

2021-2022 Güz Yarıyılı Görüntü İşleme Dersi 2. Ödevi

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Konu: İçerik Tabanlı Görüntü Erişimi (Content Based Image Retrieval)

A) Yöntem:

Görüntülerini rgb formatında dosyadan okudum. Her class için okuduğum ilk 20 görüntüyü train dizisine, 10 görüntüyü ise test dizisine koydum.

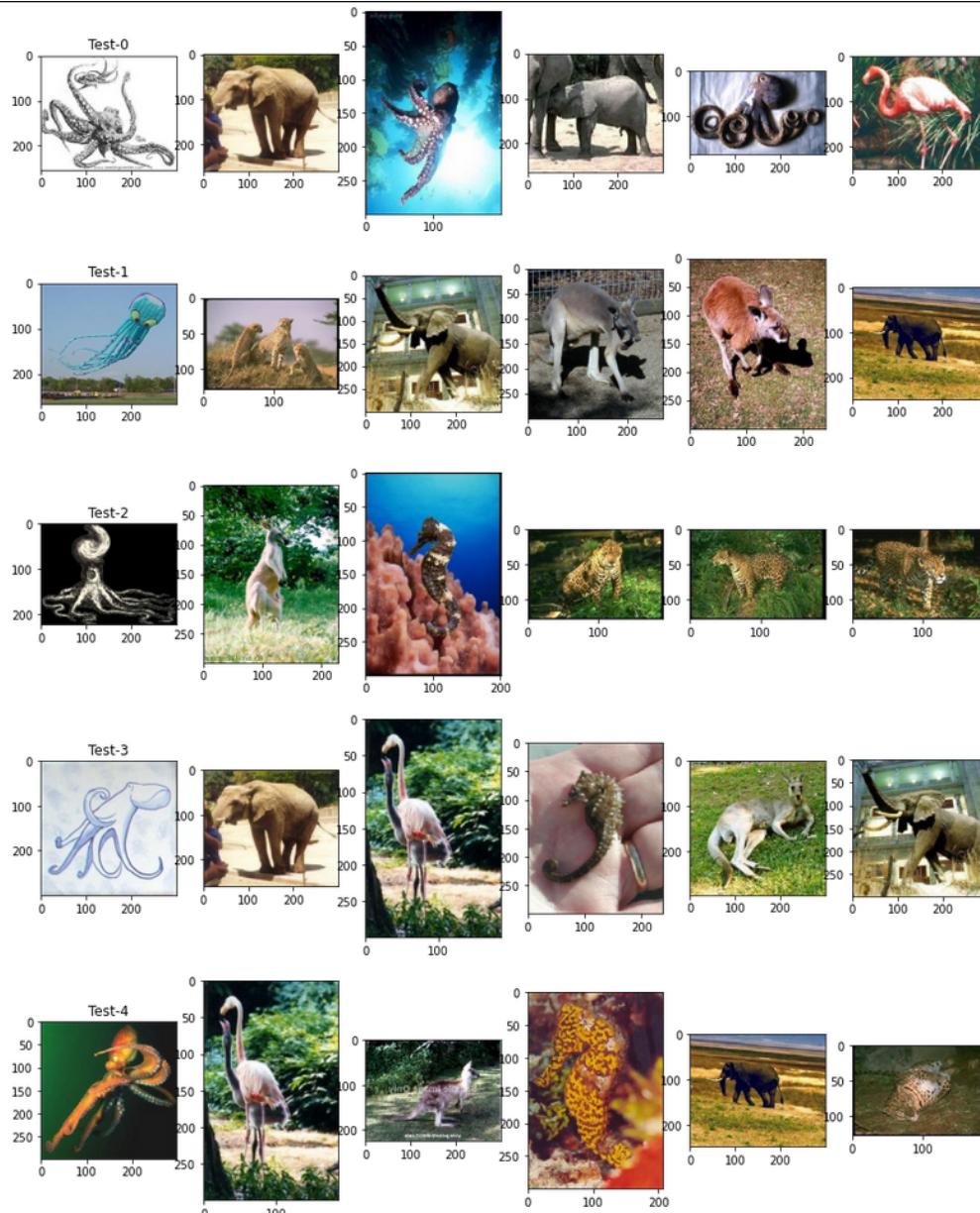
Görüntülerden histogram özelliklerini çıkarmak için yazdığım fonksiyonda, eğer oluşturulmak istenen histogram rgb olarak verilirse 256, hsv olarak verilirse 180 boyutunda bir array oluştururdum. Histogram oluşturmak için, gelen görüntüyü bir vektör haline getirdim. Görüntünün tüm pixelerindeki yoğunluk değerlerini tarayarak, oluşturduğum arrayde yoğunluğa denk gelen indexi 1 arturdum. En son oluşan 256 veya 180 elemanlı arrayi pixel sayısına bölerek normalize ettim. Rgb özellikler için, her kanal için ayrı histogram oluşturup, bu histogramları üç uca ekledim. HSV için ise, sadece tek bir kanal olan hue değerini aldım.

Öklid uzaklığını bulurken, rgb kanalında toplam karşılaşılacak 768(256*3), hue kanalında ise 180 özellik var. Test kümesindeki her görüntünün histogramlarını, train kümesindeki görüntülerle karşılaştırdım. Bu karşılaştırmayı yaparken, oluşturduğum histogram özellik vektörlerinde birbirine denk gelen indexlerdeki değerleri çıkardım. Bu çıkarma işleminin sonucunu alıp, sum_euclid değişkenine ekleyerek devam ettim. Tüm arrayi gezdıktan sonra, değişkenin karekökünü alarak, yeni bir diziye score olarak yazdım.

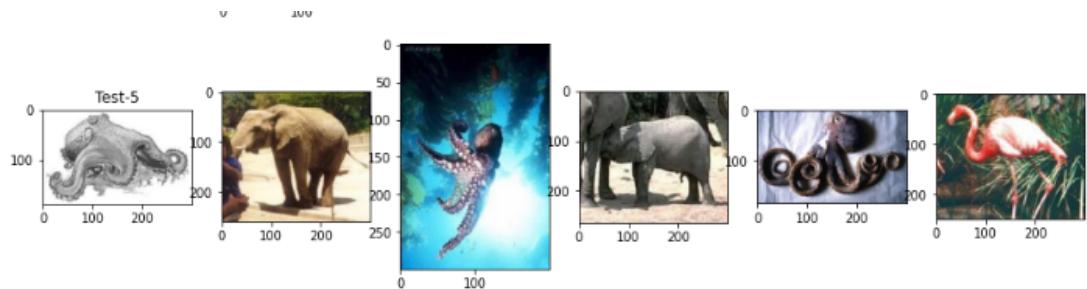
Uzaklık karşılaştırılması işlemi sonucunda her test resmi için, 60 tane train resminin skor değerleri bulunuyordu. Bunlardan en iyi 5 ini seçmek için, dizideki en düşük uzaklık değerinin indexini bulup, bu değeri 10 sayısı ile değiştirdim. 5 kere bu işlemi tekrar ettikten sonra, en düşük uzaklığa denk gelen resimlerin indexlerini elde ettim. En sonda ise Jupyter Notebook üzerinden tüm resimleri ve benzerlerini ekranda gösterdim.

B) UYGULAMA:

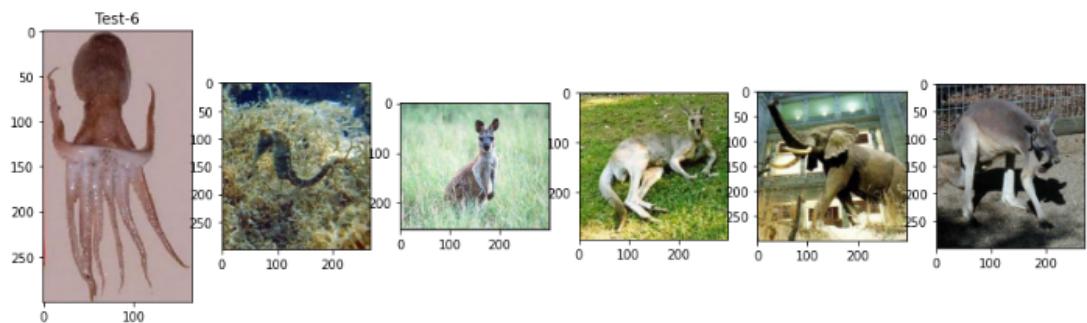
RGB UZAYI TEST RESİMLERİ VE SONUÇLARI:



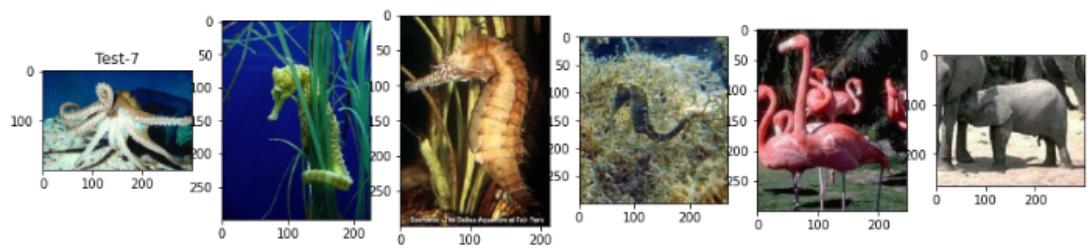
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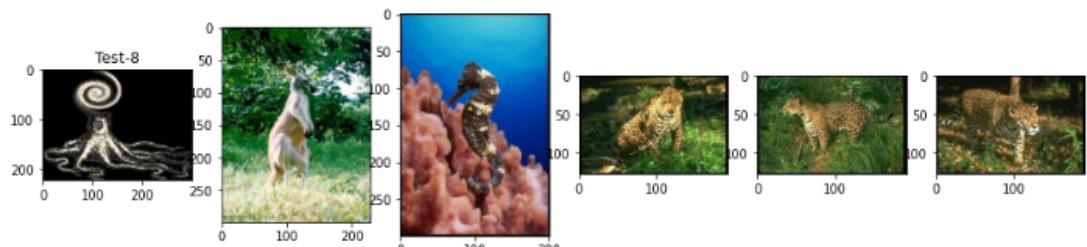
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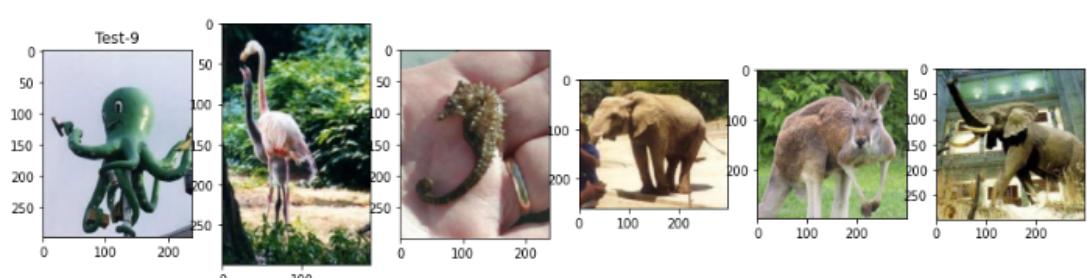
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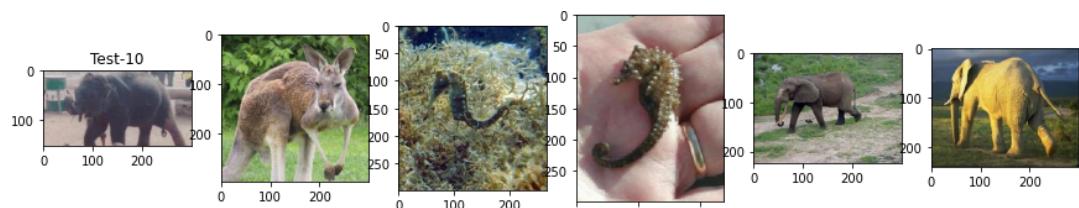
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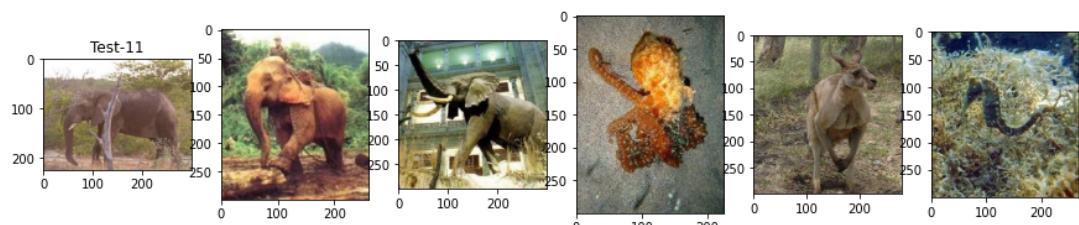
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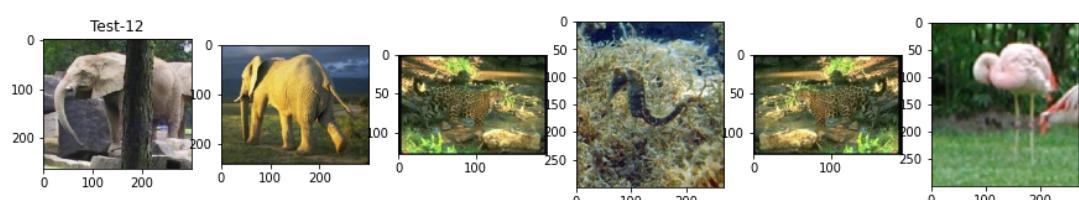
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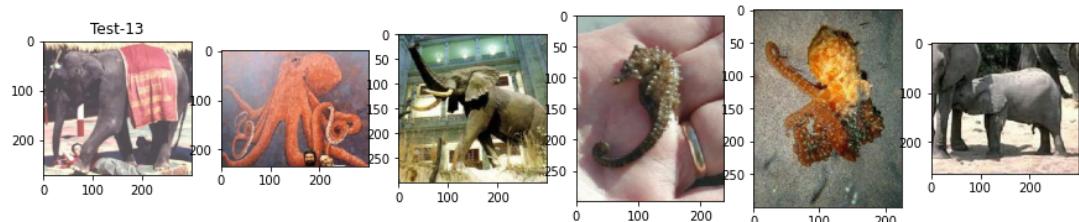
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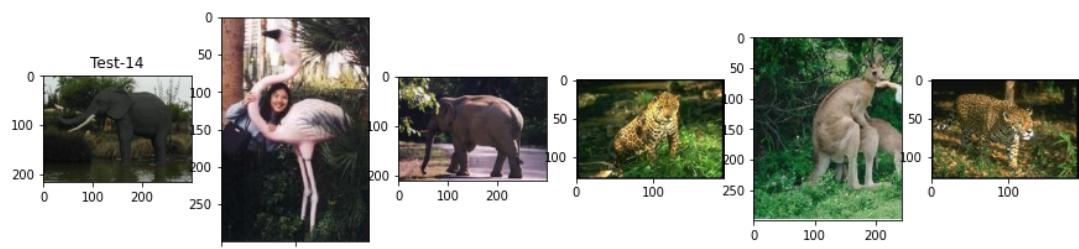
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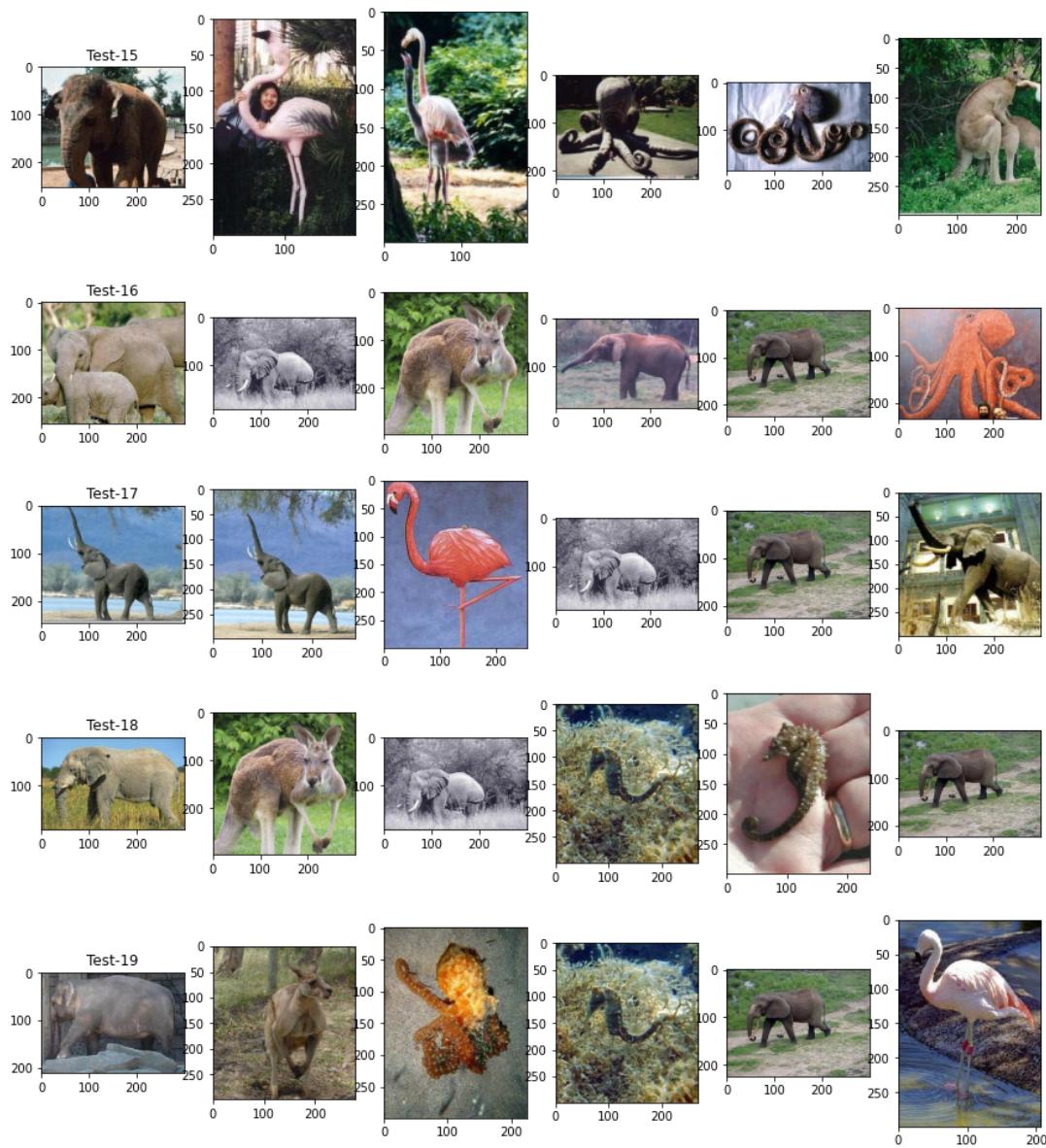
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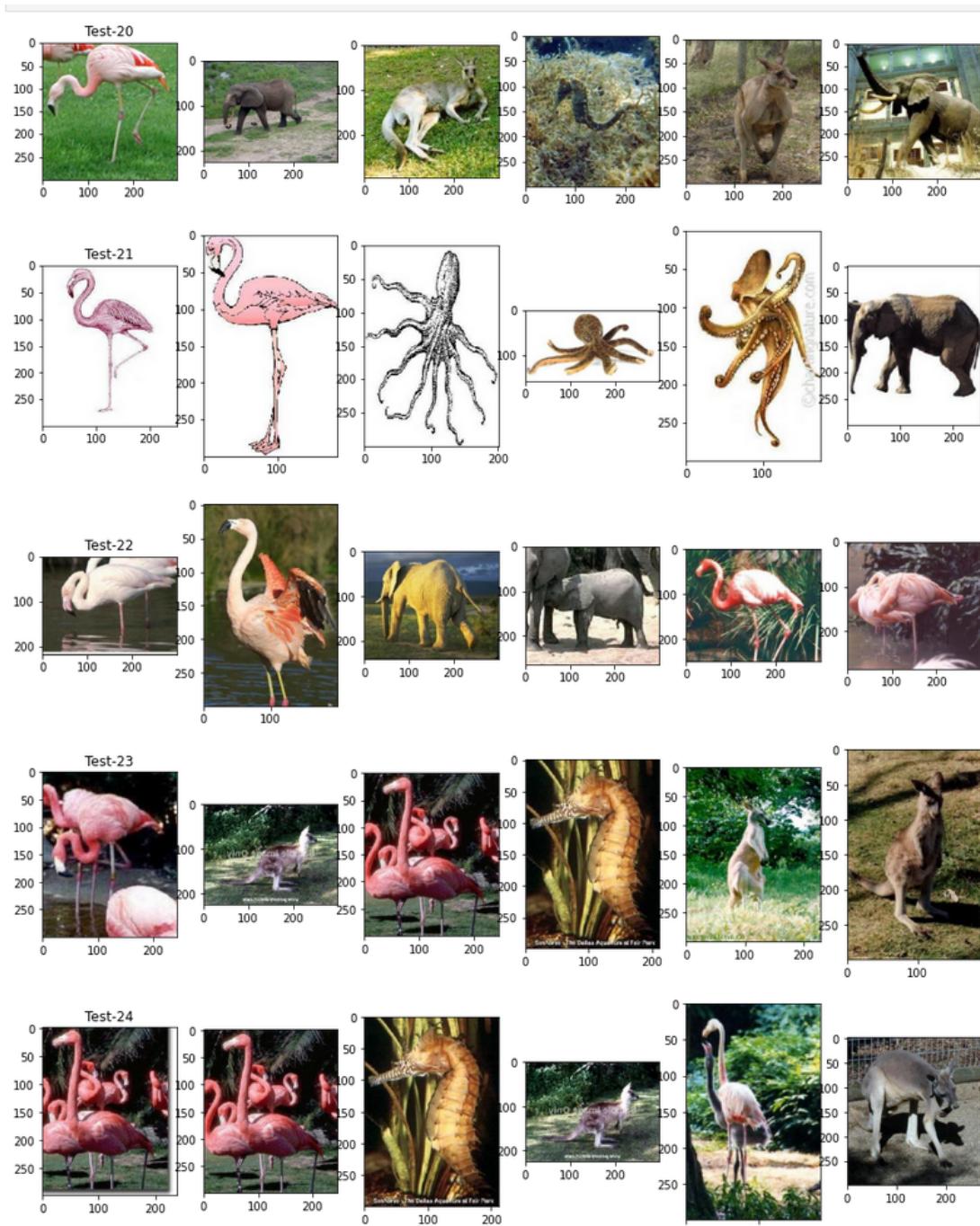
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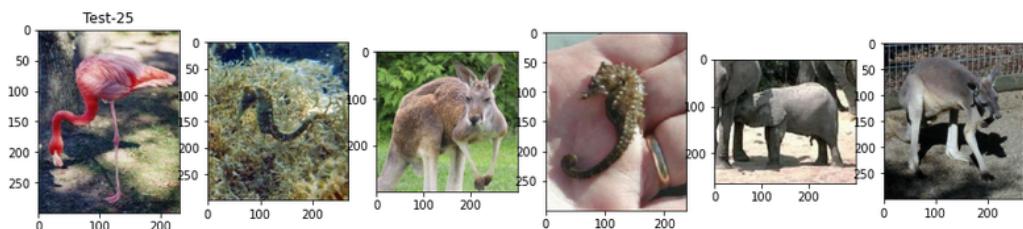
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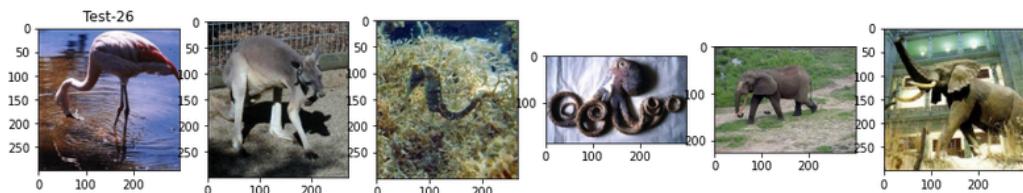
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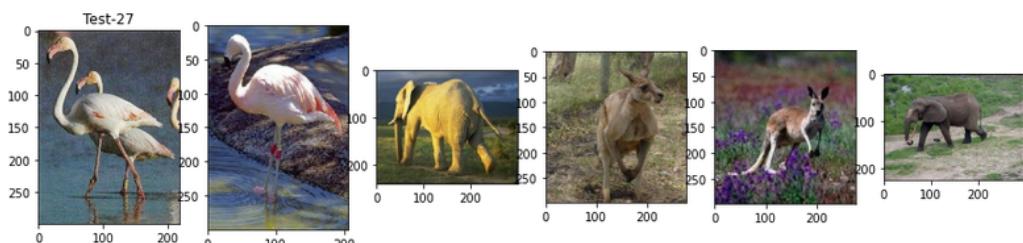
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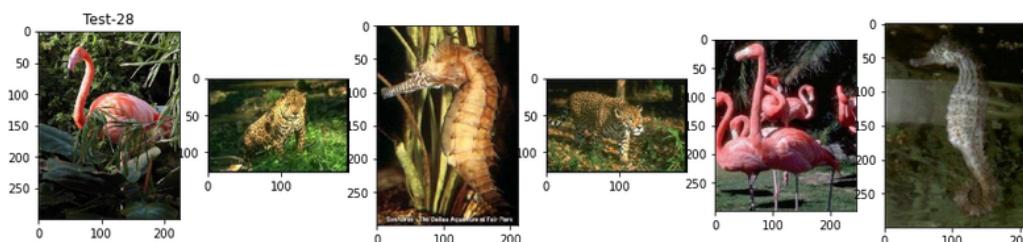
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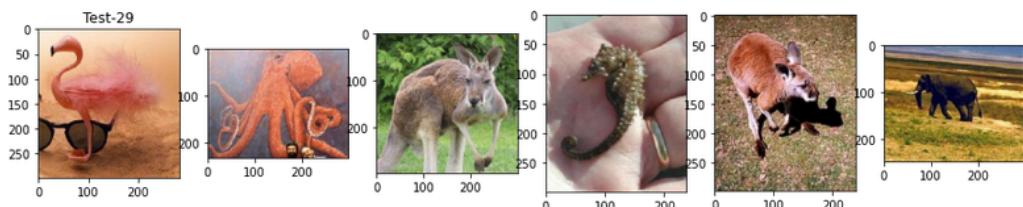
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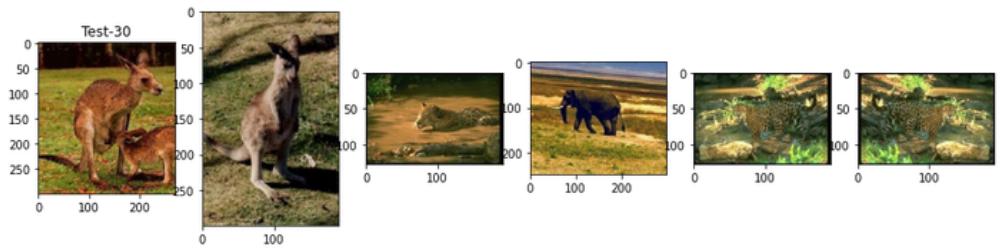
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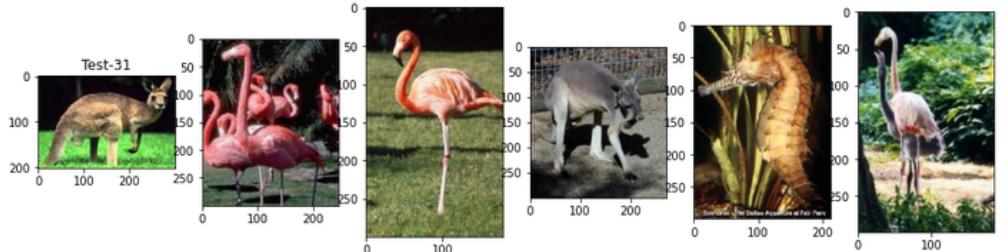
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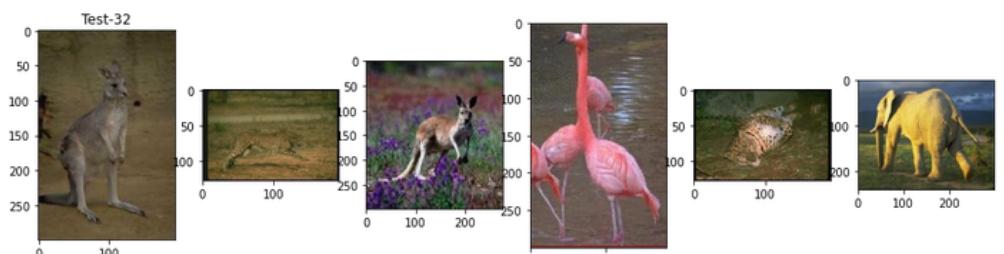
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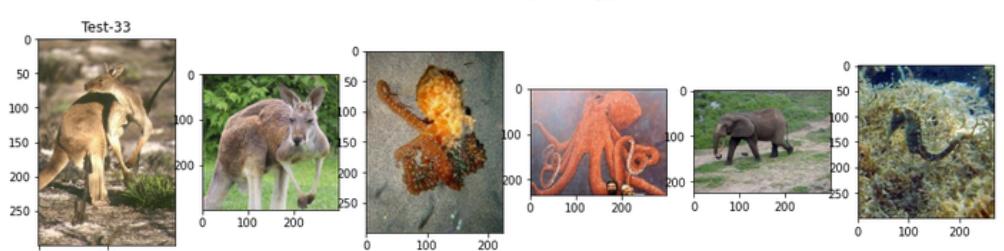
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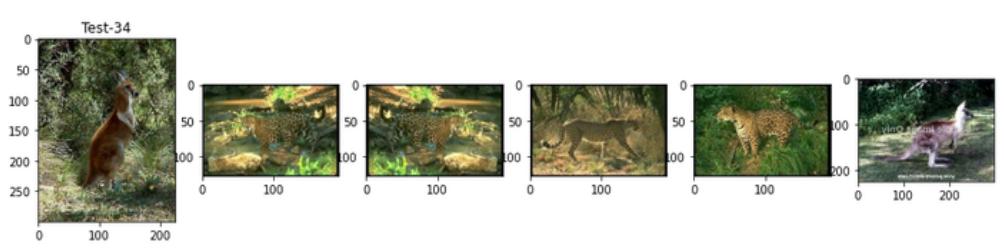
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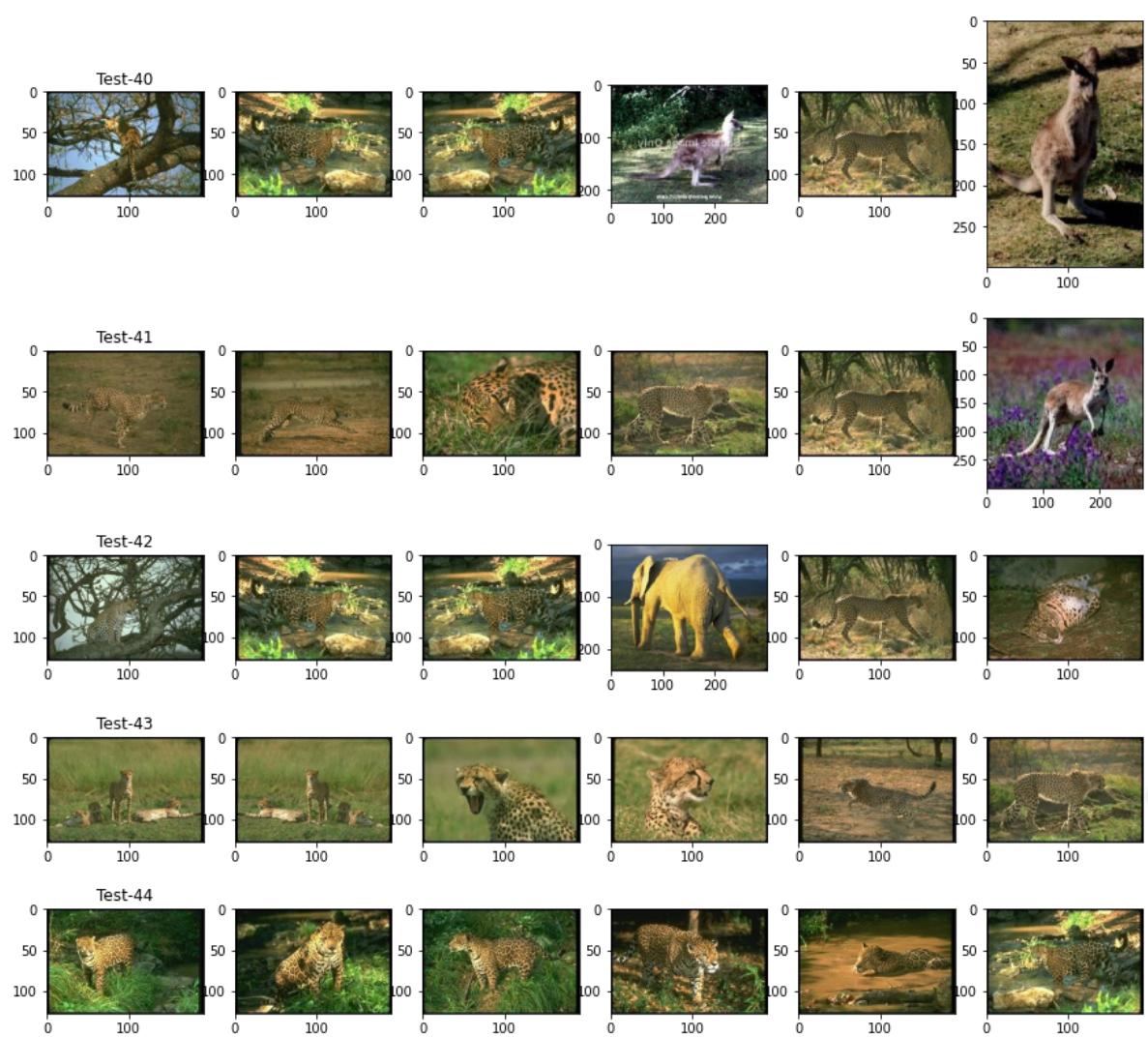


✓



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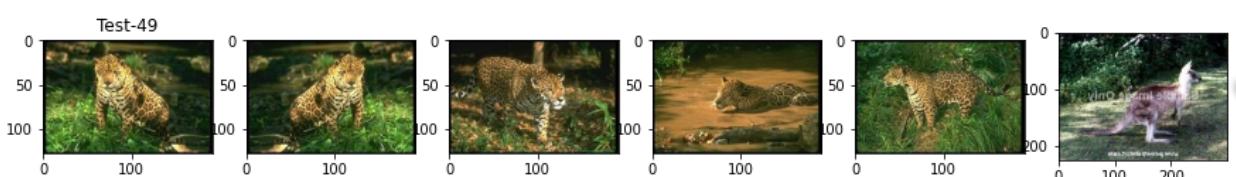
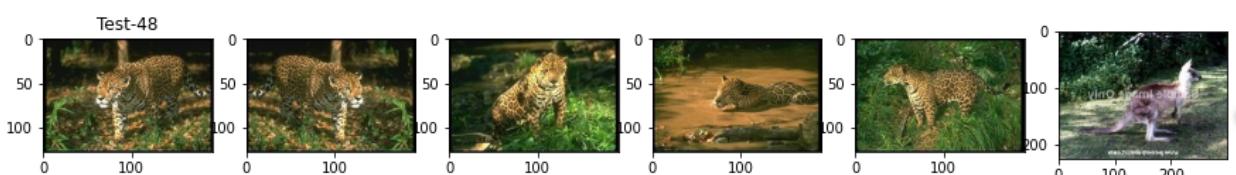
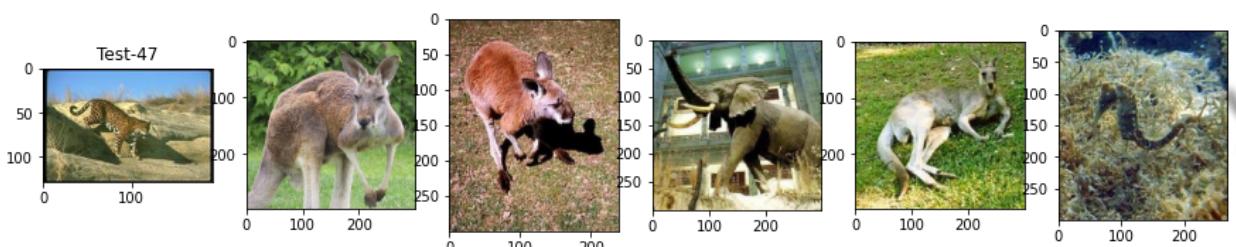
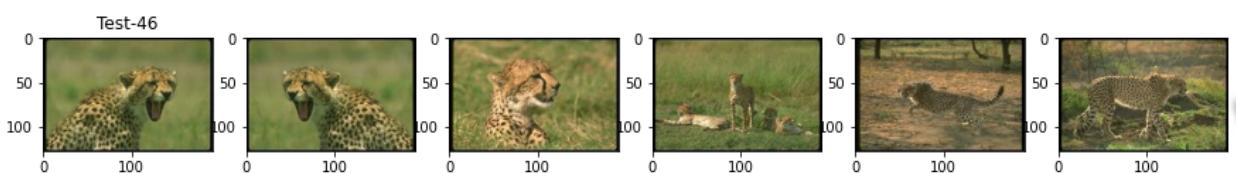
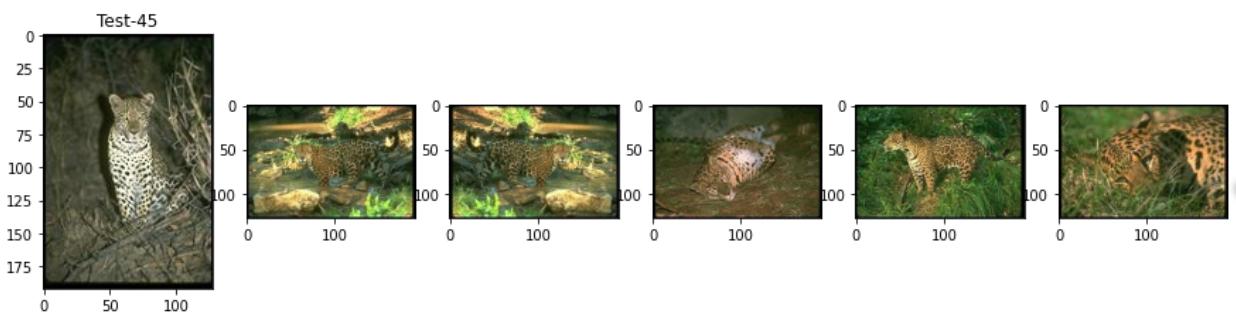
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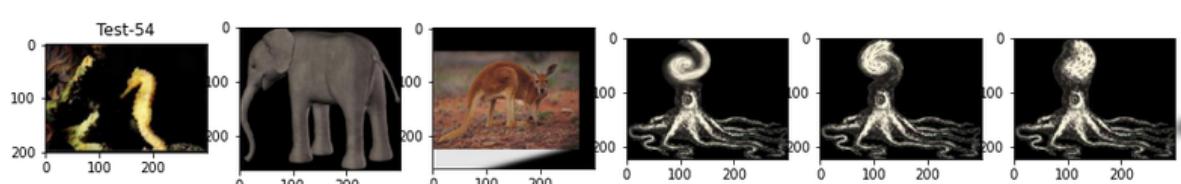
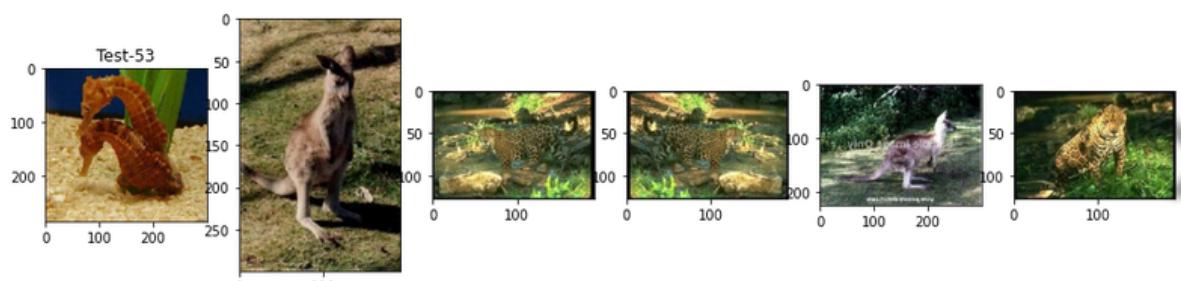
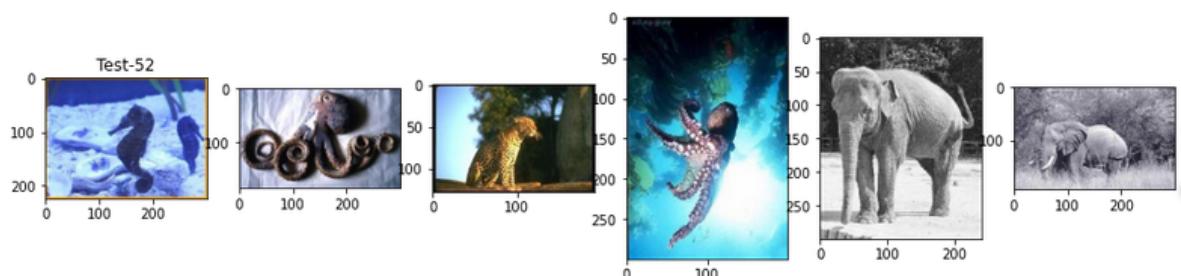
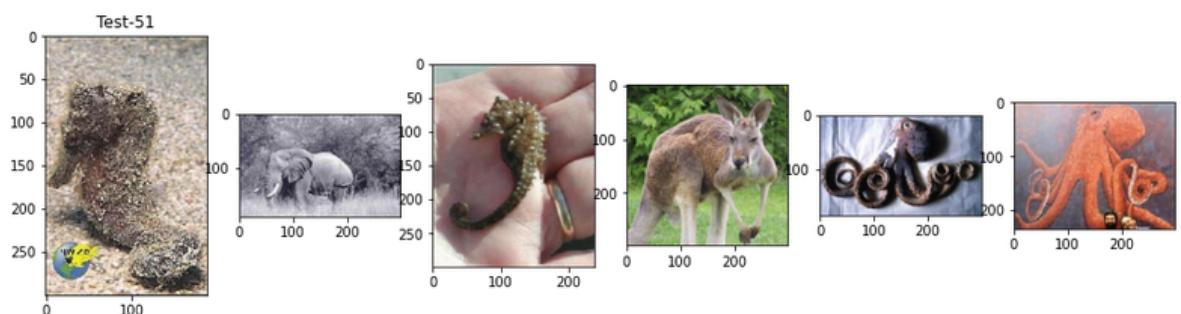
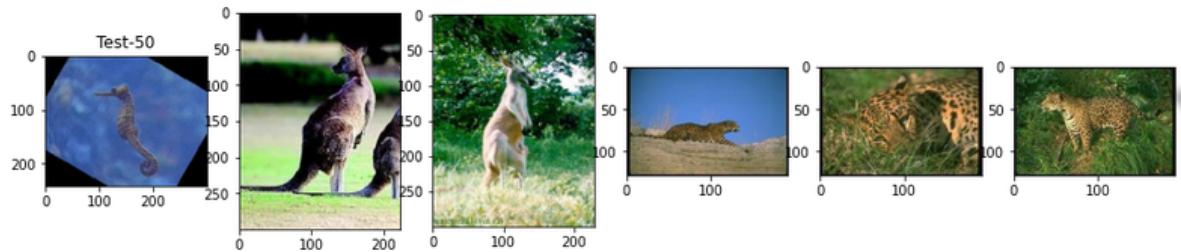
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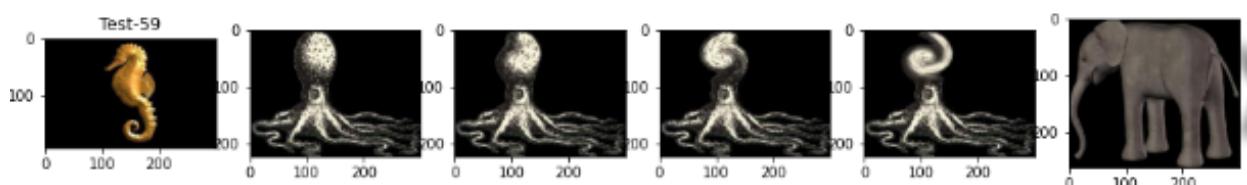
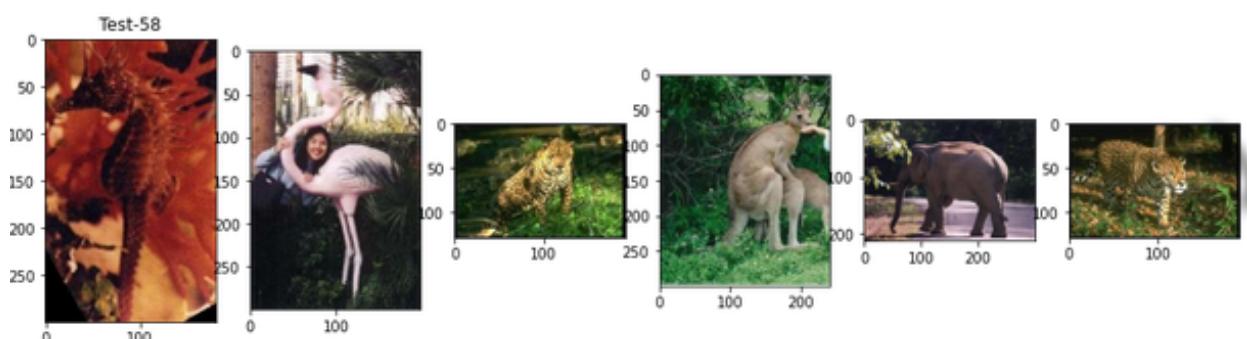
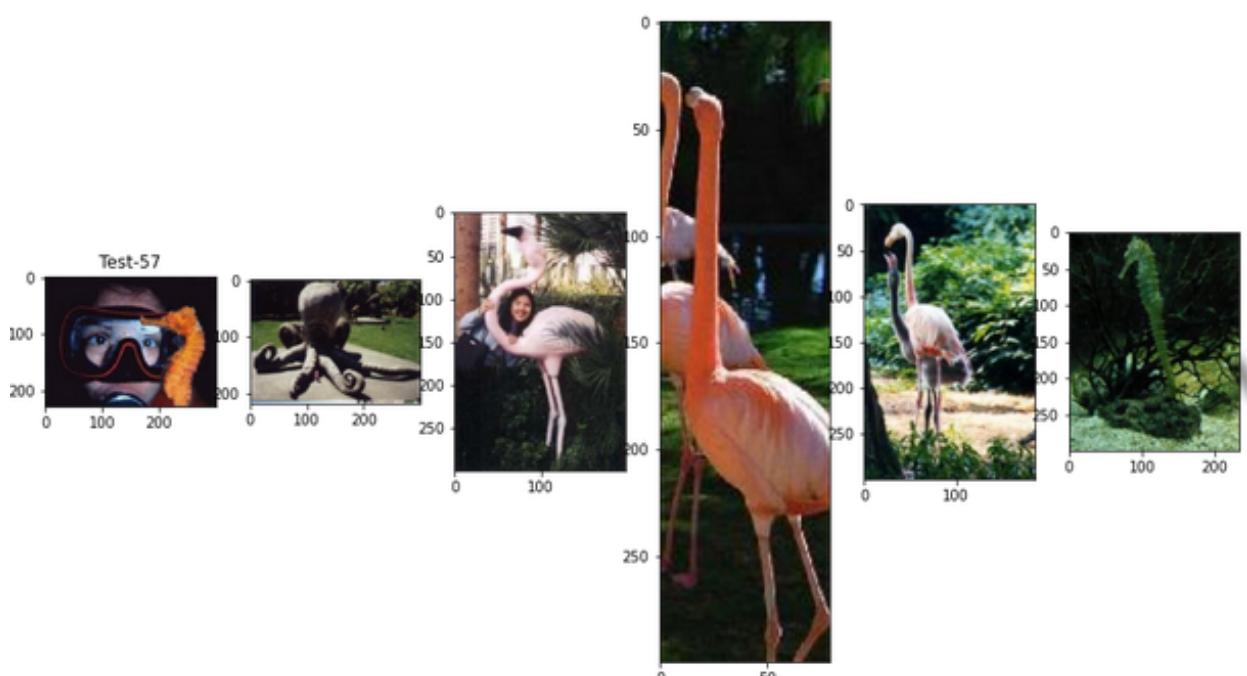
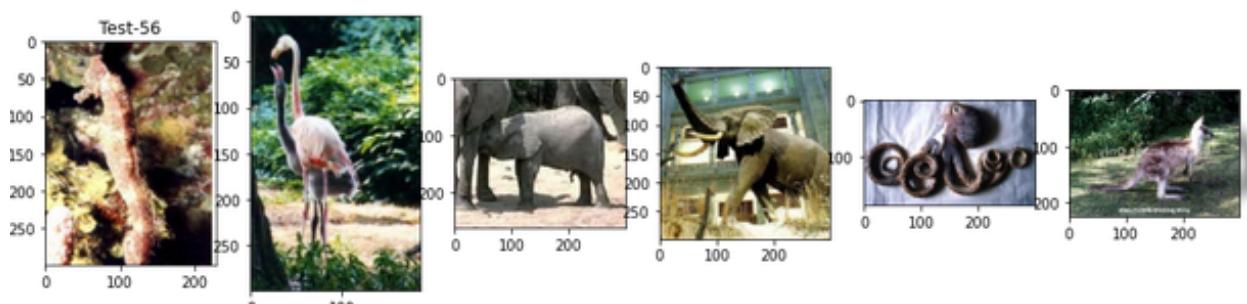
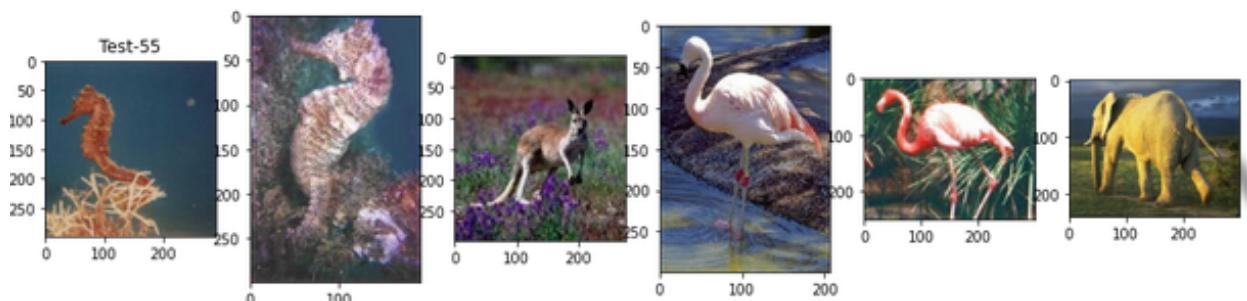
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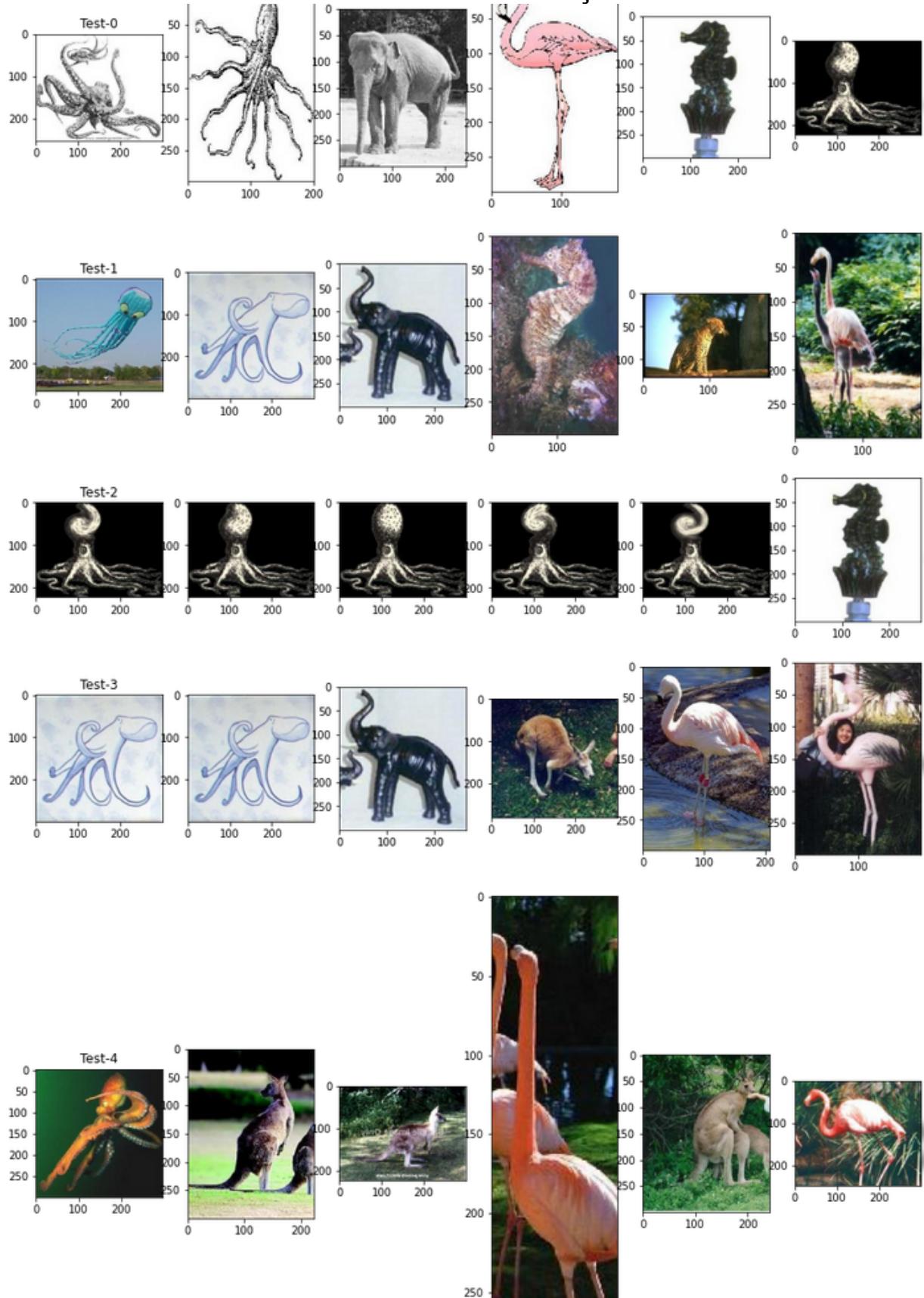
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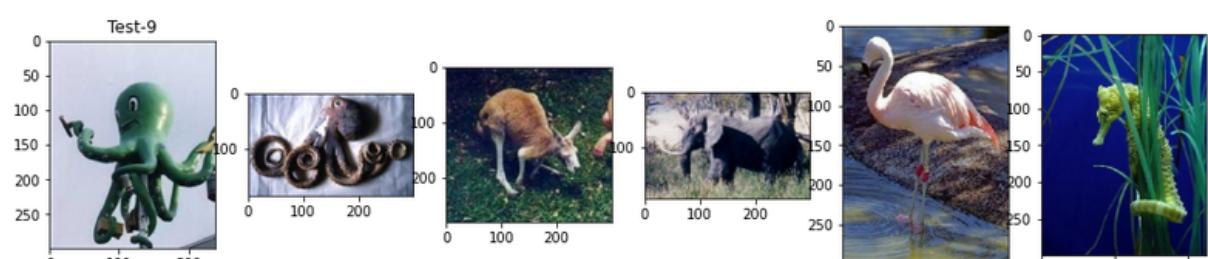
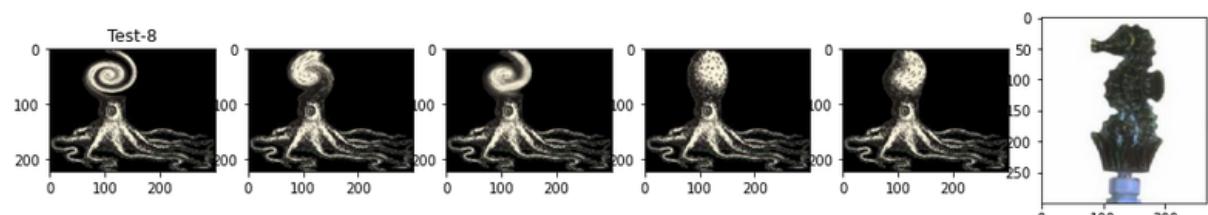
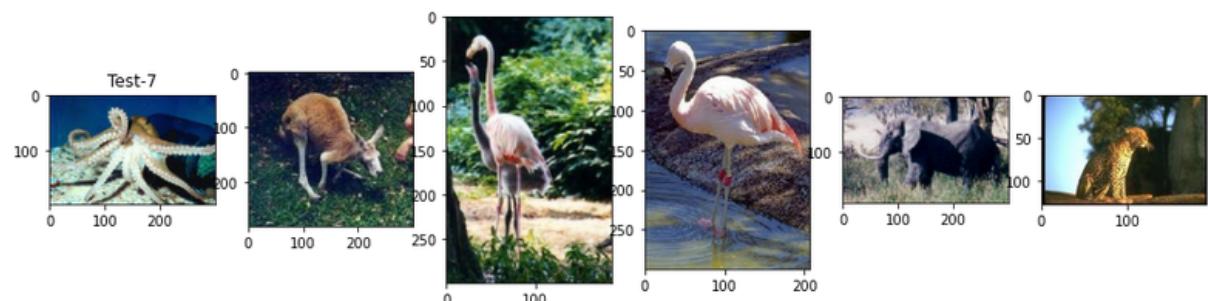
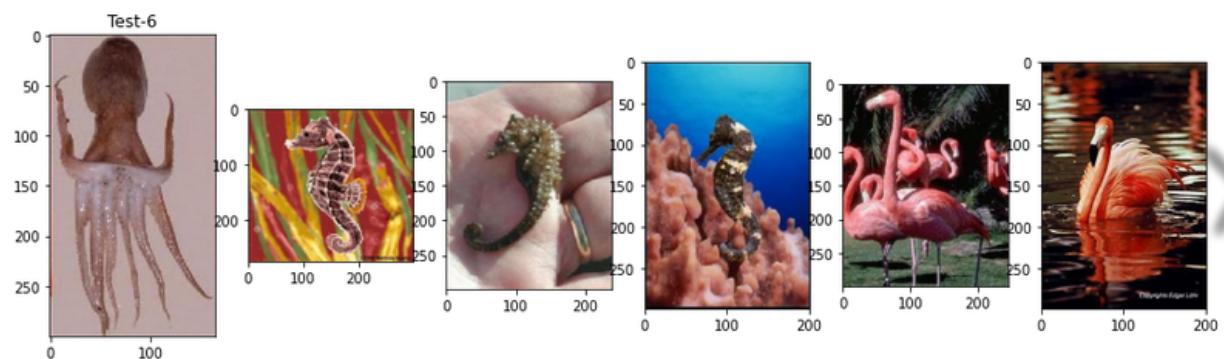
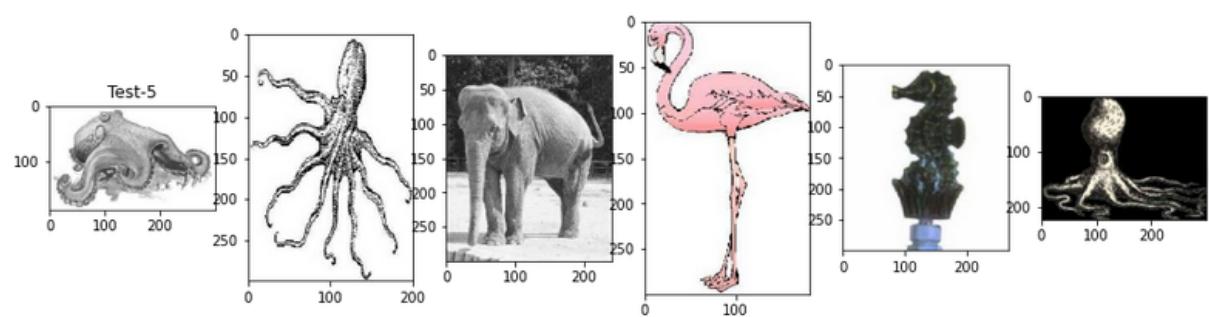


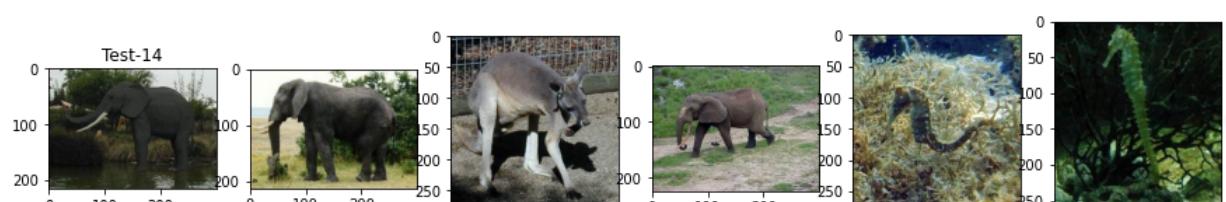
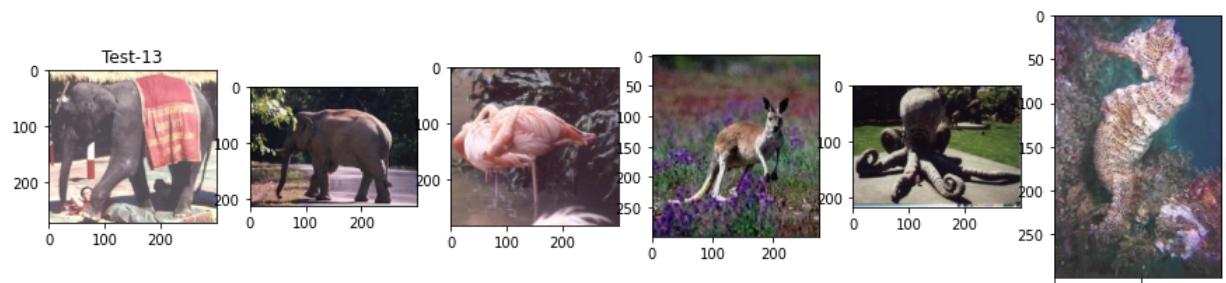
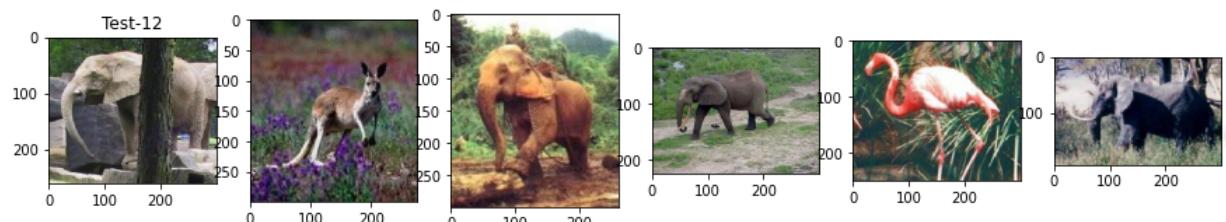
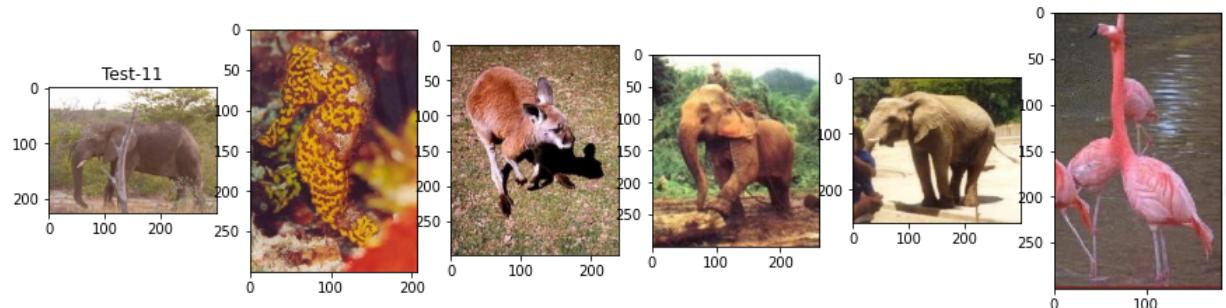
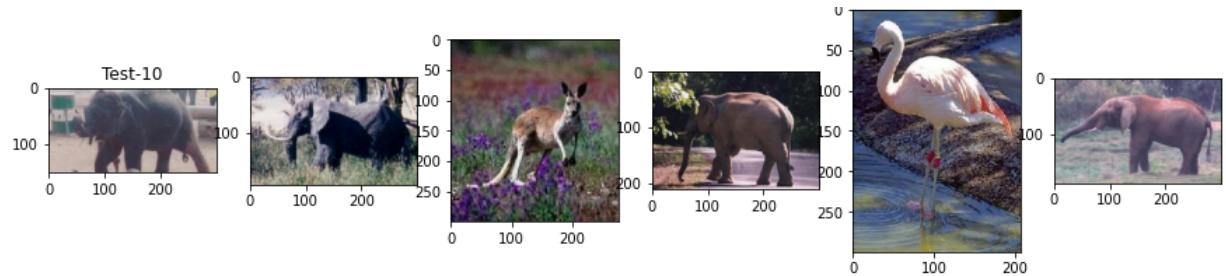


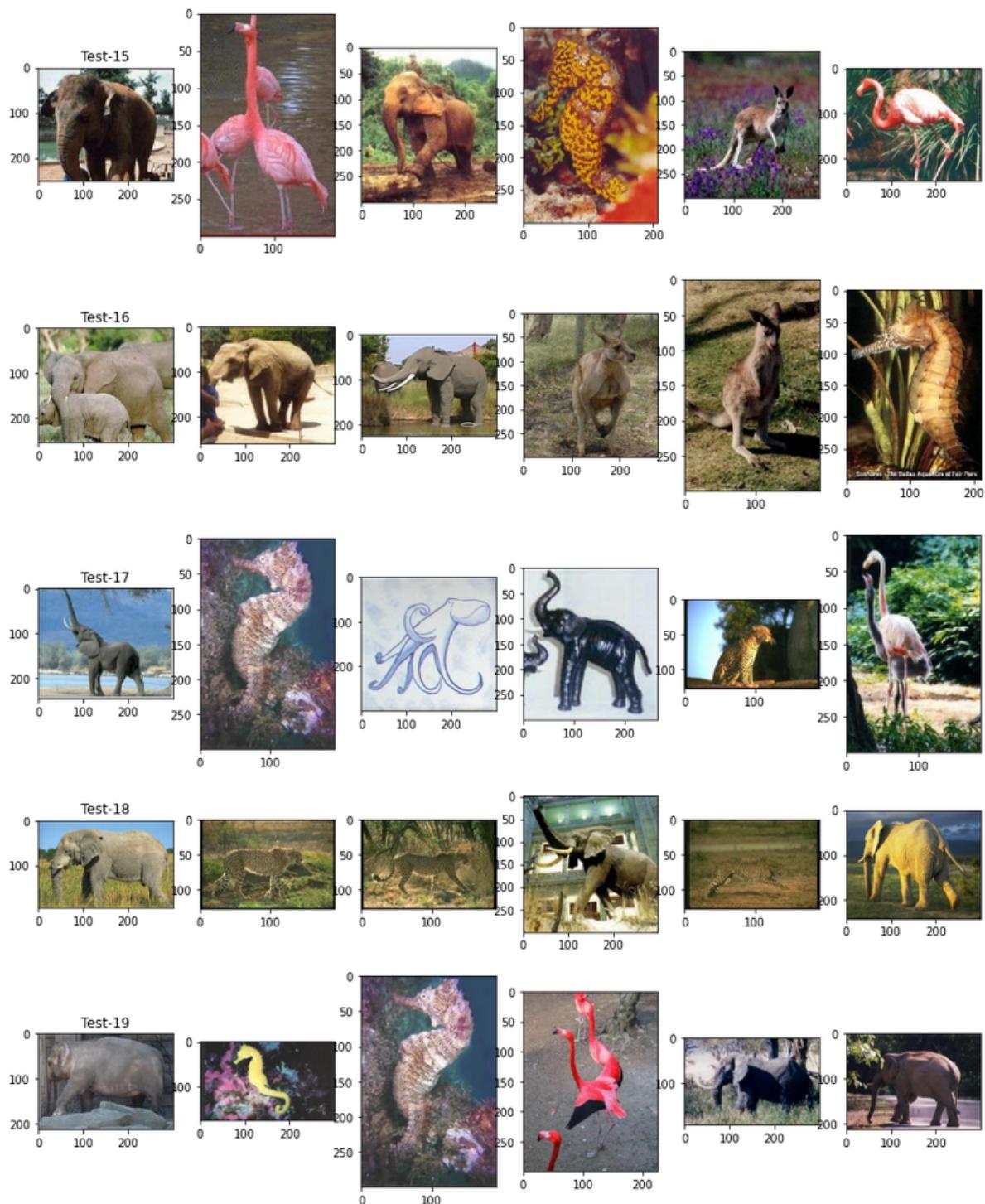


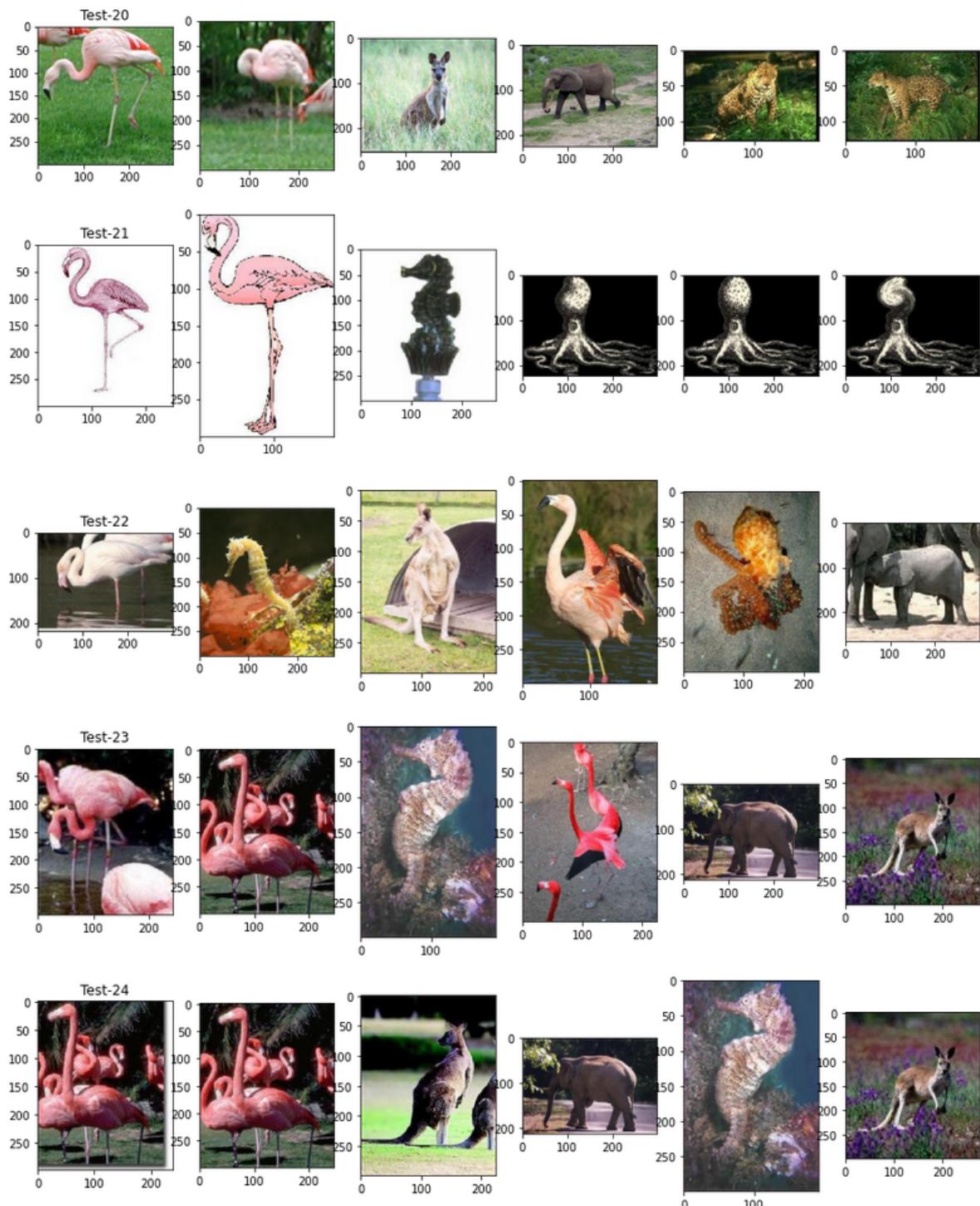
HSV UZAYI TEST RESİMLERİ VE SONUÇLARI:











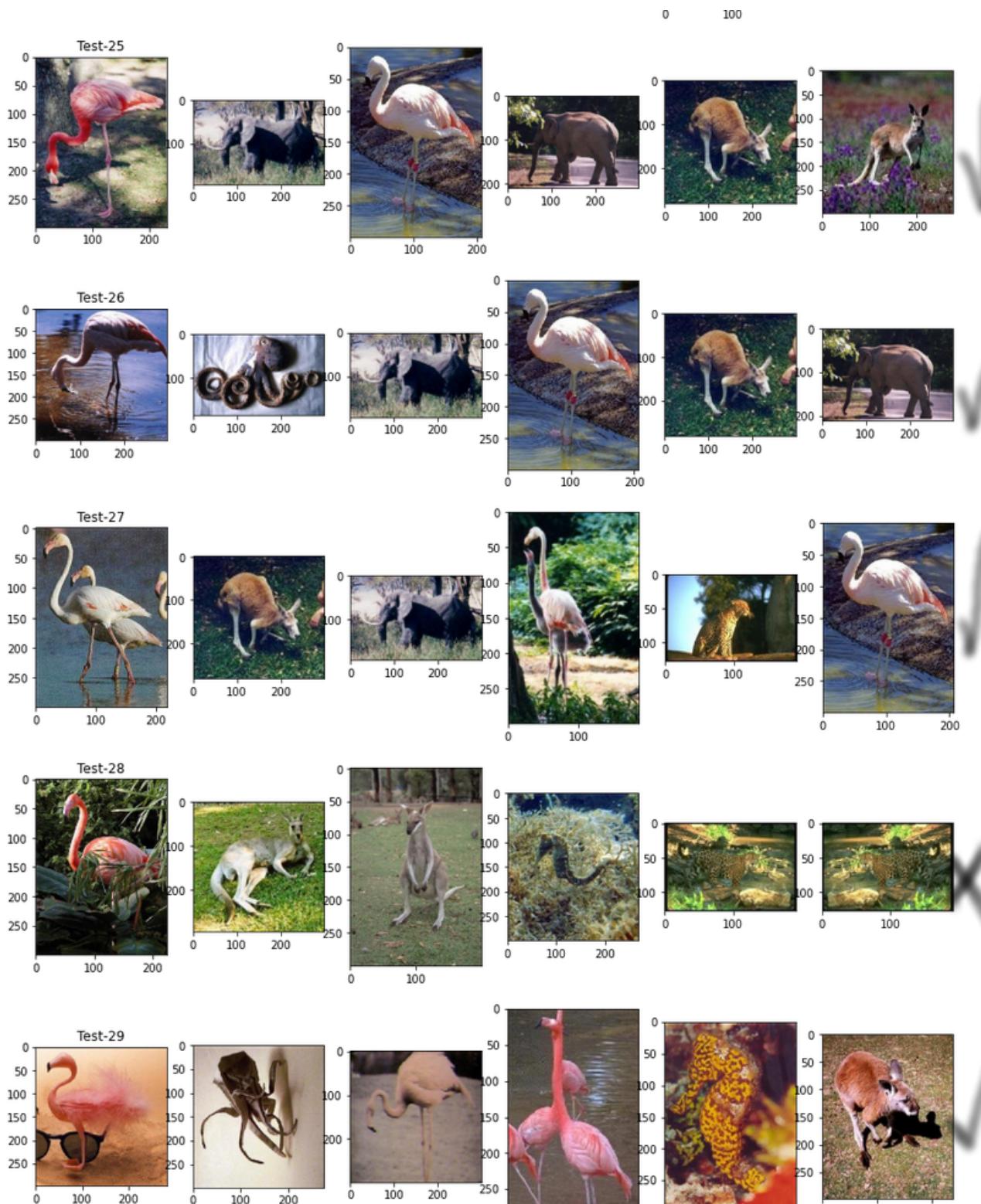
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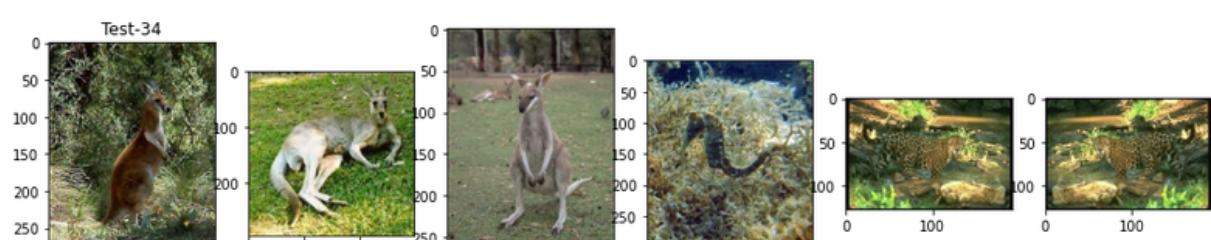
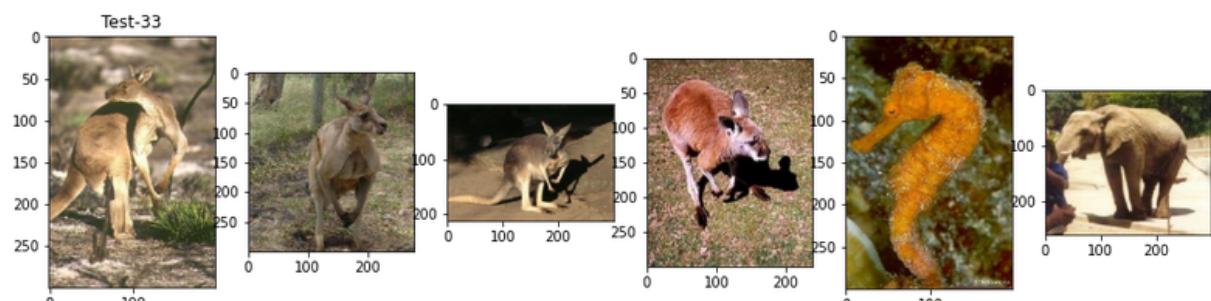
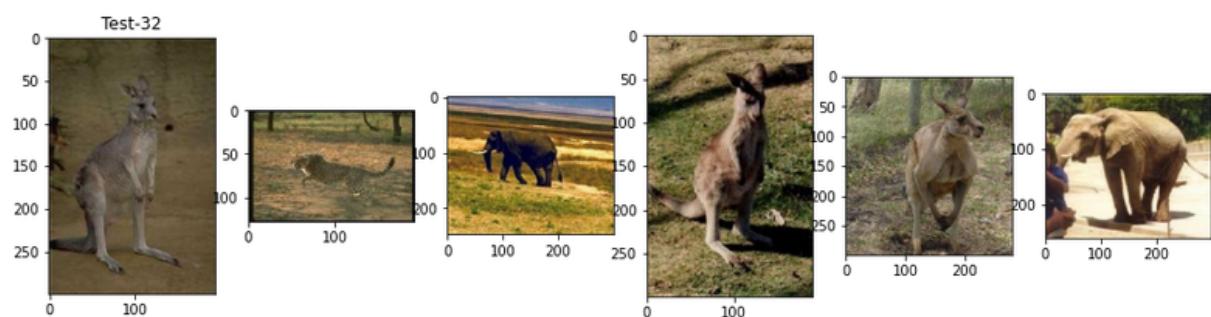
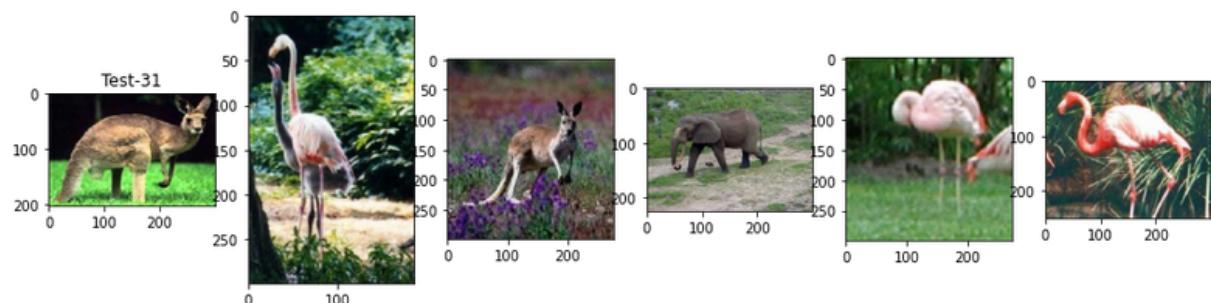
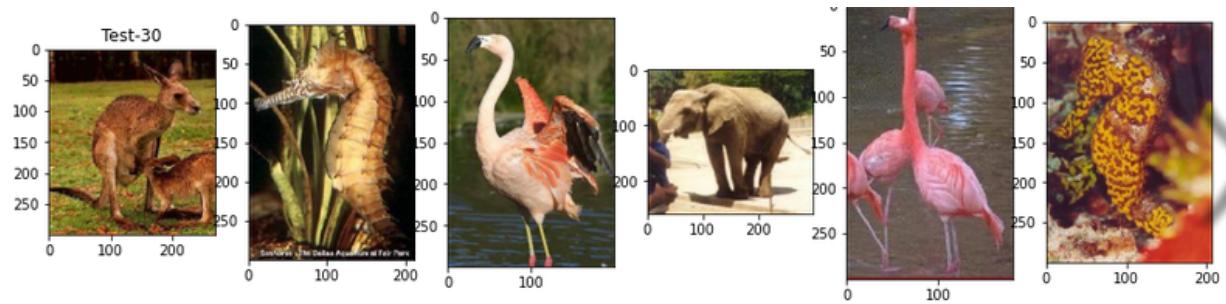
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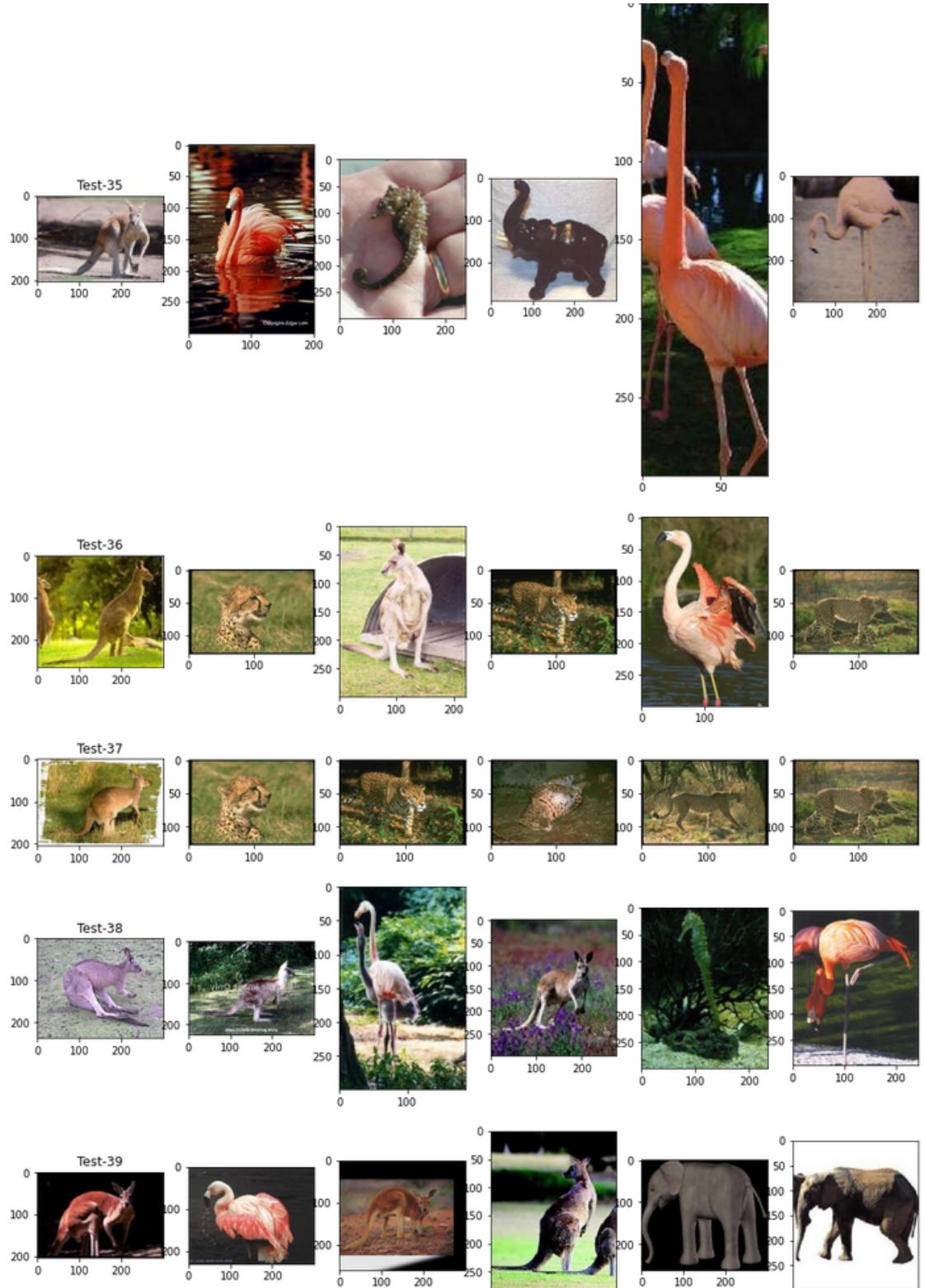
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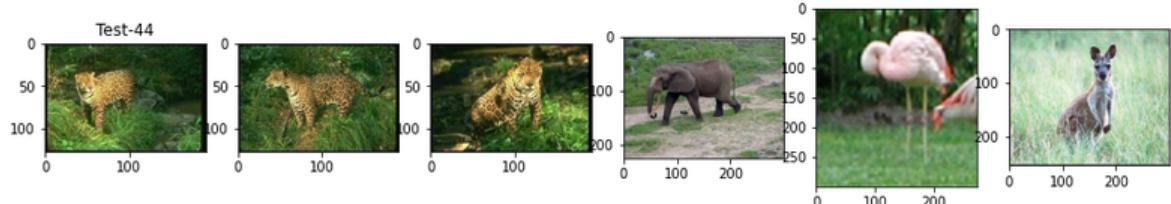
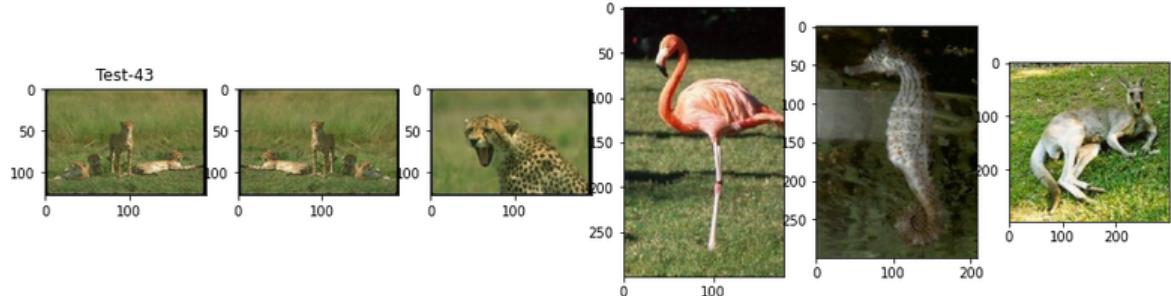
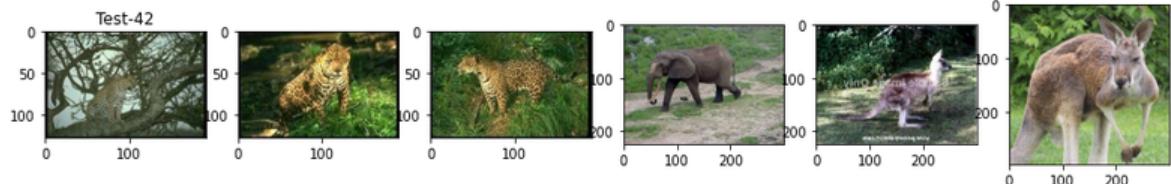
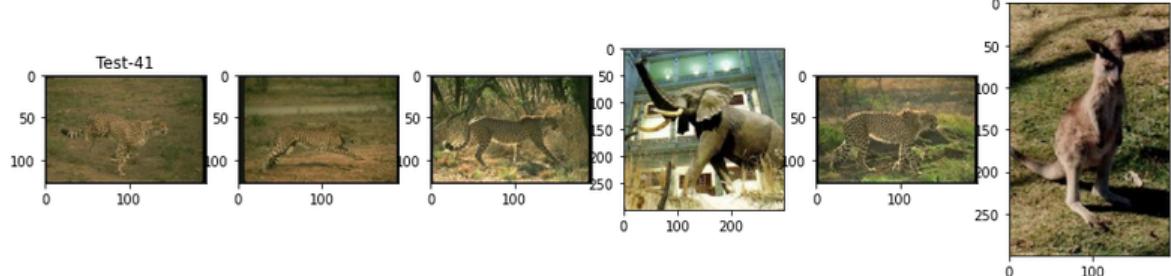
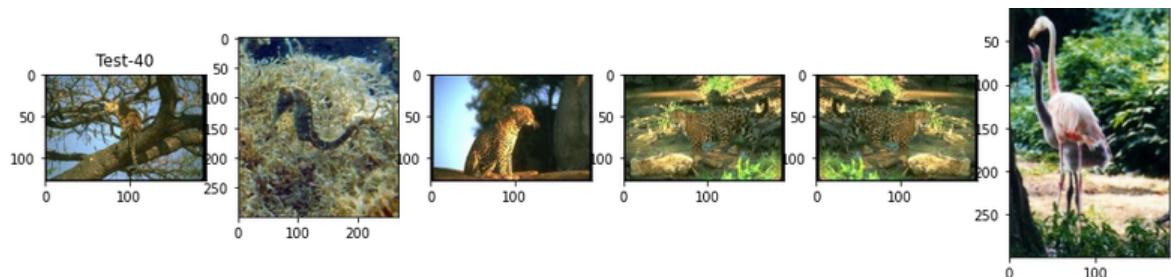
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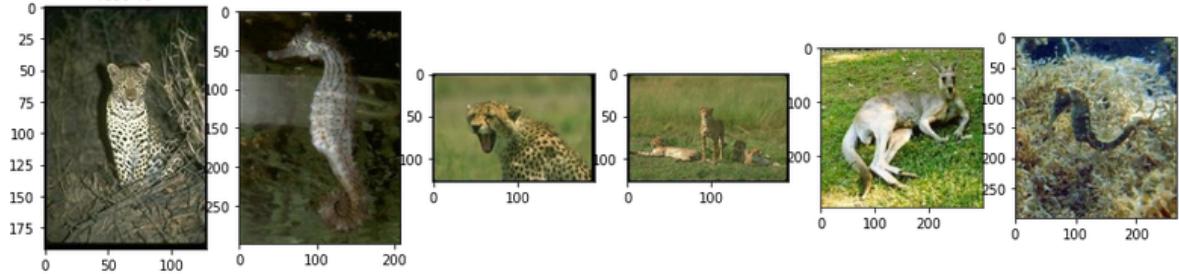






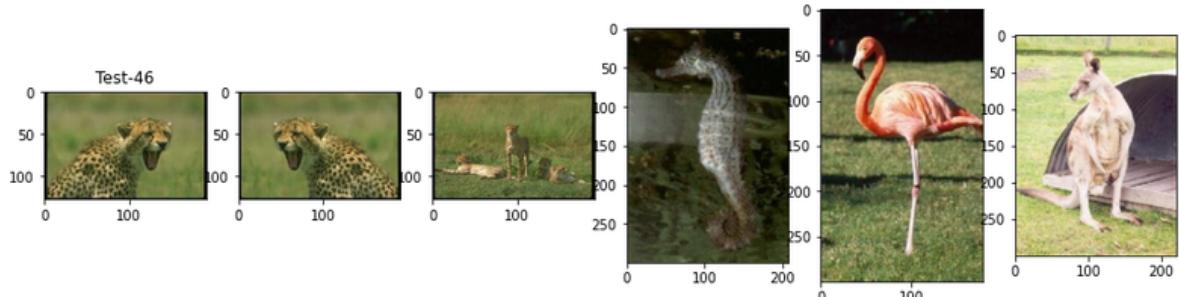
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Test-45



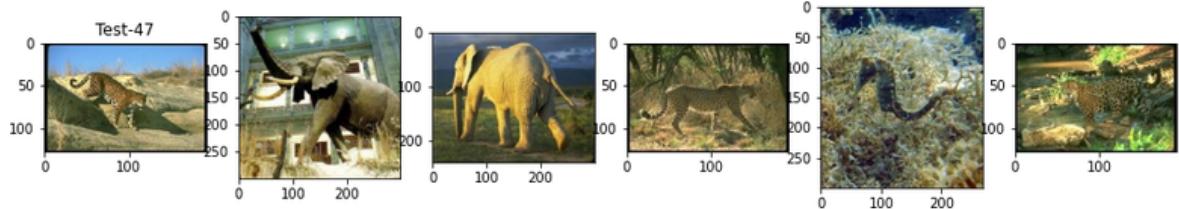
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Test-46



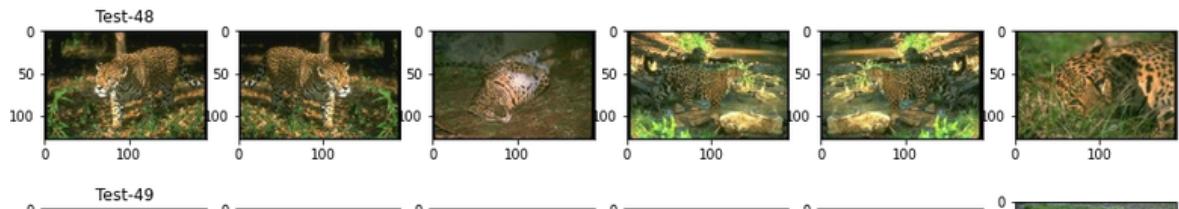
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Test-47



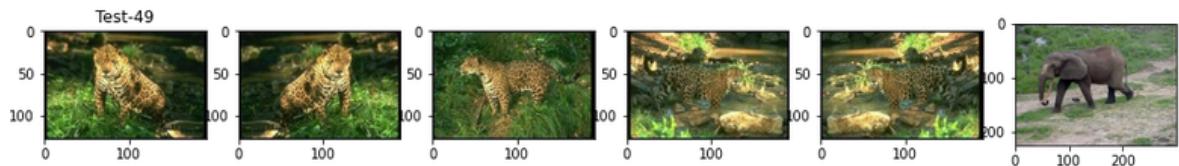
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Test-48

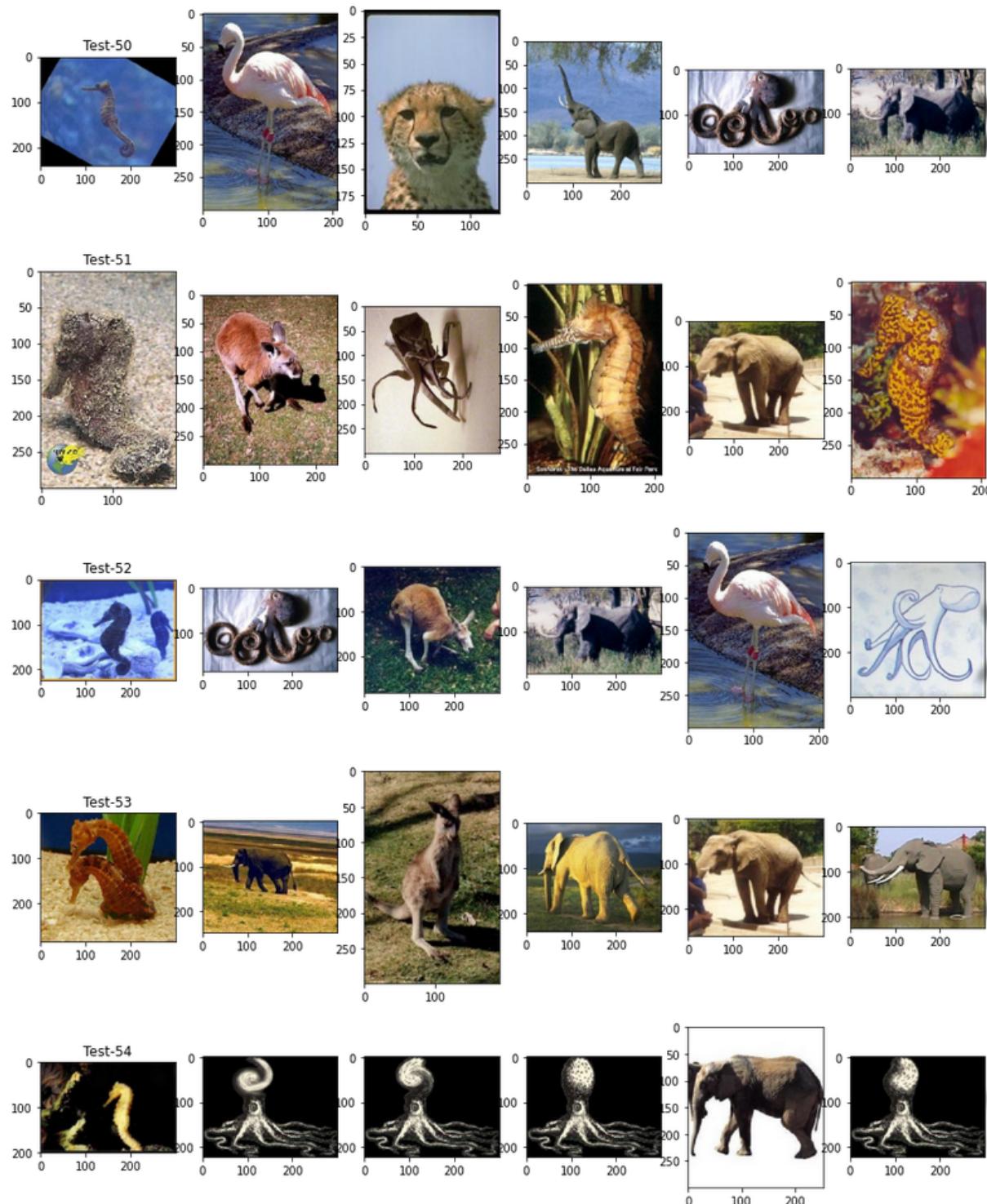


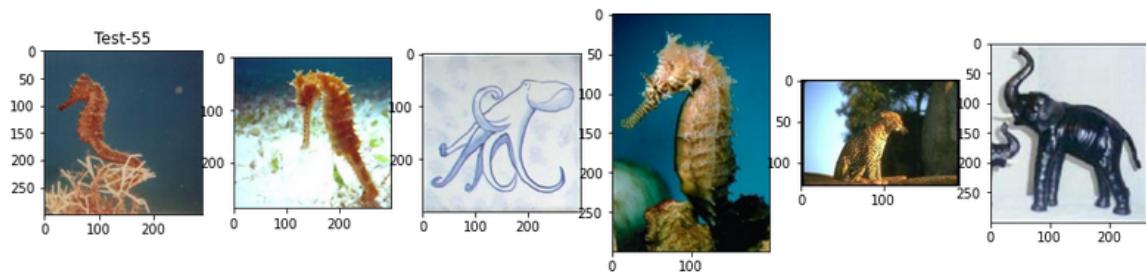
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Test-49

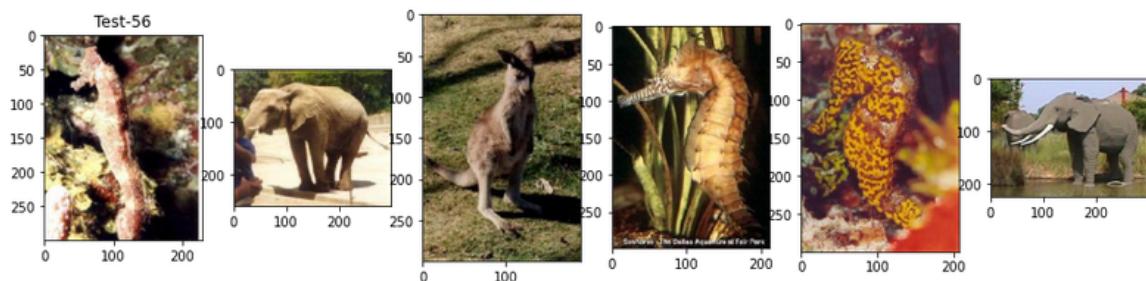


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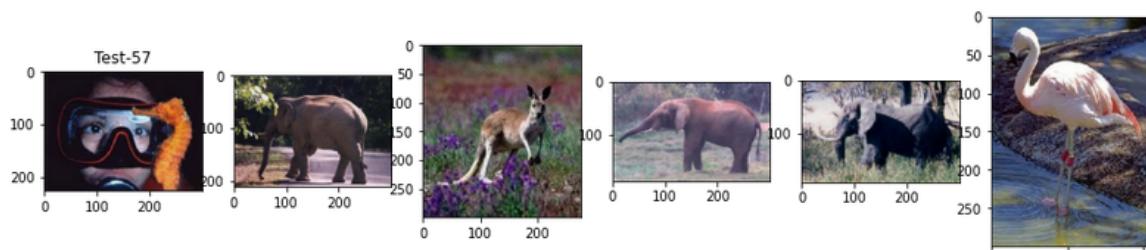




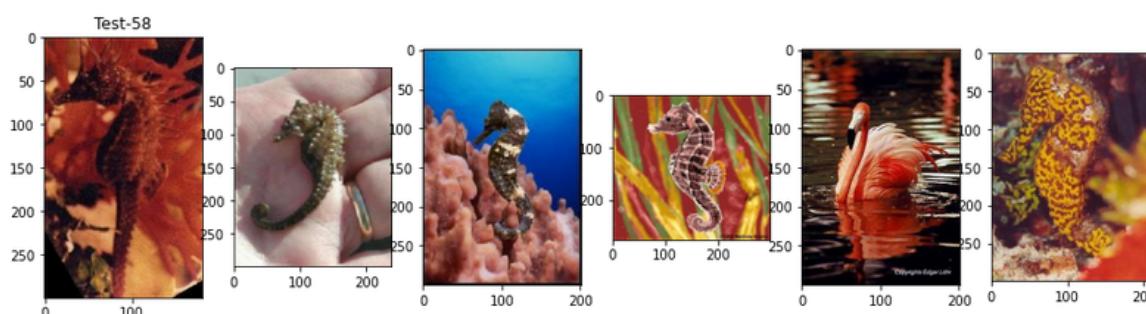
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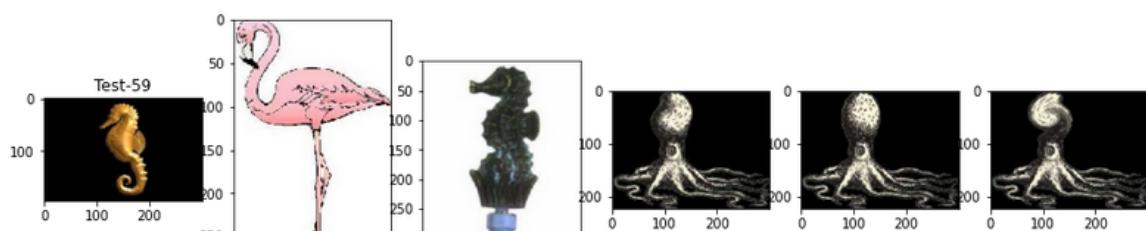
✓



✗



✓



✓

BAŞARI SONUÇLARI:

OCTOPUS_RGB: 2/10

OCTOPUS_HUE: 7/10

OCTOPUS_TOPLAM: 9/20

ELEPHANT_RGB: 9/10

ELEPHANT_HUE: 10/10

ELEPHANT_TOPLAM: 19/20

FLAMINGO_RGB: 6/10

FLAMINGO_HUE: 9/10

FLAMINGO_TOPLAM: 15/20

KANGAROO_RGB: 9/10

KANGAROO_HUE: 7/10

KANGAROO_TOPLAM: 16/20

LEOPARDS_RGB: 9/10

LEOPARDS_HUE: 10/10

LEOPARDS_TOPLAM: 19/20

SEA_HORSE_RGB: 3/10

SEA_HORSE_HUE: 5/ 10

SEA_HORSE_TOPLAM: 8/20

RGB BAŞARI ORANI: 38/60

HUE BAŞARI ORANI: 48/60

TOPLAM BAŞARI ORANI: 86/120

C) SONUÇ:

HSV uzayının Hue kanalı için 48/60 lik bir başarı oranı elde edildi. RGB uzayında 3 renk kanalı da kullanılarak 38/60 lik başarı oranı elde edildi.

Hue kanalını kullanarak yaptığımız tahminler daha başarılı sonuç verdi.

120 tane resimden 5 resim seçerek bir tahmin uyguladık. Eğer rastgele seçseydik, en az 1 tanesinin test resmi ile aynı sınıfın olasılığı 0.64.

Biz ise toplamda 86/120 ile 0.71 lik bir oran elde ettik.

Sadece renk özelliklerini kullanarak böyle bir yakınsama yapmanın çok tutarlı olmayan sonuçlar verdieneniğini görmüş olduk. Aynı zamanda bazı test görüntülerinin benzerleri test görüntüsüyle aynı sınıfta olan birden fazla benzer görüntü döndürdü. Bu ise bize renk özelliklerinin görüntü tanımda önemli yeri olduğunu gösterdi.