Parallel Computing

So what’s parallel computing?

Let’s assume you have a cake

Option 1: eat each slice in order

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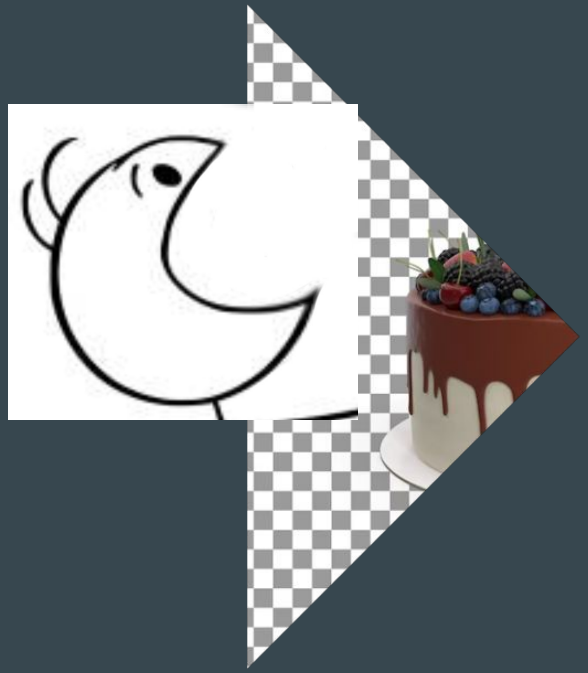

Boring, takes too much time

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The old boring way - for loop

[26]:
```
def EatSlice(cakeSlice):
    return f"{cakeSlice}_eaten"
```

[9]:
```
for cakeSlice_i, cakeSlice in enumerate(cake):
-------
    print(f"Eating slice {cakeSlice_i}")
-------
    cake[cakeSlice_i] = EatSlice(cakeSlice)
    time.sleep(.5)
```

```
Eating slice 0
Eating slice 1
Eating slice 2
Eating slice 3
```

[10]:
```
cake
```

[10]:
```
['slice_0_eaten', 'slice_1_eaten', 'slice_2_eaten', 'slice_3_eaten']
```

Boring, takes too much time

The old boring way - map and lambda functions

```
EatSliceLambda = lambda cakeSlice: f"{cakeSlice}_eaten"
```

```
EatSliceLambda('Slice')
```

```
'Slice_eaten'
```

```
chocolateCake = makeCake()
chocolateCake
```

```
['slice_0', 'slice_1', 'slice_2', 'slice_3']
```

```
chocolateCake = list(map(EatSliceLambda, chocolateCake))
chocolateCake
```

```
['slice_0_eaten', 'slice_1_eaten', 'slice_2_eaten', 'slice_3_eaten']
```

Option 2: Invite friends and eat them all at the same time

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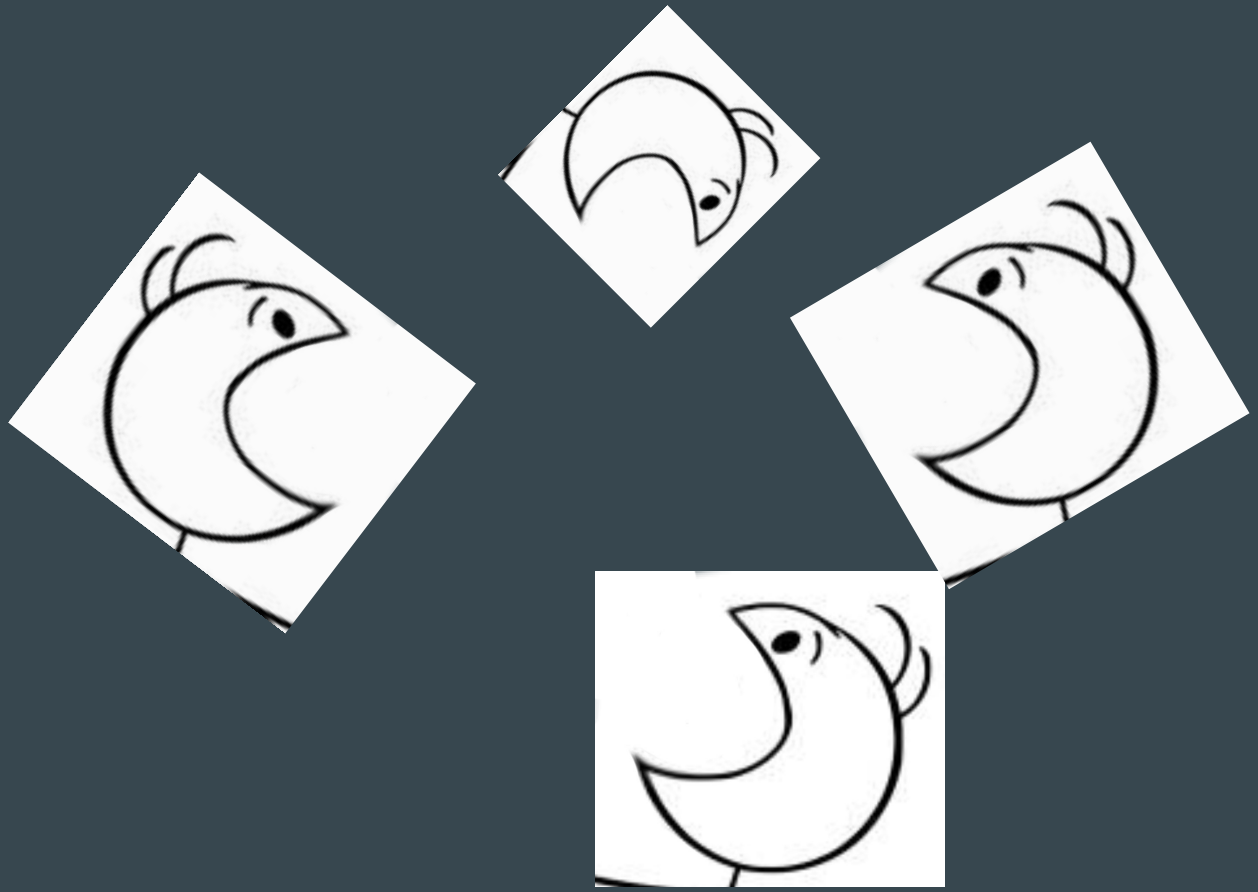
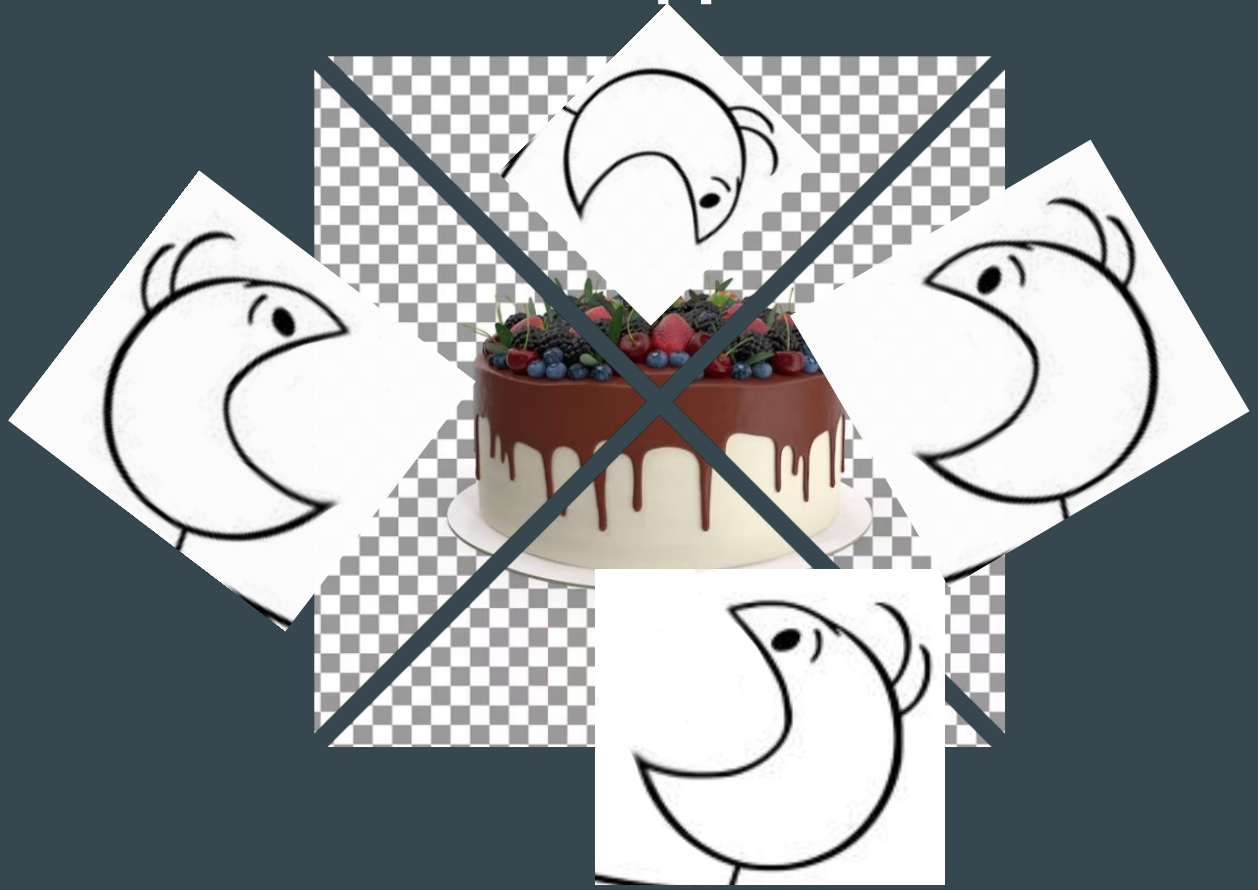


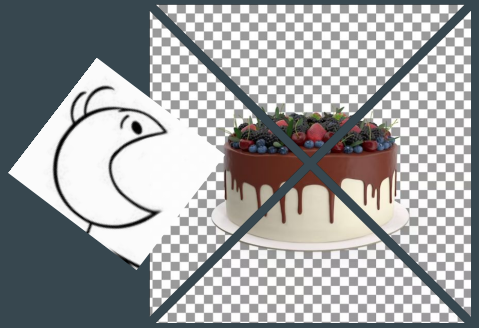
Fun, wayyyy faster

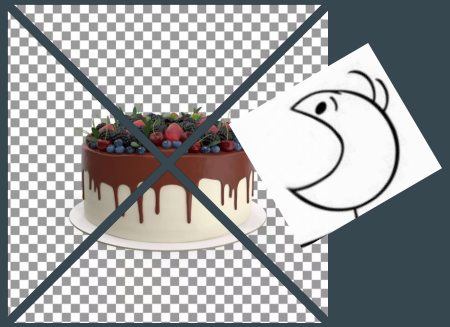



What happened?

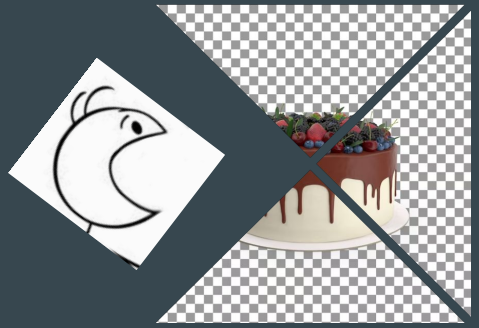


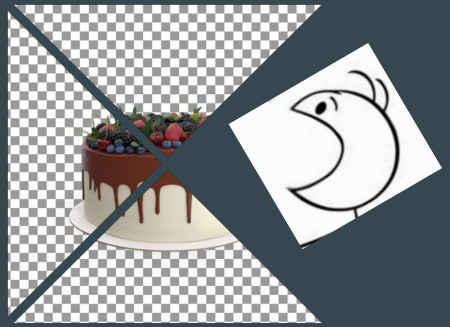
They made a copy of the cake??!!??





And ate it???





But the original is untouched

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```
[96]: import multiprocess ## multiprocess for within notebook, otherwise you can use multiprocessing

[24]: strawberryCake = makeCake()
      strawberryCake

[24]: ['slice_0', 'slice_1', 'slice_2', 'slice_3']

[33]: def EatSliceParallel(cakeSlice_i):
          strawberryCake[cakeSlice_i] = EatSlice(strawberryCake[cakeSlice_i])

[34]: with multiprocess.Pool(2) as pool:
          pool.map(EatSliceParallel, range(len(strawberryCake)))

[35]: strawberryCake

[35]: ['slice_0', 'slice_1', 'slice_2', 'slice_3']
```

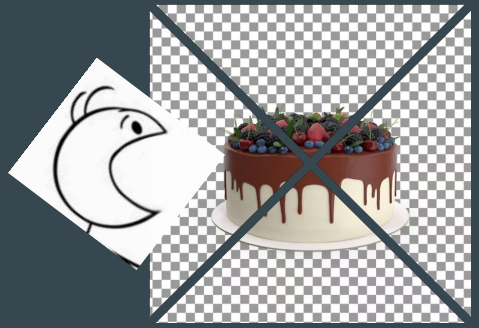
But the original is untouched

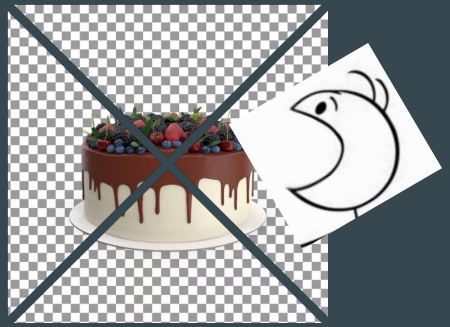
If you need to modify the cake in the parallel process:
Shared memory

What happened? - 2

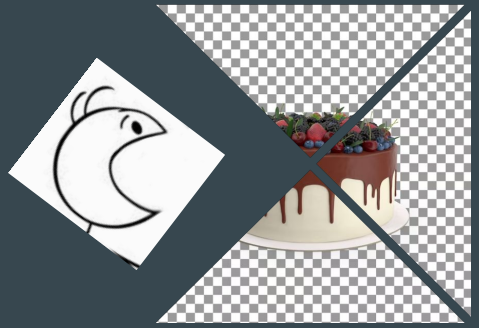
The return of what happened

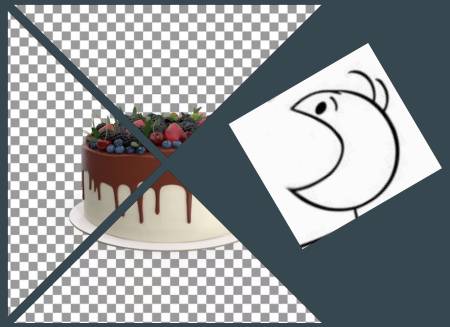
They made a copy of the cake



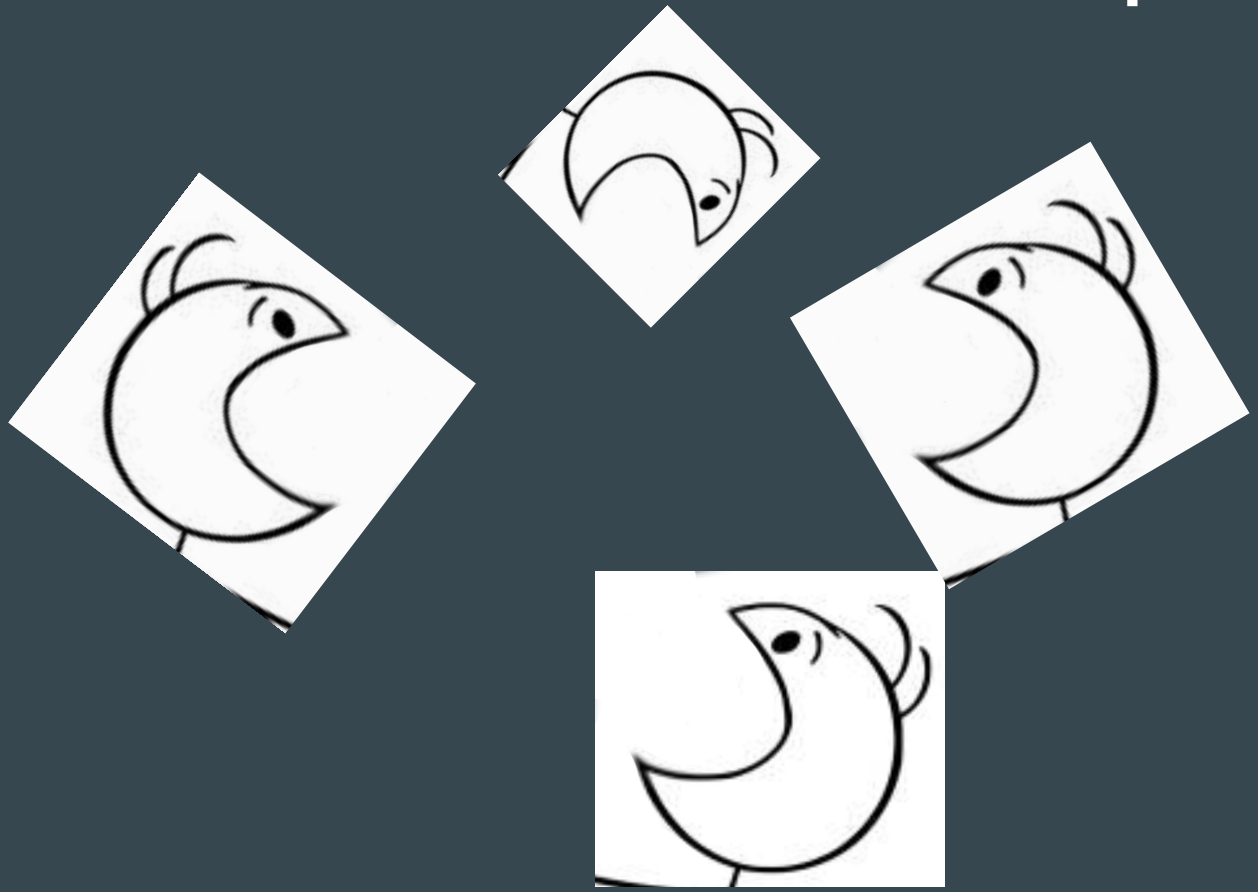


Ate the cake





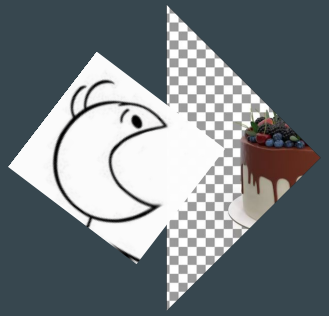
And reassembled the modified part

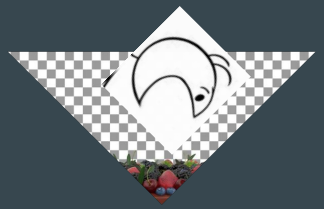


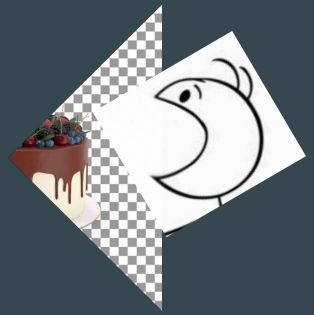
What happened? - 3

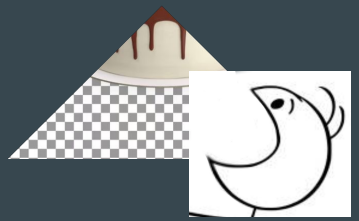
Revenge of what happened

They made a copy of each slice



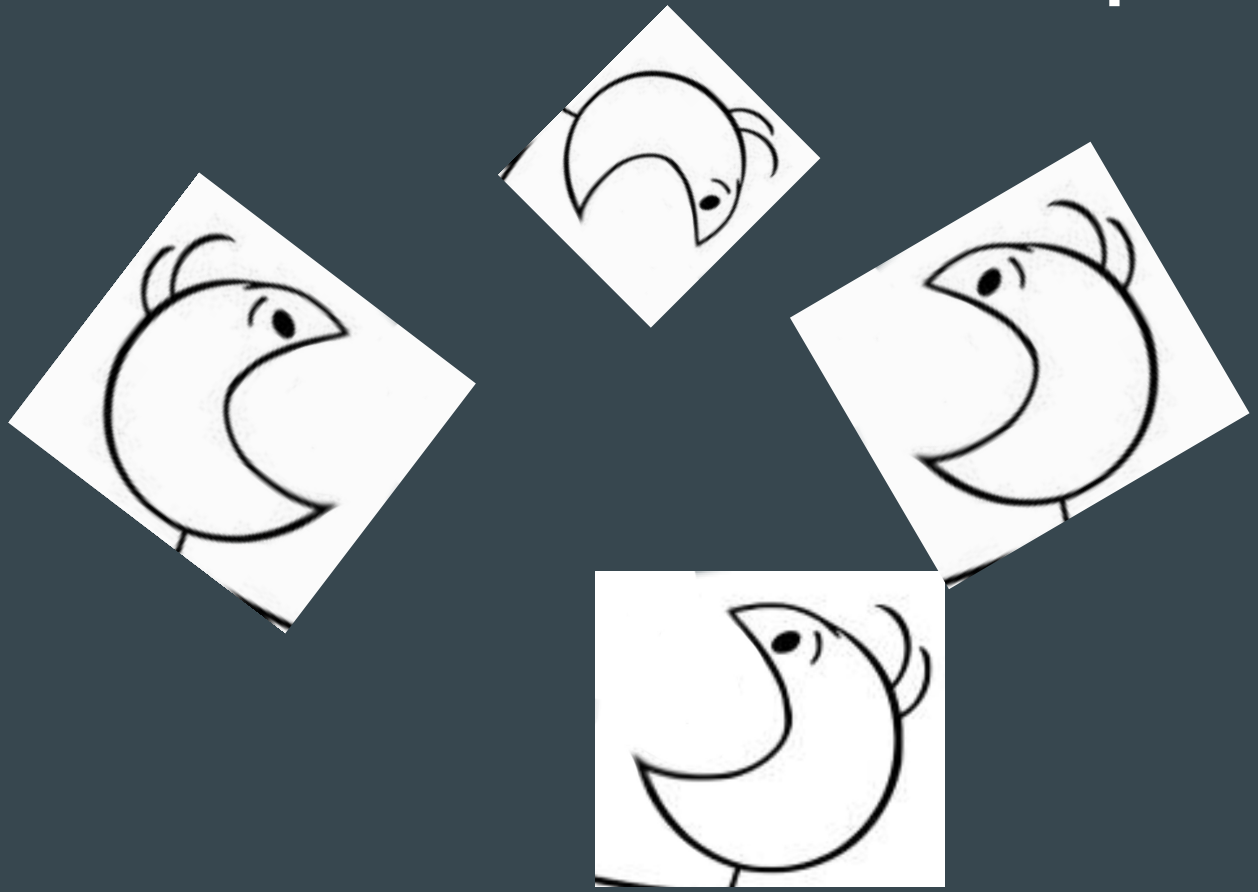






Ate the slice

And reassembled the modified parts



In general: think of how data is passed to the parallel process.
Memory can be expensive for large datasets.

There is an overhead in starting a parallel process.
Think parallel if one task takes a long time.

A lot of python functions are already parallel.
E.G.: Numpy array computations are parallel