```
import tensorflow as tf
import matplotlib.image as img
%matplotlib inline
import numpy as np
from collections import defaultdict
import collections
from shutil import copy
from shutil import copytree, rmtree
import tensorflow.keras.backend as K
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
import matplotlib.pyplot as plt
import numpy as np
import os
import random
import tensorflow as tf
import tensorflow.keras.backend as K
from tensorflow.keras import regularizers
from tensorflow.keras.applications.inception_v3 import InceptionV3
from tensorflow.keras.models import Sequential, Model
from tensorflow.keras.layers import Dense, Dropout, Activation, Flatten
from tensorflow.keras.layers import Convolution2D, MaxPooling2D, ZeroPadding2D, GlobalAveragePooling2D, AveragePooling2D
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.callbacks import ModelCheckpoint, CSVLogger
from tensorflow.keras.optimizers import SGD
from tensorflow.keras.regularizers import l2
from tensorflow import keras
from tensorflow.keras import models
import cv2
```

```
# Check if GPU is enabled
print(tf.__version__)
print(tf.test.gpu_device_name())
```

```
2.15.0
```

```
# Helper function to download data and extract
def get_data_extract():
  if "food-101" in os.listdir():
    print("Dataset already exists")
  else:
    print("Downloading the data...")
    !wget http://data.vision.ee.ethz.ch/cvl/food-101.tar.gz
    print("Dataset downloaded!")
    print("Extracting data..")
    !tar xzvf food-101.tar.gz
    print("Extraction done!")
```

```
# Download data and extract it to folder

get_data_extract()
```

```
food-101/images/paella/3709254.jpg
food-101/images/paella/1202470.jpg
food-101/images/paella/2888294.jpg
food-101/images/paella/2318429.jpg
food-101/images/paella/2539609.jpg
food-101/images/paella/2736683.jpg
food-101/images/paella/2809000.jpg
food-101/images/paella/386547.jpg
food-101/images/paella/2811848.jpg
food-101/images/paella/635481.jpg
food-101/images/paella/417745.jpg
food-101/images/paella/666719.jpg
food-101/images/paella/1850214.jpg
food-101/images/paella/1276402.jpg
food-101/images/paella/1575997.jpg
food-101/images/paella/1458747.jpg
food-101/images/paella/1913881.jpg
food-101/images/paella/1872496.jpg
food-101/images/paella/1327782.jpg
food-101/images/paella/3492231.jpg
food-101/images/paella/2120598.jpg
food-101/images/paella/329528.jpg
food-101/images/paella/354558.jpg
food-101/images/paella/1942270.jpg
food-101/images/paella/424665.jpg
food-101/images/paella/2434113.jpg
food-101/images/paella/217989.jpg
food-101/images/paella/350162.jpg
food-101/images/paella/2456775.jpg
```

Understand dataset structure and files

```
# Check the extracted dataset folder
!ls food-101/
```

```
images  license_agreement.txt  meta  README.txt
```

```
os.listdir('food-101/images')
```

```
['foie_gras',
 'peking_duck',
 'pho',
 'chicken_quesadilla',
 'croque_madame',
 'miso_soup',
 'chocolate_mousse',
 'panna_cotta',
 'spring_rolls',
 'chocolate_cake',
 'pork_chop',
 'baby_back_ribs',
 'omelette',
 'ceviche',
 'cheesecake',
 'lasagna',
 'hot_and_sour_soup',
 'french_fries',
 'gyoza',
 'bibimbap',
 'nachos',
 'sashimi',
 'garlic_bread',
 'french_onion_soup',
 'gnocchi',
 'ravioli',
 'huevos_rancheros',
 'cheese_plate',
 'mussels',
 'caprese_salad',
 'donuts',
 'strawberry_shortcake',
 'breakfast_burrito',
 'beignets',
 'greek_salad',
 'carrot_cake',
 'club_sandwich',
 'pizza',
 'poutine',
 'tuna_tartare',
 'bruschetta',
 'bread_pudding',
 'red_velvet_cake',
 'ice_cream',
 'frozen_yogurt',
 'lobster_bisque',
 'beet_salad',
 'falafel',
 'macaroni_and_cheese',
 'beef_carpaccio',
 'grilled_salmon',
 'caesar_salad',
 'seaweed_salad',
 'cup_cakes',
 'macarons',
 'samosa',
 'risotto',
 'pancakes'
```

```
os.listdir('food-101/meta')
```

```
['classes.txt',
 'test.txt',
 'train.json',
 'test.json',
 'train.txt',
 'labels.txt']
```

```
!head food-101/meta/train.txt
```

```
apple_pie/1005649
apple_pie/1014775
apple_pie/1026328
apple_pie/1028787
apple_pie/1043283
apple_pie/1050519
apple_pie/1057749
apple_pie/1057810
apple_pie/1072416
apple_pie/1074856
```

```
!head food-101/meta/classes.txt
```

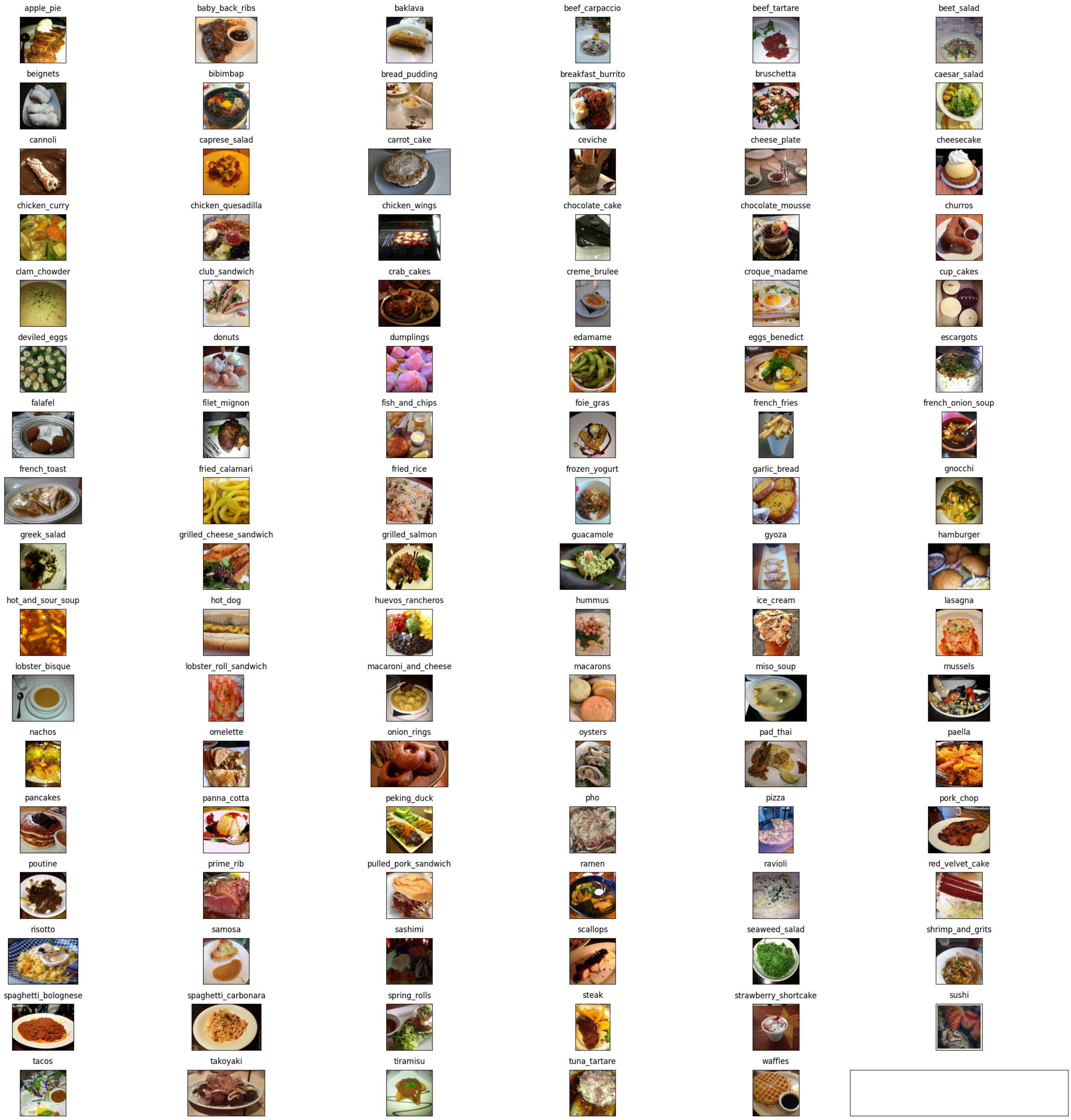
```
apple_pie
baby_back_ribs
baklava
beef_carpaccio
beef_tartare
beet_salad
beignets
bibimbap
bread_pudding
breakfast_burrito
```

Visualize random image from each of the 101 classes

```
# Visualize the data, showing one image per class from 101 classes
rows = 17
cols = 6
fig, ax = plt.subplots(rows, cols, figsize=(25,25))
fig.suptitle("Showing one random image from each class", y=1.05, fontsize=24) # Adding  y=1.05, fontsize=24 helped me fix the suptitle
data_dir = "food-101/images/"
foods_sorted = sorted(os.listdir(data_dir))
food_id = 0
for i in range(rows):
  for j in range(cols):
    try:
      food_selected = foods_sorted[food_id]
      food_id += 1
    except:
      break
    if food_selected == '.DS_Store':
        continue
    food_selected_images = os.listdir(os.path.join(data_dir,food_selected)) # returns the list of all files present in each food categor
    food_selected_random = np.random.choice(food_selected_images) # picks one food item from the list as choice, takes a list and retur
    img = plt.imread(os.path.join(data_dir,food_selected, food_selected_random))
    ax[i][j].imshow(img)
    ax[i][j].set_title(food_selected, pad = 10)

plt.setp(ax, xticks=[],yticks=[])
plt.tight_layout()
# https://matplotlib.org/users/tight_layout_guide.html
```

Showing one random image from each class



apple_pie
baby_back_ribs
baklava
beef_carpaccio
beef_tartare
beet_salad
beignets
bibimbap
bread_pudding
breakfast_burrito
bruschetta
caesar_salad
cannoli
caprese_salad
carrot_cake
ceviche
cheese_plate
cheesecake
chicken_curry
chicken_quesadilla
chicken_wings
chocolate_cake
chocolate_mousse
churros
clam_chowder
club_sandwich
crab_cakes
creme_brulee
croque_madame
cup_cakes
deviled_eggs
donuts
dumplings
edamame
eggs_benedict
escargots
falafel
filet_mignon
fish_and_chips
foie_gras
french_fries
french_onion_soup
french_toast
fried_calamari
fried_rice
frozen_yogurt
garlic_bread
gnocchi
greek_salad
grilled_cheese_sandwich
grilled_salmon
guacamole
gyoza
hamburger
hot_and_sour_soup
hot_dog
huevos_rancheros
hummus
ice_cream
lasagna
lobster_bisque
lobster_roll_sandwich
macaroni_and_cheese
macarons
miso_soup
mussels
nachos
omelette
onion_rings
oysters
pad_thai
paella
pancakes
panna_cotta
peking_duck
pho
pizza
pork_chop
poutine
prime_rib
pulled_pork_sandwich
ramen
ravioli
red_velvet_cake
risotto
samosa
sashimi
scallops
seaweed_salad
shrimp_and_grits
spaghetti_bolognese
spaghetti_carbonara
spring_rolls
steak
strawberry_shortcake
sushi
tacos
takoyaki
tiramisu
tuna_tartare
waffles