Accuracy of different models for 20 classes.

- ➔ VGG16 - 80%
- ➔ VGG19 - 80%
- ➔ Xception - 75%
- ➔ Resnet50 - 35%
- ➔ MobileNet - 80-85%
- ➔ InceptionResNetV2 - 75-80%
- ➔ InceptionV3 - 70-75%

Static Analysis

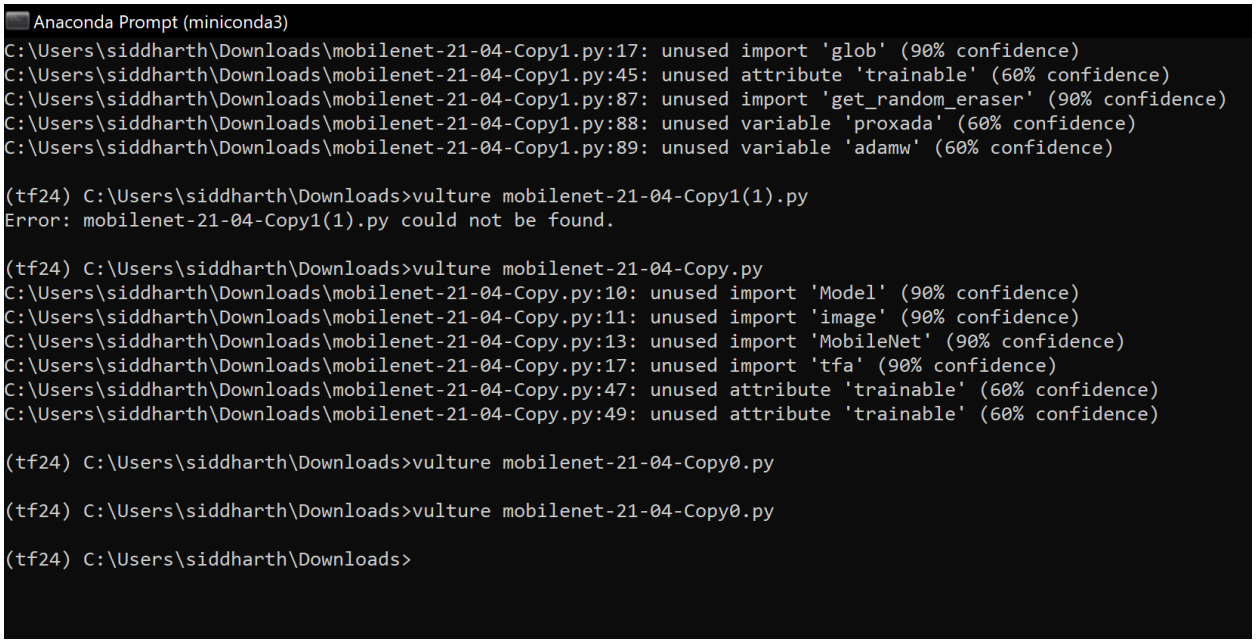
For Static analysis we have used the Vulture static analysis tool. Vulture finds unused code in large python code. This tool is used for finding and removing errors and unused code in large python code.
Here results given below:

Run 1

```
Anaconda Prompt (miniconda3)

(base) C:\Users\siddharth>activate tf24

(tf24) C:\Users\siddharth>pip install vulture
Collecting vulture
  Using cached vulture-2.3-py2.py3-none-any.whl (25 kB)
Collecting toml
  Using cached toml-0.10.2-py2.py3-none-any.whl (16 kB)
Installing collected packages: toml, vulture
Successfully installed toml-0.10.2 vulture-2.3

(tf24) C:\Users\siddharth>vulture mobilenet-21-04-Copy1.ipynb

(tf24) C:\Users\siddharth>vulture mobilenet-21-04-Copy1.ipynb

(tf24) C:\Users\siddharth>cd Downloads

(tf24) C:\Users\siddharth\Downloads>vulture mobilenet-21-04-Copy1.py
C:\Users\siddharth\Downloads\mobilenet-21-04-Copy1.py:11: unused import 'image' (90% confidence)
C:\Users\siddharth\Downloads\mobilenet-21-04-Copy1.py:14: unused import 'Sequential' (90% confidence)
C:\Users\siddharth\Downloads\mobilenet-21-04-Copy1.py:16: unused import 'np' (90% confidence)
C:\Users\siddharth\Downloads\mobilenet-21-04-Copy1.py:17: unused import 'glob' (90% confidence)
C:\Users\siddharth\Downloads\mobilenet-21-04-Copy1.py:45: unused attribute 'trainable' (60% confidence)
C:\Users\siddharth\Downloads\mobilenet-21-04-Copy1.py:87: unused import 'get_random_eraser' (90% confidence)
C:\Users\siddharth\Downloads\mobilenet-21-04-Copy1.py:88: unused variable 'proxada' (60% confidence)
C:\Users\siddharth\Downloads\mobilenet-21-04-Copy1.py:89: unused variable 'adamw' (60% confidence)

(tf24) C:\Users\siddharth\Downloads>
```

During the run of vulture static analyzer, it gave the information about which function or library was not getting used .

Run 2:



After removing unwanted libraries and functions the analyzer was not giving any warnings. After refining code all errors and warnings got resolved.

Class wise Prediction:

Here the aim of this classwise testing to check whether any class is giving very less accuracy or not. I.e whether a model is predicting wrong results for each picture of any particular image class or not.

Total Prediction rate = 96%

	Car	Accuracy
0	testing\AM General Hummer SUV 2000	1
1	testing\Acura RL Sedan 2012	0.8

2	testing\Acura TL Sedan 2012	1
3	testing\Acura ZDX Hatchback 2012	0.85
4	testing\Aston Martin V8 Vantage Convertible 2012	0.85
5	testing\Aston Martin Virage Convertible 2012	0.95
6	testing\Audi A5 Coupe 2012	1
7	testing\Audi R8 Coupe 2012	1
8	testing\Audi S4 Sedan 2012	0.9
9	testing\Audi S5 Convertible 2012	0.8
10	testing\Audi S6 Sedan 2011	1
11	testing\Audi TT RS Coupe 2012	0.9
12	testing\BMW 1 Series Convertible 2012	0.95
13	testing\BMW 3 Series Sedan 2012	0.85
14	testing\BMW ActiveHybrid 5 Sedan 2012	1

15	testing\BMW M3 Coupe 2012	1
16	testing\BMW M5 Sedan 2010	0.95
17	testing\BMW M6 Convertible 2010	1
18	testing\BMW X3 SUV 2012	0.95
19	testing\BMW X5 SUV 2007	0.95
20	testing\BMW X6 SUV 2012	0.9
21	testing\BMW Z4 Convertible 2012	0.95
22	testing\Bentley Arnage Sedan 2009	0.9
23	testing\Bentley Continental GT Coupe 2012	1
24	testing\Bentley Mulsanne Sedan 2011	1
25	testing\Bugatti Veyron 16.4 Convertible 2009	1
26	testing\Buick Enclave SUV 2012	1
27	testing\Cadillac CTS-V Sedan 2012	1

28	testing\Cadillac SRX SUV 2012	1
29	testing\Chevrolet Avalanche Crew Cab 2012	1
30	testing\Chevrolet Camaro Convertible 2012	0.85
31	testing\Chevrolet Corvette Convertible 2012	1
32	testing\Chevrolet Corvette ZR1 2012	0.85
33	testing\Chevrolet Impala Sedan 2007	1
34	testing\Chevrolet Malibu Sedan 2007	0.85
35	testing\Chevrolet Monte Carlo Coupe 2007	0.95
36	testing\Chevrolet Silverado 1500 Classic Extended Cab 2007	1
37	testing\Chevrolet Sonic Sedan 2012	1
38	testing\Chevrolet Tahoe Hybrid SUV 2012	0.8
39	testing\Chevrolet Traverse SUV 2012	0.95
40	testing\Chrysler Aspen SUV 2009	1

41	testing\Chrysler PT Cruiser Convertible 2008	1
42	testing\Chrysler Sebring Convertible 2010	1
43	testing\Dodge Caliber Wagon 2012	1
44	testing\Dodge Challenger SRT8 2011	1
45	testing\Dodge Charger Sedan 2012	1
46	testing\Dodge Durango SUV 2012	1
47	testing\Dodge Journey SUV 2012	1
48	testing\Dodge Magnum Wagon 2008	1
49	testing\Dodge Ram Pickup 3500 Crew Cab 2010	0.95
50	testing\FIAT 500 Abarth 2012	1
51	testing\FIAT 500 Convertible 2012	1
52	testing\Ferrari 458 Italia Convertible 2012	0.9
53	testing\Ferrari FF Coupe 2012	1

54	testing\Ford Edge SUV 2012	1
55	testing\Ford Fiesta Sedan 2012	1
56	testing\Ford Focus Sedan 2007	0.9
57	testing\Ford Freestar Minivan 2007	1
58	testing\Ford Mustang Convertible 2007	0.95
59	testing\GMC Acadia SUV 2012	1
60	testing\GMC Canyon Extended Cab 2012	0.9
61	testing\GMC Savana Van 2012	1
62	testing\GMC Terrain SUV 2012	1
63	testing\Honda Accord Coupe 2012	1
64	testing\Hyundai Accent Sedan 2012	0.85
65	testing\Hyundai Elantra Sedan 2007	0.95
66	testing\Hyundai Elantra Touring Hatchback 2012	1

67	testing\Hyundai Santa Fe SUV 2012	1
68	testing\Hyundai Sonata Hybrid Sedan 2012	0.95
69	testing\Hyundai Sonata Sedan 2012	0.9
70	testing\Hyundai Tucson SUV 2012	1
71	testing\Hyundai Veracruz SUV 2012	0.9
72	testing\Jaguar XK XKR 2012	0.9
73	testing\Jeep Compass SUV 2012	1
74	testing\Lamborghini Aventador Coupe 2012	0.95
75	testing\Lamborghini Reventon Coupe 2008	1
76	testing\Mercedes-Benz C-Class Sedan 2012	0.95
77	testing\Mercedes-Benz E-Class Sedan 2012	1
78	testing\Mercedes-Benz S-Class Sedan 2012	1
79	testing\Mercedes-Benz SL-Class Coupe 2009	0.95

80	testing\Mitsubishi Lancer Sedan 2012	0.95
81	testing\Nissan 240SX Coupe 1998	1
82	testing\Nissan Juke Hatchback 2012	1
83	testing\Nissan Leaf Hatchback 2012	1
84	testing\Porsche Panamera Sedan 2012	0.95
85	testing\Rolls-Royce Ghost Sedan 2012	0.95
86	testing\Rolls-Royce Phantom Sedan 2012	0.9
87	testing\Spyker C8 Convertible 2009	1
88	testing\Suzuki Aerio Sedan 2007	0.95
89	testing\Suzuki Kizashi Sedan 2012	1
90	testing\Suzuki SX4 Hatchback 2012	1
91	testing\Tesla Model S Sedan 2012	0.95
92	testing\Toyota 4Runner SUV 2012	1

93	testing\Toyota Camry Sedan 2012	0.95
94	testing\Toyota Corolla Sedan 2012	0.95
95	testing\Toyota Sequoia SUV 2012	0.95
96	testing\Volkswagen Beetle Hatchback 2012	1
97	testing\Volkswagen Golf Hatchback 1991	1
98	testing\Volvo C30 Hatchback 2012	0.9
99	testing\Volvo XC90 SUV 2007	1

Here the model is giving good accuracy for each image class. The least accuracy is 0.8 and maximum accuracy in predicting image is 1. The overall accuracy of the model is 96%.

BlackBox testing

Here for blackbox testing we have divided inputs into two classes. Here input is in the form of an image.

Valid Class:

Expected: Valid
Verdict: Valid
Test: Pass

Expected: Valid
Verdict: Valid
Test: Pass

Invalid class

Expected: Invalid
Verdict: Invalid
Test: Pass

Expected: Invalid
Verdict: Invalid
Test: Pass

Expected: Invalid
Verdict: Invalid
Test: Pass

Expected: Invalid
Verdict: Invalid
Test: Pass

Boundary value analysis

Expected: Invalid
Verdict: Invalid
Test: Pass

Expected: Invalid
Verdict: Invalid
Test: Pass

Expected: Valid
Verdict: Valid
Test: Pass

Expected: Valid
Verdict: Valid
Test: Pass