0.4914

Epoch 67/300

49/49 [=====] - 5s 106ms/step - loss: 1.0861 - sparse\_categorical\_accuracy: 0.6130  
- val\_loss: 1.4730 - val\_sparse\_categorical\_accuracy: 0.5211

Epoch 68/300

49/49 [=====] - 5s 107ms/step - loss: 1.0466 - sparse\_categorical\_accuracy: 0.6290  
- val\_loss: 1.3875 - val\_sparse\_categorical\_accuracy: 0.5422

Epoch 69/300

49/49 [=====] - 5s 108ms/step - loss: 1.0459 - sparse\_categorical\_accuracy: 0.6232  
- val\_loss: 1.7270 - val\_sparse\_categorical\_accuracy: 0.4086

Epoch 70/300

49/49 [=====] - 5s 105ms/step - loss: 1.0301 - sparse\_categorical\_accuracy: 0.6249  
- val\_loss: 1.5548 - val\_sparse\_categorical\_accuracy: 0.4477

Epoch 71/300

49/49 [=====] - 5s 106ms/step - loss: 1.0177 - sparse\_categorical\_accuracy: 0.6357  
- val\_loss: 1.4027 - val\_sparse\_categorical\_accuracy: 0.4969

Epoch 72/300

49/49 [=====] - 5s 107ms/step - loss: 1.0016 - sparse\_categorical\_accuracy: 0.6364  
- val\_loss: 1.4613 - val\_sparse\_categorical\_accuracy: 0.5109

Epoch 73/300

49/49 [=====] - 5s 108ms/step - loss: 0.9747 - sparse\_categorical\_accuracy: 0.6478

- val\_loss: 1.3546 - val\_sparse\_categorical\_accuracy: 0.5703  
Epoch 74/300  
49/49 [=====] - 5s 106ms/step - loss: 0.9777 - sparse\_categorical\_accuracy: 0.6472  
- val\_loss: 1.6071 - val\_sparse\_categorical\_accuracy: 0.4391  
Epoch 75/300  
49/49 [=====] - 5s 107ms/step - loss: 0.9736 - sparse\_categorical\_accuracy: 0.6488  
- val\_loss: 1.6804 - val\_sparse\_categorical\_accuracy: 0.4711  
Epoch 76/300  
49/49 [=====] - 5s 109ms/step - loss: 0.9756 - sparse\_categorical\_accuracy: 0.6492  
- val\_loss: 1.3350 - val\_sparse\_categorical\_accuracy: 0.5461  
Epoch 77/300  
49/49 [=====] - 5s 106ms/step - loss: 0.9548 - sparse\_categorical\_accuracy: 0.6569  
- val\_loss: 1.3744 - val\_sparse\_categorical\_accuracy: 0.5383  
Epoch 78/300  
49/49 [=====] - 5s 106ms/step - loss: 0.9333 - sparse\_categorical\_accuracy: 0.6589  
- val\_loss: 1.4135 - val\_sparse\_categorical\_accuracy: 0.5391  
Epoch 79/300  
49/49 [=====] - 5s 107ms/step - loss: 0.9309 - sparse\_categorical\_accuracy: 0.6609  
- val\_loss: 1.6968 - val\_sparse\_categorical\_accuracy: 0.4461  
Epoch 80/300  
49/49 [=====] - 5s 105ms/step - loss: 0.9574 - sparse\_categorical\_accuracy: 0.6521  
- val\_loss: 1.3739 - val\_sparse\_categorical\_accuracy: 0.5281  
Epoch 81/300  
49/49 [=====] - 6s 114ms/step - loss: 0.9096 - sparse\_categorical\_accuracy: 0.6690  
- val\_loss: 1.2529 - val\_sparse\_categorical\_accuracy: 0.5539  
Epoch 82/300  
49/49 [=====] - 5s 107ms/step - loss: 0.8994 - sparse\_categorical\_accuracy: 0.6695  
- val\_loss: 1.9210 - val\_sparse\_categorical\_accuracy: 0.4305  
Epoch 83/300  
49/49 [=====] - 5s 110ms/step - loss: 0.9061 - sparse\_categorical\_accuracy: 0.6682  
- val\_loss: 1.2395 - val\_sparse\_categorical\_accuracy: 0.5828  
Epoch 84/300  
49/49 [=====] - 5s 107ms/step - loss: 0.8823 - sparse\_categorical\_accuracy: 0.6794  
- val\_loss: 1.2999 - val\_sparse\_categorical\_accuracy: 0.5703  
Epoch 85/300  
49/49 [=====] - 5s 108ms/step - loss: 0.8672 - sparse\_categorical\_accuracy: 0.6846  
- val\_loss: 1.4147 - val\_sparse\_categorical\_accuracy: 0.5195  
Epoch 86/300  
49/49 [=====] - 5s 108ms/step - loss: 0.8523 - sparse\_categorical\_accuracy: 0.6959  
- val\_loss: 1.5536 - val\_sparse\_categorical\_accuracy: 0.4930  
Epoch 87/300  
49/49 [=====] - 5s 107ms/step - loss: 0.8278 - sparse\_categorical\_accuracy: 0.6997  
- val\_loss: 1.2900 - val\_sparse\_categorical\_accuracy: 0.5719  
Epoch 88/300

49/49 [=====] - 5s 107ms/step - loss: 0.8772 - sparse\_categorical\_accuracy: 0.6810  
- val\_loss: 1.4819 - val\_sparse\_categorical\_accuracy: 0.4437  
Epoch 89/300  
49/49 [=====] - 5s 108ms/step - loss: 0.8285 - sparse\_categorical\_accuracy: 0.6888  
- val\_loss: 1.3613 - val\_sparse\_categorical\_accuracy: 0.5219  
Epoch 90/300  
49/49 [=====] - 5s 109ms/step - loss: 0.8403 - sparse\_categorical\_accuracy: 0.6940  
- val\_loss: 1.4996 - val\_sparse\_categorical\_accuracy: 0.4961  
Epoch 91/300  
49/49 [=====] - 5s 108ms/step - loss: 0.7847 - sparse\_categorical\_accuracy: 0.7031  
- val\_loss: 1.3329 - val\_sparse\_categorical\_accuracy: 0.5453  
Epoch 92/300  
49/49 [=====] - 5s 105ms/step - loss: 0.7872 - sparse\_categorical\_accuracy: 0.7022  
- val\_loss: 1.5254 - val\_sparse\_categorical\_accuracy: 0.4648  
Epoch 93/300  
49/49 [=====] - 5s 108ms/step - loss: 0.7856 - sparse\_categorical\_accuracy: 0.7100  
- val\_loss: 1.4206 - val\_sparse\_categorical\_accuracy: 0.5289  
Epoch 94/300  
49/49 [=====] - 5s 105ms/step - loss: 0.7578 - sparse\_categorical\_accuracy: 0.7166  
- val\_loss: 1.3840 - val\_sparse\_categorical\_accuracy: 0.5344  
Epoch 95/300  
49/49 [=====] - 5s 108ms/step - loss: 0.7906 - sparse\_categorical\_accuracy: 0.7108  
- val\_loss: 2.3617 - val\_sparse\_categorical\_accuracy: 0.2859  
Epoch 96/300  
49/49 [=====] - 5s 107ms/step - loss: 0.7689 - sparse\_categorical\_accuracy: 0.7161  
- val\_loss: 1.3767 - val\_sparse\_categorical\_accuracy: 0.5680  
Epoch 97/300  
49/49 [=====] - 5s 109ms/step - loss: 0.7218 - sparse\_categorical\_accuracy: 0.7266  
- val\_loss: 1.5290 - val\_sparse\_categorical\_accuracy: 0.4820  
Epoch 98/300  
49/49 [=====] - 5s 107ms/step - loss: 0.7342 - sparse\_categorical\_accuracy: 0.7286  
- val\_loss: 1.2703 - val\_sparse\_categorical\_accuracy: 0.5875  
Epoch 99/300  
49/49 [=====] - 5s 106ms/step - loss: 0.7144 - sparse\_categorical\_accuracy: 0.7387  
- val\_loss: 1.5367 - val\_sparse\_categorical\_accuracy: 0.4938  
Epoch 100/300  
49/49 [=====] - 5s 105ms/step - loss: 0.7274 - sparse\_categorical\_accuracy: 0.7387  
- val\_loss: 1.2412 - val\_sparse\_categorical\_accuracy: 0.5641  
Epoch 101/300  
49/49 [=====] - 5s 107ms/step - loss: 0.7376 - sparse\_categorical\_accuracy: 0.7344  
- val\_loss: 1.5431 - val\_sparse\_categorical\_accuracy: 0.4867  
Epoch 102/300  
49/49 [=====] - 5s 107ms/step - loss: 0.7315 - sparse\_categorical\_accuracy: 0.7379  
- val\_loss: 1.5670 - val\_sparse\_categorical\_accuracy: 0.4805

Epoch 103/300

49/49 [=====] - 5s 107ms/step - loss: 0.6717 - sparse\_categorical\_accuracy: 0.7576  
- val\_loss: 1.3856 - val\_sparse\_categorical\_accuracy: 0.5258

Epoch 104/300

49/49 [=====] - 5s 108ms/step - loss: 0.7020 - sparse\_categorical\_accuracy: 0.7463  
- val\_loss: 1.3298 - val\_sparse\_categorical\_accuracy: 0.5562

Epoch 105/300

49/49 [=====] - 5s 108ms/step - loss: 0.7045 - sparse\_categorical\_accuracy: 0.7465  
- val\_loss: 1.6838 - val\_sparse\_categorical\_accuracy: 0.4437

Epoch 106/300

49/49 [=====] - 5s 106ms/step - loss: 0.6960 - sparse\_categorical\_accuracy: 0.7442  
- val\_loss: 1.3636 - val\_sparse\_categorical\_accuracy: 0.5305

Epoch 107/300

49/49 [=====] - 5s 107ms/step - loss: 0.6727 - sparse\_categorical\_accuracy: 0.7579  
- val\_loss: 1.4615 - val\_sparse\_categorical\_accuracy: 0.5250

Epoch 108/300

49/49 [=====] - 5s 106ms/step - loss: 0.6594 - sparse\_categorical\_accuracy: 0.7637  
- val\_loss: 1.5647 - val\_sparse\_categorical\_accuracy: 0.4727

Epoch 109/300

49/49 [=====] - 5s 107ms/step - loss: 0.6471 - sparse\_categorical\_accuracy: 0.7647  
- val\_loss: 1.2372 - val\_sparse\_categorical\_accuracy: 0.5883

Epoch 110/300

49/49 [=====] - 5s 107ms/step - loss: 0.6033 - sparse\_categorical\_accuracy: 0.7832  
- val\_loss: 1.4140 - val\_sparse\_categorical\_accuracy: 0.5109

Epoch 111/300

49/49 [=====] - 5s 106ms/step - loss: 0.6087 - sparse\_categorical\_accuracy: 0.7814  
- val\_loss: 1.3261 - val\_sparse\_categorical\_accuracy: 0.5688

Epoch 112/300

49/49 [=====] - 5s 110ms/step - loss: 0.6580 - sparse\_categorical\_accuracy: 0.7702  
- val\_loss: 1.3643 - val\_sparse\_categorical\_accuracy: 0.5383

Epoch 113/300

49/49 [=====] - 5s 107ms/step - loss: 0.6042 - sparse\_categorical\_accuracy: 0.7881  
- val\_loss: 1.3477 - val\_sparse\_categorical\_accuracy: 0.5742

Epoch 114/300

49/49 [=====] - 5s 107ms/step - loss: 0.5861 - sparse\_categorical\_accuracy: 0.7918  
- val\_loss: 1.5166 - val\_sparse\_categorical\_accuracy: 0.5180

Epoch 115/300

49/49 [=====] - 5s 106ms/step - loss: 0.5917 - sparse\_categorical\_accuracy: 0.7910  
- val\_loss: 1.2545 - val\_sparse\_categorical\_accuracy: 0.5758

Epoch 116/300

49/49 [=====] - 5s 106ms/step - loss: 0.5314 - sparse\_categorical\_accuracy: 0.8118  
- val\_loss: 1.4000 - val\_sparse\_categorical\_accuracy: 0.5297

Epoch 117/300

49/49 [=====] - 5s 105ms/step - loss: 0.5711 - sparse\_categorical\_accuracy: 0.8007



- val\_loss: 1.8515 - val\_sparse\_categorical\_accuracy: 0.4750  
Epoch 118/300  
49/49 [=====] - 5s 107ms/step - loss: 0.5931 - sparse\_categorical\_accuracy: 0.7965  
- val\_loss: 1.3175 - val\_sparse\_categorical\_accuracy: 0.5570  
Epoch 119/300  
49/49 [=====] - 5s 106ms/step - loss: 0.5348 - sparse\_categorical\_accuracy: 0.8132  
- val\_loss: 1.3976 - val\_sparse\_categorical\_accuracy: 0.5250  
Epoch 120/300  
49/49 [=====] - 5s 111ms/step - loss: 0.5640 - sparse\_categorical\_accuracy: 0.8016  
- val\_loss: 1.4791 - val\_sparse\_categorical\_accuracy: 0.5516  
Epoch 121/300  
49/49 [=====] - 5s 107ms/step - loss: 0.6085 - sparse\_categorical\_accuracy: 0.7909  
- val\_loss: 1.3719 - val\_sparse\_categorical\_accuracy: 0.5859  
Epoch 122/300  
49/49 [=====] - 5s 107ms/step - loss: 0.5164 - sparse\_categorical\_accuracy: 0.8232  
- val\_loss: 1.5492 - val\_sparse\_categorical\_accuracy: 0.5156  
Epoch 123/300  
49/49 [=====] - 5s 105ms/step - loss: 0.5397 - sparse\_categorical\_accuracy: 0.8150  
- val\_loss: 1.4201 - val\_sparse\_categorical\_accuracy: 0.5289  
Epoch 124/300  
49/49 [=====] - 5s 109ms/step - loss: 0.5290 - sparse\_categorical\_accuracy: 0.8192  
- val\_loss: 1.3147 - val\_sparse\_categorical\_accuracy: 0.5789  
Epoch 125/300  
49/49 [=====] - 5s 107ms/step - loss: 0.5131 - sparse\_categorical\_accuracy: 0.8254  
- val\_loss: 1.2383 - val\_sparse\_categorical\_accuracy: 0.5898  
Epoch 126/300  
49/49 [=====] - 5s 108ms/step - loss: 0.5011 - sparse\_categorical\_accuracy: 0.8286  
- val\_loss: 1.7660 - val\_sparse\_categorical\_accuracy: 0.4500  
Epoch 127/300  
49/49 [=====] - 5s 106ms/step - loss: 0.4798 - sparse\_categorical\_accuracy: 0.8366  
- val\_loss: 1.2645 - val\_sparse\_categorical\_accuracy: 0.6023  
Epoch 128/300  
49/49 [=====] - 5s 106ms/step - loss: 0.4492 - sparse\_categorical\_accuracy: 0.8486  
- val\_loss: 1.2089 - val\_sparse\_categorical\_accuracy: 0.5914  
Epoch 129/300  
49/49 [=====] - 5s 106ms/step - loss: 0.4367 - sparse\_categorical\_accuracy: 0.8499  
- val\_loss: 1.4808 - val\_sparse\_categorical\_accuracy: 0.5547  
Epoch 130/300  
49/49 [=====] - 5s 107ms/step - loss: 0.5998 - sparse\_categorical\_accuracy: 0.7983  
- val\_loss: 1.3239 - val\_sparse\_categorical\_accuracy: 0.5602  
Epoch 131/300  
49/49 [=====] - 5s 108ms/step - loss: 0.4771 - sparse\_categorical\_accuracy: 0.8344  
- val\_loss: 1.3259 - val\_sparse\_categorical\_accuracy: 0.5539  
Epoch 132/300

49/49 [=====] - 5s 108ms/step - loss: 0.4598 - sparse\_categorical\_accuracy: 0.8430  
- val\_loss: 1.4459 - val\_sparse\_categorical\_accuracy: 0.5437  
Epoch 133/300  
49/49 [=====] - 5s 109ms/step - loss: 0.4391 - sparse\_categorical\_accuracy: 0.8521  
- val\_loss: 1.2143 - val\_sparse\_categorical\_accuracy: 0.5906  
Epoch 134/300  
49/49 [=====] - 5s 106ms/step - loss: 0.4062 - sparse\_categorical\_accuracy: 0.8599  
- val\_loss: 1.2505 - val\_sparse\_categorical\_accuracy: 0.6133  
Epoch 135/300  
49/49 [=====] - 5s 108ms/step - loss: 0.4474 - sparse\_categorical\_accuracy: 0.8460  
- val\_loss: 1.9964 - val\_sparse\_categorical\_accuracy: 0.4422  
Epoch 136/300  
49/49 [=====] - 5s 106ms/step - loss: 0.4618 - sparse\_categorical\_accuracy: 0.8418  
- val\_loss: 1.2335 - val\_sparse\_categorical\_accuracy: 0.5898  
Epoch 137/300  
49/49 [=====] - 5s 108ms/step - loss: 0.4327 - sparse\_categorical\_accuracy: 0.8576  
- val\_loss: 1.3174 - val\_sparse\_categorical\_accuracy: 0.5805  
Epoch 138/300  
49/49 [=====] - 5s 107ms/step - loss: 0.4153 - sparse\_categorical\_accuracy: 0.8615  
- val\_loss: 1.4333 - val\_sparse\_categorical\_accuracy: 0.5672  
Epoch 139/300  
49/49 [=====] - 5s 107ms/step - loss: 0.3990 - sparse\_categorical\_accuracy: 0.8677  
- val\_loss: 2.1576 - val\_sparse\_categorical\_accuracy: 0.4641  
Epoch 140/300  
49/49 [=====] - 5s 105ms/step - loss: 0.3658 - sparse\_categorical\_accuracy: 0.8802  
- val\_loss: 1.2931 - val\_sparse\_categorical\_accuracy: 0.5781  
Epoch 141/300  
49/49 [=====] - 5s 107ms/step - loss: 0.3958 - sparse\_categorical\_accuracy: 0.8677  
- val\_loss: 1.3377 - val\_sparse\_categorical\_accuracy: 0.5570  
Epoch 142/300  
49/49 [=====] - 5s 107ms/step - loss: 0.3942 - sparse\_categorical\_accuracy: 0.8687  
- val\_loss: 1.3832 - val\_sparse\_categorical\_accuracy: 0.5586  
Epoch 143/300  
49/49 [=====] - 5s 107ms/step - loss: 0.3658 - sparse\_categorical\_accuracy: 0.8787  
- val\_loss: 1.4459 - val\_sparse\_categorical\_accuracy: 0.5484  
Epoch 144/300  
49/49 [=====] - 5s 104ms/step - loss: 0.3840 - sparse\_categorical\_accuracy: 0.8721  
- val\_loss: 1.2921 - val\_sparse\_categorical\_accuracy: 0.5781  
Epoch 145/300  
49/49 [=====] - 5s 109ms/step - loss: 0.3612 - sparse\_categorical\_accuracy: 0.8813  
- val\_loss: 1.3308 - val\_sparse\_categorical\_accuracy: 0.5664  
Epoch 146/300  
49/49 [=====] - 5s 106ms/step - loss: 0.3478 - sparse\_categorical\_accuracy: 0.8873  
- val\_loss: 1.2713 - val\_sparse\_categorical\_accuracy: 0.6266

Epoch 147/300

49/49 [=====] - 5s 106ms/step - loss: 0.3208 - sparse\_categorical\_accuracy: 0.8956  
- val\_loss: 1.3819 - val\_sparse\_categorical\_accuracy: 0.5734

Epoch 148/300

49/49 [=====] - 5s 107ms/step - loss: 0.3863 - sparse\_categorical\_accuracy: 0.8760  
- val\_loss: 1.5537 - val\_sparse\_categorical\_accuracy: 0.5531

Epoch 149/300

49/49 [=====] - 5s 107ms/step - loss: 0.3559 - sparse\_categorical\_accuracy: 0.8813  
- val\_loss: 1.2217 - val\_sparse\_categorical\_accuracy: 0.6250

Epoch 150/300

49/49 [=====] - 5s 105ms/step - loss: 0.3271 - sparse\_categorical\_accuracy: 0.8926  
- val\_loss: 1.6848 - val\_sparse\_categorical\_accuracy: 0.5008

Epoch 151/300

49/49 [=====] - 5s 108ms/step - loss: 0.3463 - sparse\_categorical\_accuracy: 0.8901  
- val\_loss: 1.8368 - val\_sparse\_categorical\_accuracy: 0.4688

Epoch 152/300

49/49 [=====] - 5s 108ms/step - loss: 0.3159 - sparse\_categorical\_accuracy: 0.8975  
- val\_loss: 1.8035 - val\_sparse\_categorical\_accuracy: 0.4531

Epoch 153/300

49/49 [=====] - 5s 105ms/step - loss: 0.3483 - sparse\_categorical\_accuracy: 0.8873  
- val\_loss: 1.3001 - val\_sparse\_categorical\_accuracy: 0.5828

Epoch 154/300

49/49 [=====] - 5s 107ms/step - loss: 0.3080 - sparse\_categorical\_accuracy: 0.9019  
- val\_loss: 1.4052 - val\_sparse\_categorical\_accuracy: 0.5914

Epoch 155/300

49/49 [=====] - 5s 107ms/step - loss: 0.2836 - sparse\_categorical\_accuracy: 0.9089  
- val\_loss: 1.3068 - val\_sparse\_categorical\_accuracy: 0.6078

Epoch 156/300

49/49 [=====] - 5s 108ms/step - loss: 0.3324 - sparse\_categorical\_accuracy: 0.8934  
- val\_loss: 1.5228 - val\_sparse\_categorical\_accuracy: 0.5500

Epoch 157/300

49/49 [=====] - 5s 110ms/step - loss: 0.3163 - sparse\_categorical\_accuracy: 0.9001  
- val\_loss: 1.2537 - val\_sparse\_categorical\_accuracy: 0.6109

Epoch 158/300

49/49 [=====] - 5s 109ms/step - loss: 0.2885 - sparse\_categorical\_accuracy: 0.9089  
- val\_loss: 1.2238 - val\_sparse\_categorical\_accuracy: 0.6219

Epoch 159/300

49/49 [=====] - 5s 107ms/step - loss: 0.2796 - sparse\_categorical\_accuracy: 0.9115  
- val\_loss: 1.3030 - val\_sparse\_categorical\_accuracy: 0.5984

Epoch 160/300

49/49 [=====] - 5s 108ms/step - loss: 0.2697 - sparse\_categorical\_accuracy: 0.9140  
- val\_loss: 1.3860 - val\_sparse\_categorical\_accuracy: 0.5773

Epoch 161/300

49/49 [=====] - 5s 105ms/step - loss: 0.2831 - sparse\_categorical\_accuracy: 0.9101

- val\_loss: 1.3163 - val\_sparse\_categorical\_accuracy: 0.5805  
Epoch 162/300  
49/49 [=====] - 5s 108ms/step - loss: 0.2447 - sparse\_categorical\_accuracy: 0.9259  
- val\_loss: 1.6822 - val\_sparse\_categorical\_accuracy: 0.5500  
Epoch 163/300  
49/49 [=====] - 5s 105ms/step - loss: 0.2638 - sparse\_categorical\_accuracy: 0.9163  
- val\_loss: 1.3624 - val\_sparse\_categorical\_accuracy: 0.5914  
Epoch 164/300  
49/49 [=====] - 5s 111ms/step - loss: 0.2638 - sparse\_categorical\_accuracy: 0.9176  
- val\_loss: 1.2984 - val\_sparse\_categorical\_accuracy: 0.6008  
Epoch 165/300  
49/49 [=====] - 5s 108ms/step - loss: 0.2748 - sparse\_categorical\_accuracy: 0.9145  
- val\_loss: 1.4227 - val\_sparse\_categorical\_accuracy: 0.5516  
Epoch 166/300  
49/49 [=====] - 5s 106ms/step - loss: 0.2480 - sparse\_categorical\_accuracy: 0.9253  
- val\_loss: 1.8979 - val\_sparse\_categorical\_accuracy: 0.4805  
Epoch 167/300  
49/49 [=====] - 5s 107ms/step - loss: 0.2704 - sparse\_categorical\_accuracy: 0.9145  
- val\_loss: 1.4154 - val\_sparse\_categorical\_accuracy: 0.5711  
Epoch 168/300  
49/49 [=====] - 5s 109ms/step - loss: 0.2494 - sparse\_categorical\_accuracy: 0.9248  
- val\_loss: 1.3974 - val\_sparse\_categorical\_accuracy: 0.5727  
Epoch 169/300  
49/49 [=====] - 5s 107ms/step - loss: 0.2806 - sparse\_categorical\_accuracy: 0.9152  
- val\_loss: 1.3619 - val\_sparse\_categorical\_accuracy: 0.5891  
Epoch 170/300  
49/49 [=====] - 5s 107ms/step - loss: 0.2567 - sparse\_categorical\_accuracy: 0.9201  
- val\_loss: 1.3971 - val\_sparse\_categorical\_accuracy: 0.5797  
Epoch 171/300  
49/49 [=====] - 5s 106ms/step - loss: 0.2391 - sparse\_categorical\_accuracy: 0.9276  
- val\_loss: 1.3398 - val\_sparse\_categorical\_accuracy: 0.6313  
Epoch 172/300  
49/49 [=====] - 5s 106ms/step - loss: 0.2080 - sparse\_categorical\_accuracy: 0.9362  
- val\_loss: 1.7948 - val\_sparse\_categorical\_accuracy: 0.5437  
Epoch 173/300  
49/49 [=====] - 5s 107ms/step - loss: 0.2214 - sparse\_categorical\_accuracy: 0.9322  
- val\_loss: 1.6117 - val\_sparse\_categorical\_accuracy: 0.5437  
Epoch 174/300  
49/49 [=====] - 5s 109ms/step - loss: 0.2075 - sparse\_categorical\_accuracy: 0.9370  
- val\_loss: 1.2290 - val\_sparse\_categorical\_accuracy: 0.6094  
Epoch 175/300  
49/49 [=====] - 5s 106ms/step - loss: 0.2231 - sparse\_categorical\_accuracy: 0.9318  
- val\_loss: 1.3389 - val\_sparse\_categorical\_accuracy: 0.6023  
Epoch 176/300

49/49 [=====] - 5s 106ms/step - loss: 0.2187 - sparse\_categorical\_accuracy: 0.9328  
- val\_loss: 1.5341 - val\_sparse\_categorical\_accuracy: 0.5586  
Epoch 177/300  
49/49 [=====] - 5s 107ms/step - loss: 0.2266 - sparse\_categorical\_accuracy: 0.9316  
- val\_loss: 1.4482 - val\_sparse\_categorical\_accuracy: 0.5914  
Epoch 178/300  
49/49 [=====] - 5s 106ms/step - loss: 0.2231 - sparse\_categorical\_accuracy: 0.9308  
- val\_loss: 1.3779 - val\_sparse\_categorical\_accuracy: 0.6148  
Epoch 179/300  
49/49 [=====] - 5s 107ms/step - loss: 0.2186 - sparse\_categorical\_accuracy: 0.9328  
- val\_loss: 1.3171 - val\_sparse\_categorical\_accuracy: 0.6047  
Epoch 180/300  
49/49 [=====] - 5s 108ms/step - loss: 0.2167 - sparse\_categorical\_accuracy: 0.9371  
- val\_loss: 1.3537 - val\_sparse\_categorical\_accuracy: 0.5906  
Epoch 181/300  
49/49 [=====] - 5s 108ms/step - loss: 0.1981 - sparse\_categorical\_accuracy: 0.9395  
- val\_loss: 1.2655 - val\_sparse\_categorical\_accuracy: 0.6281  
Epoch 182/300  
49/49 [=====] - 5s 105ms/step - loss: 0.2326 - sparse\_categorical\_accuracy: 0.9286  
- val\_loss: 1.5014 - val\_sparse\_categorical\_accuracy: 0.5437  
Epoch 183/300  
49/49 [=====] - 5s 109ms/step - loss: 0.2017 - sparse\_categorical\_accuracy: 0.9388  
- val\_loss: 1.7888 - val\_sparse\_categorical\_accuracy: 0.4891  
Epoch 184/300  
49/49 [=====] - 5s 109ms/step - loss: 0.2008 - sparse\_categorical\_accuracy: 0.9386  
- val\_loss: 1.4490 - val\_sparse\_categorical\_accuracy: 0.5852  
Epoch 185/300  
49/49 [=====] - 5s 108ms/step - loss: 0.1910 - sparse\_categorical\_accuracy: 0.9434  
- val\_loss: 1.2975 - val\_sparse\_categorical\_accuracy: 0.6023  
Epoch 186/300  
49/49 [=====] - 5s 107ms/step - loss: 0.1860 - sparse\_categorical\_accuracy: 0.9431  
- val\_loss: 1.5149 - val\_sparse\_categorical\_accuracy: 0.5539  
Epoch 187/300  
49/49 [=====] - 5s 106ms/step - loss: 0.2316 - sparse\_categorical\_accuracy: 0.9294  
- val\_loss: 1.4892 - val\_sparse\_categorical\_accuracy: 0.5711  
Epoch 188/300  
49/49 [=====] - 5s 105ms/step - loss: 0.1938 - sparse\_categorical\_accuracy: 0.9410  
- val\_loss: 1.3840 - val\_sparse\_categorical\_accuracy: 0.6133  
Epoch 189/300  
49/49 [=====] - 5s 108ms/step - loss: 0.1822 - sparse\_categorical\_accuracy: 0.9481  
- val\_loss: 1.5734 - val\_sparse\_categorical\_accuracy: 0.5367  
Epoch 190/300  
49/49 [=====] - 5s 105ms/step - loss: 0.2023 - sparse\_categorical\_accuracy: 0.9376  
- val\_loss: 1.5148 - val\_sparse\_categorical\_accuracy: 0.5711

Epoch 191/300

49/49 [=====] - 5s 110ms/step - loss: 0.1911 - sparse\_categorical\_accuracy: 0.9407  
- val\_loss: 1.3405 - val\_sparse\_categorical\_accuracy: 0.6016

Epoch 192/300

49/49 [=====] - 5s 106ms/step - loss: 0.1514 - sparse\_categorical\_accuracy: 0.9541  
- val\_loss: 1.3867 - val\_sparse\_categorical\_accuracy: 0.6102

Epoch 193/300

49/49 [=====] - 5s 108ms/step - loss: 0.1398 - sparse\_categorical\_accuracy: 0.9571  
- val\_loss: 1.3484 - val\_sparse\_categorical\_accuracy: 0.6156

Epoch 194/300

49/49 [=====] - 5s 105ms/step - loss: 0.1603 - sparse\_categorical\_accuracy: 0.9498  
- val\_loss: 1.5988 - val\_sparse\_categorical\_accuracy: 0.5836

Epoch 195/300

49/49 [=====] - 5s 107ms/step - loss: 0.1680 - sparse\_categorical\_accuracy: 0.9492  
- val\_loss: 1.5894 - val\_sparse\_categorical\_accuracy: 0.5297

Epoch 196/300

49/49 [=====] - 5s 107ms/step - loss: 0.2683 - sparse\_categorical\_accuracy: 0.9196  
- val\_loss: 1.7672 - val\_sparse\_categorical\_accuracy: 0.5367

Epoch 197/300

49/49 [=====] - 5s 110ms/step - loss: 0.1784 - sparse\_categorical\_accuracy: 0.9472  
- val\_loss: 1.2661 - val\_sparse\_categorical\_accuracy: 0.6125

Epoch 198/300

49/49 [=====] - 5s 108ms/step - loss: 0.1662 - sparse\_categorical\_accuracy: 0.9492  
- val\_loss: 1.3186 - val\_sparse\_categorical\_accuracy: 0.6531

Epoch 199/300

49/49 [=====] - 5s 107ms/step - loss: 0.1758 - sparse\_categorical\_accuracy: 0.9460  
- val\_loss: 1.2617 - val\_sparse\_categorical\_accuracy: 0.6133

Epoch 200/300

49/49 [=====] - 5s 107ms/step - loss: 0.1719 - sparse\_categorical\_accuracy: 0.9482  
- val\_loss: 1.4412 - val\_sparse\_categorical\_accuracy: 0.5578

Epoch 201/300

49/49 [=====] - 5s 106ms/step - loss: 0.1942 - sparse\_categorical\_accuracy: 0.9420  
- val\_loss: 1.4985 - val\_sparse\_categorical\_accuracy: 0.5562

Epoch 202/300

49/49 [=====] - 5s 107ms/step - loss: 0.1773 - sparse\_categorical\_accuracy: 0.9484  
- val\_loss: 1.4909 - val\_sparse\_categorical\_accuracy: 0.5586

Epoch 203/300

49/49 [=====] - 5s 107ms/step - loss: 0.2226 - sparse\_categorical\_accuracy: 0.9330  
- val\_loss: 2.2342 - val\_sparse\_categorical\_accuracy: 0.4461

Epoch 204/300

49/49 [=====] - 5s 112ms/step - loss: 0.1586 - sparse\_categorical\_accuracy: 0.9521  
- val\_loss: 1.9422 - val\_sparse\_categorical\_accuracy: 0.5469

Epoch 205/300

49/49 [=====] - 5s 106ms/step - loss: 0.1339 - sparse\_categorical\_accuracy: 0.9609

- val\_loss: 1.2633 - val\_sparse\_categorical\_accuracy: 0.6094  
Epoch 206/300  
49/49 [=====] - 5s 106ms/step - loss: 0.1473 - sparse\_categorical\_accuracy: 0.9573  
- val\_loss: 1.4282 - val\_sparse\_categorical\_accuracy: 0.6070  
Epoch 207/300  
49/49 [=====] - 5s 107ms/step - loss: 0.1285 - sparse\_categorical\_accuracy: 0.9621  
- val\_loss: 1.3052 - val\_sparse\_categorical\_accuracy: 0.6133  
Epoch 208/300  
49/49 [=====] - 5s 106ms/step - loss: 0.1436 - sparse\_categorical\_accuracy: 0.9583  
- val\_loss: 1.2881 - val\_sparse\_categorical\_accuracy: 0.6328  
Epoch 209/300  
49/49 [=====] - 5s 106ms/step - loss: 0.1622 - sparse\_categorical\_accuracy: 0.9514  
- val\_loss: 1.4859 - val\_sparse\_categorical\_accuracy: 0.5531  
Epoch 210/300  
49/49 [=====] - 5s 107ms/step - loss: 0.1788 - sparse\_categorical\_accuracy: 0.9468  
- val\_loss: 1.4901 - val\_sparse\_categorical\_accuracy: 0.5781  
Epoch 211/300  
49/49 [=====] - 5s 106ms/step - loss: 0.1492 - sparse\_categorical\_accuracy: 0.9541  
- val\_loss: 1.3814 - val\_sparse\_categorical\_accuracy: 0.5813  
Epoch 212/300  
49/49 [=====] - 5s 109ms/step - loss: 0.1295 - sparse\_categorical\_accuracy: 0.9601  
- val\_loss: 1.5307 - val\_sparse\_categorical\_accuracy: 0.5852  
Epoch 213/300  
49/49 [=====] - 5s 110ms/step - loss: 0.1283 - sparse\_categorical\_accuracy: 0.9613  
- val\_loss: 1.4252 - val\_sparse\_categorical\_accuracy: 0.6000  
Epoch 214/300  
49/49 [=====] - 5s 108ms/step - loss: 0.1079 - sparse\_categorical\_accuracy: 0.9677  
- val\_loss: 1.3758 - val\_sparse\_categorical\_accuracy: 0.6258  
Epoch 215/300  
49/49 [=====] - 5s 107ms/step - loss: 0.1256 - sparse\_categorical\_accuracy: 0.9626  
- val\_loss: 1.4249 - val\_sparse\_categorical\_accuracy: 0.5922  
Epoch 216/300  
49/49 [=====] - 5s 106ms/step - loss: 0.1302 - sparse\_categorical\_accuracy: 0.9623  
- val\_loss: 1.3086 - val\_sparse\_categorical\_accuracy: 0.6180  
Epoch 217/300  
49/49 [=====] - 5s 108ms/step - loss: 0.1436 - sparse\_categorical\_accuracy: 0.9589  
- val\_loss: 1.7454 - val\_sparse\_categorical\_accuracy: 0.5383  
Epoch 218/300  
49/49 [=====] - 5s 105ms/step - loss: 0.1557 - sparse\_categorical\_accuracy: 0.9543  
- val\_loss: 1.4176 - val\_sparse\_categorical\_accuracy: 0.6141  
Epoch 219/300  
49/49 [=====] - 5s 110ms/step - loss: 0.1312 - sparse\_categorical\_accuracy: 0.9623  
- val\_loss: 1.4869 - val\_sparse\_categorical\_accuracy: 0.5891  
Epoch 220/300

49/49 [=====] - 5s 106ms/step - loss: 0.1357 - sparse\_categorical\_accuracy: 0.9597  
- val\_loss: 2.1160 - val\_sparse\_categorical\_accuracy: 0.4852  
Epoch 221/300

49/49 [=====] - 5s 105ms/step - loss: 0.1396 - sparse\_categorical\_accuracy: 0.9587  
- val\_loss: 1.4128 - val\_sparse\_categorical\_accuracy: 0.6047  
Epoch 222/300

49/49 [=====] - 5s 106ms/step - loss: 0.1149 - sparse\_categorical\_accuracy: 0.9659  
- val\_loss: 1.3566 - val\_sparse\_categorical\_accuracy: 0.5953  
Epoch 223/300

49/49 [=====] - 5s 108ms/step - loss: 0.1258 - sparse\_categorical\_accuracy: 0.9646  
- val\_loss: 1.7752 - val\_sparse\_categorical\_accuracy: 0.5391  
Epoch 224/300

49/49 [=====] - 5s 107ms/step - loss: 0.1432 - sparse\_categorical\_accuracy: 0.9597  
- val\_loss: 1.3979 - val\_sparse\_categorical\_accuracy: 0.5891  
Epoch 225/300

49/49 [=====] - 5s 107ms/step - loss: 0.1187 - sparse\_categorical\_accuracy: 0.9652  
- val\_loss: 1.4665 - val\_sparse\_categorical\_accuracy: 0.6187  
Epoch 226/300

49/49 [=====] - 5s 105ms/step - loss: 0.1202 - sparse\_categorical\_accuracy: 0.9653  
- val\_loss: 1.6062 - val\_sparse\_categorical\_accuracy: 0.5578  
Epoch 227/300

49/49 [=====] - 5s 108ms/step - loss: 0.1103 - sparse\_categorical\_accuracy: 0.9680  
- val\_loss: 1.3042 - val\_sparse\_categorical\_accuracy: 0.6219  
Epoch 228/300

49/49 [=====] - 5s 107ms/step - loss: 0.1043 - sparse\_categorical\_accuracy: 0.9693  
- val\_loss: 1.3411 - val\_sparse\_categorical\_accuracy: 0.5945  
Epoch 229/300

49/49 [=====] - 5s 107ms/step - loss: 0.0887 - sparse\_categorical\_accuracy: 0.9745  
- val\_loss: 1.3913 - val\_sparse\_categorical\_accuracy: 0.6234  
Epoch 230/300

49/49 [=====] - 5s 106ms/step - loss: 0.1009 - sparse\_categorical\_accuracy: 0.9699  
- val\_loss: 1.5259 - val\_sparse\_categorical\_accuracy: 0.6141  
Epoch 231/300

49/49 [=====] - 5s 107ms/step - loss: 0.1566 - sparse\_categorical\_accuracy: 0.9541  
- val\_loss: 1.5549 - val\_sparse\_categorical\_accuracy: 0.5781  
Epoch 232/300

49/49 [=====] - 5s 105ms/step - loss: 0.1564 - sparse\_categorical\_accuracy: 0.9542  
- val\_loss: 1.6021 - val\_sparse\_categorical\_accuracy: 0.5625  
Epoch 233/300

49/49 [=====] - 5s 109ms/step - loss: 0.1368 - sparse\_categorical\_accuracy: 0.9588  
- val\_loss: 1.6651 - val\_sparse\_categorical\_accuracy: 0.5773  
Epoch 234/300

49/49 [=====] - 5s 106ms/step - loss: 0.1049 - sparse\_categorical\_accuracy: 0.9680  
- val\_loss: 1.5316 - val\_sparse\_categorical\_accuracy: 0.5742



Epoch 235/300

49/49 [=====] - 5s 108ms/step - loss: 0.0921 - sparse\_categorical\_accuracy: 0.9723  
- val\_loss: 1.5469 - val\_sparse\_categorical\_accuracy: 0.6031

Epoch 236/300

49/49 [=====] - 5s 104ms/step - loss: 0.1031 - sparse\_categorical\_accuracy: 0.9699  
- val\_loss: 1.3032 - val\_sparse\_categorical\_accuracy: 0.6445

Epoch 237/300

49/49 [=====] - 5s 107ms/step - loss: 0.0829 - sparse\_categorical\_accuracy: 0.9746  
- val\_loss: 1.5752 - val\_sparse\_categorical\_accuracy: 0.6008

Epoch 238/300

49/49 [=====] - 5s 108ms/step - loss: 0.1977 - sparse\_categorical\_accuracy: 0.9418  
- val\_loss: 1.6789 - val\_sparse\_categorical\_accuracy: 0.5914

Epoch 239/300

49/49 [=====] - 5s 105ms/step - loss: 0.1261 - sparse\_categorical\_accuracy: 0.9637  
- val\_loss: 1.5918 - val\_sparse\_categorical\_accuracy: 0.5758

Epoch 240/300

49/49 [=====] - 5s 108ms/step - loss: 0.1101 - sparse\_categorical\_accuracy: 0.9701  
- val\_loss: 1.7596 - val\_sparse\_categorical\_accuracy: 0.5344

Epoch 241/300

49/49 [=====] - 5s 108ms/step - loss: 0.1349 - sparse\_categorical\_accuracy: 0.9584  
- val\_loss: 1.2816 - val\_sparse\_categorical\_accuracy: 0.6391

Epoch 242/300

49/49 [=====] - 5s 108ms/step - loss: 0.1131 - sparse\_categorical\_accuracy: 0.9699  
- val\_loss: 1.3188 - val\_sparse\_categorical\_accuracy: 0.6109

Epoch 243/300

49/49 [=====] - 5s 107ms/step - loss: 0.0979 - sparse\_categorical\_accuracy: 0.9722  
- val\_loss: 1.4592 - val\_sparse\_categorical\_accuracy: 0.6086

Epoch 244/300

49/49 [=====] - 5s 108ms/step - loss: 0.0962 - sparse\_categorical\_accuracy: 0.9728  
- val\_loss: 1.7833 - val\_sparse\_categorical\_accuracy: 0.5484

Epoch 245/300

49/49 [=====] - 5s 108ms/step - loss: 0.0767 - sparse\_categorical\_accuracy: 0.9777  
- val\_loss: 1.3235 - val\_sparse\_categorical\_accuracy: 0.6453

Epoch 246/300

49/49 [=====] - 5s 107ms/step - loss: 0.0797 - sparse\_categorical\_accuracy: 0.9784  
- val\_loss: 1.5871 - val\_sparse\_categorical\_accuracy: 0.5773

Epoch 247/300

49/49 [=====] - 5s 110ms/step - loss: 0.0803 - sparse\_categorical\_accuracy: 0.9763  
- val\_loss: 1.7563 - val\_sparse\_categorical\_accuracy: 0.5852

Epoch 248/300

49/49 [=====] - 5s 106ms/step - loss: 0.0712 - sparse\_categorical\_accuracy: 0.9795  
- val\_loss: 1.4670 - val\_sparse\_categorical\_accuracy: 0.6242

Epoch 249/300

49/49 [=====] - 5s 107ms/step - loss: 0.0912 - sparse\_categorical\_accuracy: 0.9737

- val\_loss: 1.5355 - val\_sparse\_categorical\_accuracy: 0.5867  
Epoch 250/300  
49/49 [=====] - 5s 107ms/step - loss: 0.1377 - sparse\_categorical\_accuracy: 0.9593  
- val\_loss: 1.7710 - val\_sparse\_categorical\_accuracy: 0.5437  
Epoch 251/300  
49/49 [=====] - 5s 107ms/step - loss: 0.1192 - sparse\_categorical\_accuracy: 0.9648  
- val\_loss: 1.3765 - val\_sparse\_categorical\_accuracy: 0.6375  
Epoch 252/300  
49/49 [=====] - 5s 106ms/step - loss: 0.0854 - sparse\_categorical\_accuracy: 0.9745  
- val\_loss: 1.3596 - val\_sparse\_categorical\_accuracy: 0.6125  
Epoch 253/300  
49/49 [=====] - 5s 110ms/step - loss: 0.1039 - sparse\_categorical\_accuracy: 0.9709  
- val\_loss: 1.3933 - val\_sparse\_categorical\_accuracy: 0.6133  
Epoch 254/300  
49/49 [=====] - 5s 107ms/step - loss: 0.0964 - sparse\_categorical\_accuracy: 0.9730  
- val\_loss: 1.6495 - val\_sparse\_categorical\_accuracy: 0.5719  
Epoch 255/300  
49/49 [=====] - 5s 107ms/step - loss: 0.0867 - sparse\_categorical\_accuracy: 0.9768  
- val\_loss: 1.6408 - val\_sparse\_categorical\_accuracy: 0.5930  
Epoch 256/300  
49/49 [=====] - 5s 107ms/step - loss: 0.1066 - sparse\_categorical\_accuracy: 0.9672  
- val\_loss: 1.6150 - val\_sparse\_categorical\_accuracy: 0.6055  
Epoch 257/300  
49/49 [=====] - 5s 106ms/step - loss: 0.0825 - sparse\_categorical\_accuracy: 0.9769  
- val\_loss: 1.4008 - val\_sparse\_categorical\_accuracy: 0.6578  
Epoch 258/300  
49/49 [=====] - 5s 106ms/step - loss: 0.0914 - sparse\_categorical\_accuracy: 0.9737  
- val\_loss: 1.6904 - val\_sparse\_categorical\_accuracy: 0.5609  
Epoch 259/300  
49/49 [=====] - 5s 107ms/step - loss: 0.1128 - sparse\_categorical\_accuracy: 0.9670  
- val\_loss: 1.9695 - val\_sparse\_categorical\_accuracy: 0.4914  
Epoch 260/300  
49/49 [=====] - 5s 109ms/step - loss: 0.1112 - sparse\_categorical\_accuracy: 0.9694  
- val\_loss: 1.3986 - val\_sparse\_categorical\_accuracy: 0.5969  
Epoch 261/300  
49/49 [=====] - 5s 107ms/step - loss: 0.1006 - sparse\_categorical\_accuracy: 0.9720  
- val\_loss: 1.5438 - val\_sparse\_categorical\_accuracy: 0.6023  
Epoch 262/300  
49/49 [=====] - 5s 107ms/step - loss: 0.0810 - sparse\_categorical\_accuracy: 0.9767  
- val\_loss: 1.4307 - val\_sparse\_categorical\_accuracy: 0.6109  
Epoch 263/300  
49/49 [=====] - 5s 107ms/step - loss: 0.0799 - sparse\_categorical\_accuracy: 0.9770  
- val\_loss: 1.6045 - val\_sparse\_categorical\_accuracy: 0.5859  
Epoch 264/300

49/49 [=====] - 5s 106ms/step - loss: 0.1176 - sparse\_categorical\_accuracy: 0.9684  
- val\_loss: 1.5677 - val\_sparse\_categorical\_accuracy: 0.5945  
Epoch 265/300  
49/49 [=====] - 5s 108ms/step - loss: 0.0750 - sparse\_categorical\_accuracy: 0.9792  
- val\_loss: 1.3617 - val\_sparse\_categorical\_accuracy: 0.6109  
Epoch 266/300  
49/49 [=====] - 5s 106ms/step - loss: 0.0813 - sparse\_categorical\_accuracy: 0.9765  
- val\_loss: 1.5378 - val\_sparse\_categorical\_accuracy: 0.6016  
Epoch 267/300  
49/49 [=====] - 5s 107ms/step - loss: 0.0730 - sparse\_categorical\_accuracy: 0.9767  
- val\_loss: 1.2814 - val\_sparse\_categorical\_accuracy: 0.6508  
Epoch 268/300  
49/49 [=====] - 5s 105ms/step - loss: 0.0780 - sparse\_categorical\_accuracy: 0.9775  
- val\_loss: 1.6157 - val\_sparse\_categorical\_accuracy: 0.6305  
Epoch 269/300  
49/49 [=====] - 5s 110ms/step - loss: 0.0631 - sparse\_categorical\_accuracy: 0.9813  
- val\_loss: 1.8090 - val\_sparse\_categorical\_accuracy: 0.5711  
Epoch 270/300  
49/49 [=====] - 5s 106ms/step - loss: 0.0601 - sparse\_categorical\_accuracy: 0.9825  
- val\_loss: 1.6852 - val\_sparse\_categorical\_accuracy: 0.5781  
Epoch 271/300  
49/49 [=====] - 5s 107ms/step - loss: 0.0806 - sparse\_categorical\_accuracy: 0.9772  
- val\_loss: 1.3806 - val\_sparse\_categorical\_accuracy: 0.6289  
Epoch 272/300  
49/49 [=====] - 5s 105ms/step - loss: 0.0666 - sparse\_categorical\_accuracy: 0.9798  
- val\_loss: 1.5773 - val\_sparse\_categorical\_accuracy: 0.5938  
Epoch 273/300  
49/49 [=====] - 5s 107ms/step - loss: 0.0628 - sparse\_categorical\_accuracy: 0.9826  
- val\_loss: 1.3266 - val\_sparse\_categorical\_accuracy: 0.6477  
Epoch 274/300  
49/49 [=====] - 5s 105ms/step - loss: 0.1104 - sparse\_categorical\_accuracy: 0.9691  
- val\_loss: 1.8041 - val\_sparse\_categorical\_accuracy: 0.5641  
Epoch 275/300  
49/49 [=====] - 5s 107ms/step - loss: 0.1158 - sparse\_categorical\_accuracy: 0.9672  
- val\_loss: 2.4376 - val\_sparse\_categorical\_accuracy: 0.5133  
Epoch 276/300  
49/49 [=====] - 5s 109ms/step - loss: 0.0986 - sparse\_categorical\_accuracy: 0.9723  
- val\_loss: 1.5325 - val\_sparse\_categorical\_accuracy: 0.5625  
Epoch 277/300  
49/49 [=====] - 5s 108ms/step - loss: 0.1246 - sparse\_categorical\_accuracy: 0.9627  
- val\_loss: 1.6792 - val\_sparse\_categorical\_accuracy: 0.5820  
Epoch 278/300  
49/49 [=====] - 5s 105ms/step - loss: 0.0708 - sparse\_categorical\_accuracy: 0.9823  
- val\_loss: 1.3293 - val\_sparse\_categorical\_accuracy: 0.6227

Epoch 279/300

49/49 [=====] - 5s 107ms/step - loss: 0.0562 - sparse\_categorical\_accuracy: 0.9839  
- val\_loss: 1.6433 - val\_sparse\_categorical\_accuracy: 0.6094

Epoch 280/300

49/49 [=====] - 5s 105ms/step - loss: 0.0537 - sparse\_categorical\_accuracy: 0.9847  
- val\_loss: 1.3304 - val\_sparse\_categorical\_accuracy: 0.6344

Epoch 281/300

49/49 [=====] - 5s 107ms/step - loss: 0.0551 - sparse\_categorical\_accuracy: 0.9826  
- val\_loss: 1.6444 - val\_sparse\_categorical\_accuracy: 0.6102

Epoch 282/300

49/49 [=====] - 5s 107ms/step - loss: 0.0535 - sparse\_categorical\_accuracy: 0.9847  
- val\_loss: 1.8396 - val\_sparse\_categorical\_accuracy: 0.5586

Epoch 283/300

49/49 [=====] - 5s 108ms/step - loss: 0.0585 - sparse\_categorical\_accuracy: 0.9826  
- val\_loss: 1.6931 - val\_sparse\_categorical\_accuracy: 0.6078

Epoch 284/300

49/49 [=====] - 5s 108ms/step - loss: 0.0645 - sparse\_categorical\_accuracy: 0.9813  
- val\_loss: 1.5991 - val\_sparse\_categorical\_accuracy: 0.6305

Epoch 285/300

49/49 [=====] - 5s 107ms/step - loss: 0.0720 - sparse\_categorical\_accuracy: 0.9795  
- val\_loss: 1.9649 - val\_sparse\_categorical\_accuracy: 0.5828

Epoch 286/300

49/49 [=====] - 5s 108ms/step - loss: 0.1121 - sparse\_categorical\_accuracy: 0.9685  
- val\_loss: 1.7290 - val\_sparse\_categorical\_accuracy: 0.5914

Epoch 287/300

49/49 [=====] - 5s 105ms/step - loss: 0.0762 - sparse\_categorical\_accuracy: 0.9786  
- val\_loss: 1.6053 - val\_sparse\_categorical\_accuracy: 0.5828

Epoch 288/300

49/49 [=====] - 5s 106ms/step - loss: 0.1116 - sparse\_categorical\_accuracy: 0.9682  
- val\_loss: 1.8873 - val\_sparse\_categorical\_accuracy: 0.5125

Epoch 289/300

49/49 [=====] - 5s 104ms/step - loss: 0.0585 - sparse\_categorical\_accuracy: 0.9812  
- val\_loss: 1.3790 - val\_sparse\_categorical\_accuracy: 0.6594

Epoch 290/300

49/49 [=====] - 5s 109ms/step - loss: 0.0680 - sparse\_categorical\_accuracy: 0.9797  
- val\_loss: 1.7767 - val\_sparse\_categorical\_accuracy: 0.6133

Epoch 291/300

49/49 [=====] - 5s 108ms/step - loss: 0.0458 - sparse\_categorical\_accuracy: 0.9864  
- val\_loss: 2.5935 - val\_sparse\_categorical\_accuracy: 0.5633

Epoch 292/300

49/49 [=====] - 5s 107ms/step - loss: 0.0558 - sparse\_categorical\_accuracy: 0.9834  
- val\_loss: 1.5677 - val\_sparse\_categorical\_accuracy: 0.6258

Epoch 293/300

49/49 [=====] - 5s 105ms/step - loss: 0.0500 - sparse\_categorical\_accuracy: 0.9864

- val\_loss: 1.4933 - val\_sparse\_categorical\_accuracy: 0.6469  
Epoch 294/300  
49/49 [=====] - 5s 109ms/step - loss: 0.0567 - sparse\_categorical\_accuracy: 0.9843  
- val\_loss: 1.5012 - val\_sparse\_categorical\_accuracy: 0.6297  
Epoch 295/300  
49/49 [=====] - 5s 108ms/step - loss: 0.0575 - sparse\_categorical\_accuracy: 0.9830  
- val\_loss: 1.6280 - val\_sparse\_categorical\_accuracy: 0.6156  
Epoch 296/300  
49/49 [=====] - 5s 108ms/step - loss: 0.0524 - sparse\_categorical\_accuracy: 0.9851  
- val\_loss: 1.6802 - val\_sparse\_categorical\_accuracy: 0.6055  
Epoch 297/300  
49/49 [=====] - 5s 109ms/step - loss: 0.0832 - sparse\_categorical\_accuracy: 0.9761  
- val\_loss: 1.5666 - val\_sparse\_categorical\_accuracy: 0.5758  
Epoch 298/300  
49/49 [=====] - 5s 108ms/step - loss: 0.1025 - sparse\_categorical\_accuracy: 0.9724  
- val\_loss: 1.6626 - val\_sparse\_categorical\_accuracy: 0.5516  
Epoch 299/300  
49/49 [=====] - 5s 106ms/step - loss: 0.0711 - sparse\_categorical\_accuracy: 0.9795  
- val\_loss: 1.4426 - val\_sparse\_categorical\_accuracy: 0.6281  
Epoch 300/300  
49/49 [=====] - 5s 106ms/step - loss: 0.0457 - sparse\_categorical\_accuracy: 0.9856  
- val\_loss: 1.4710 - val\_sparse\_categorical\_accuracy: 0.6195  
Model: "alex\_net8"

Layer (type)	Output Shape	Param #
=====		
conv2d_2 (Conv2D)	multiple	34944
batch_normalization (Batch Normalization)	multiple	384
activation (Activation)	multiple	0
max_pooling2d_2 (MaxPooling2D)	multiple	0
conv2d_3 (Conv2D)	multiple	614656
batch_normalization_1 (Batch Normalization)	multiple	1024
activation_1 (Activation)	multiple	0
max_pooling2d_3 (MaxPooling2D)	multiple	0
conv2d_4 (Conv2D)	multiple	885120

conv2d_5 (Conv2D)	multiple	1327488
conv2d_6 (Conv2D)	multiple	884992
batch_normalization_2 (Batch normalization)	multiple	1024
activation_2 (Activation)	multiple	0
max_pooling2d_4 (MaxPooling2D)	multiple	0
flatten_1 (Flatten)	multiple	0
dense_3 (Dense)	multiple	13109248
dropout (Dropout)	multiple	0
dense_4 (Dense)	multiple	4196352
dropout_1 (Dropout)	multiple	0
dense_5 (Dense)	multiple	20490

=====  
Total params: 21,075,722

Trainable params: 21,074,506

Non-trainable params: 1,216

Training and Validation Accuracy Training and Validation Loss

