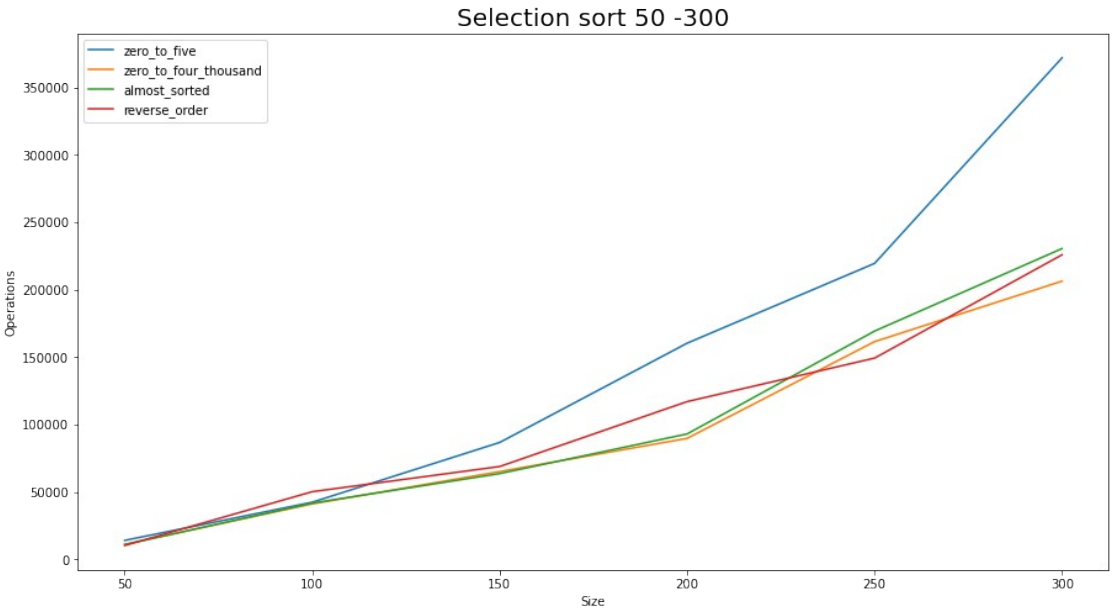
```
%matplotlib inline
import numpy as np
import matplotlib.pyplot as plt
```

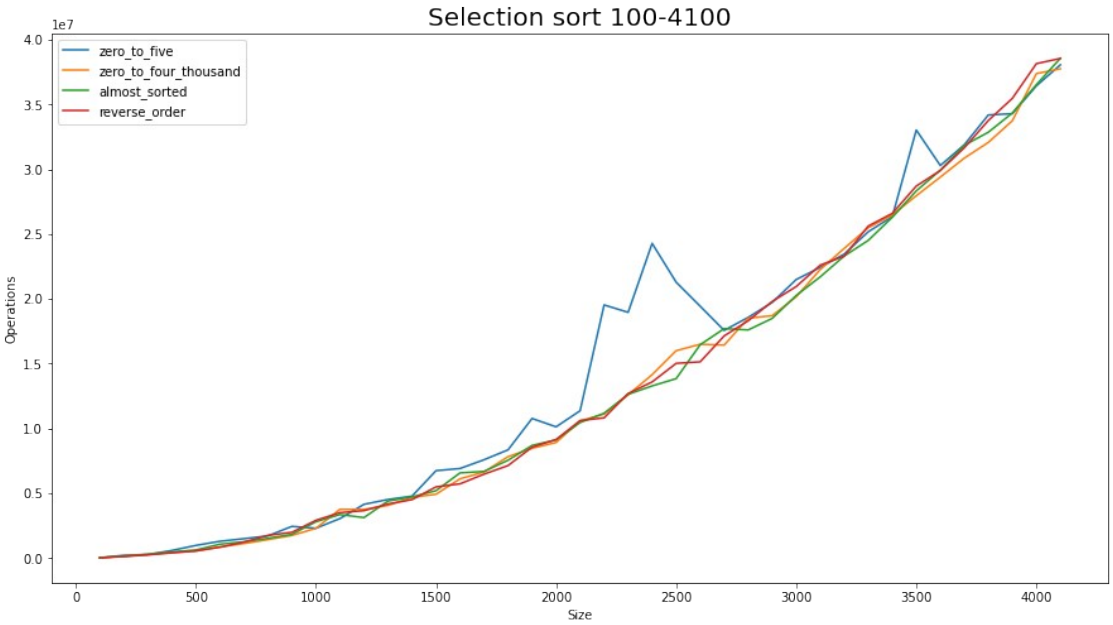
Selection sort

```
# Размерность 50 - 300
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(50, 301, 50):
    size.append(i)
array_type = ""
with open ("selection_sort 50 - 300.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Selection sort 50 -300", fontsize= 20)
plt.legend(loc='best')
plt.show()
```

```
# Размерность 100 - 4100
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
```

```
reverse_order = []
for i in range(100, 4101, 100):
    size.append(i)
array_type = ""
with open ("selection_sort 100 - 4100.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Selection sort 100-4100", fontsize= 20)
plt.legend(loc='best')
plt.show()
```





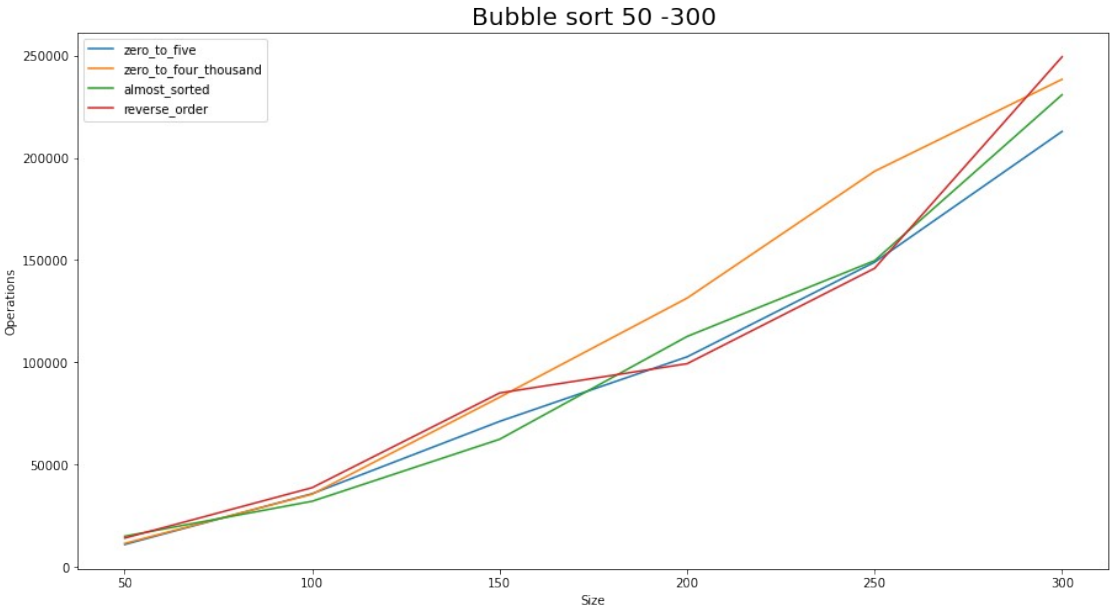
Bubble sort

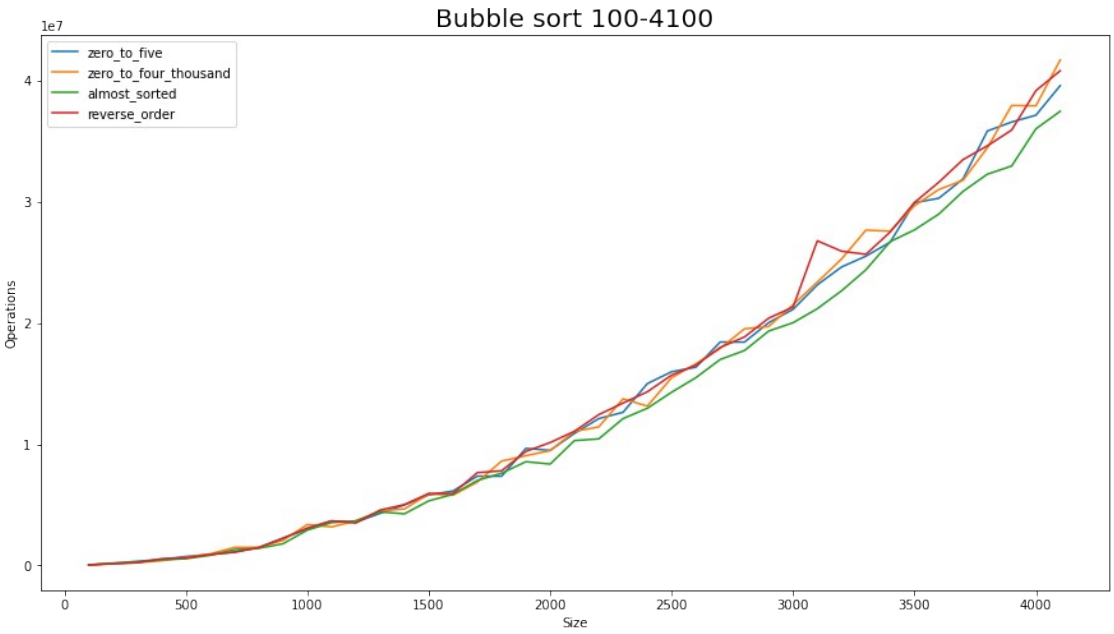
```
# Размерность 50 - 300
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(50, 301, 50):
    size.append(i)
array_type = ""
```

```
with open ("bubble_sort 50 - 300.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Bubble sort 50 -300", fontsize= 20)
plt.legend(loc='best')
plt.show()


# Размерность 100 - 4100
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(100, 4101, 100):
    size.append(i)
array_type = ""
with open ("bubble_sort 100 - 4100.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
```

```
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Bubble sort 100-4100", fontsize= 20)
plt.legend(loc='best')
plt.show()
```



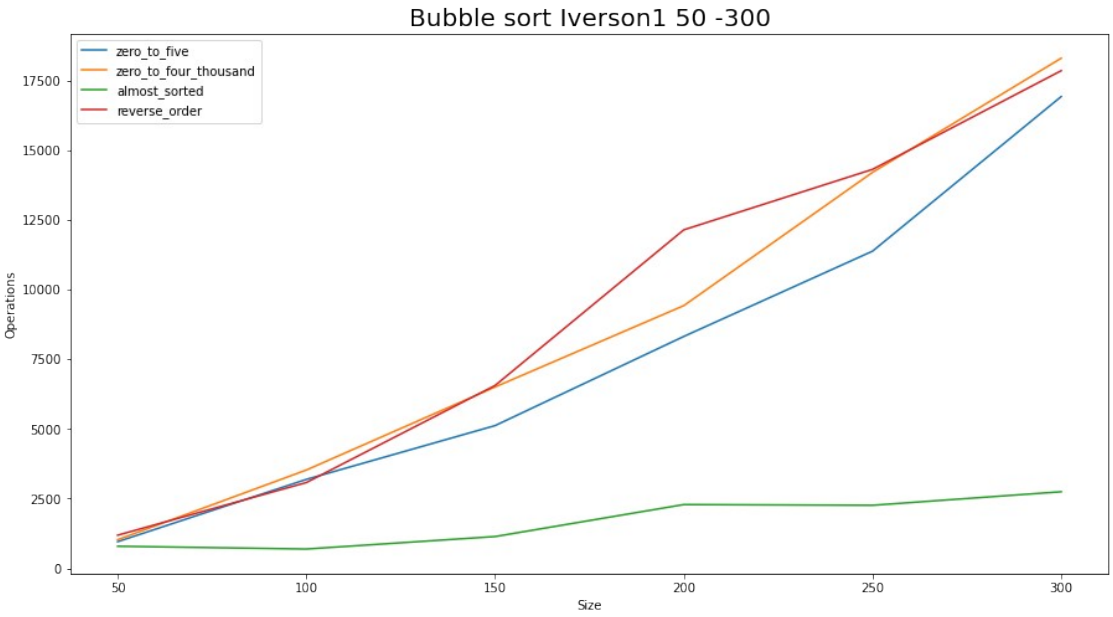


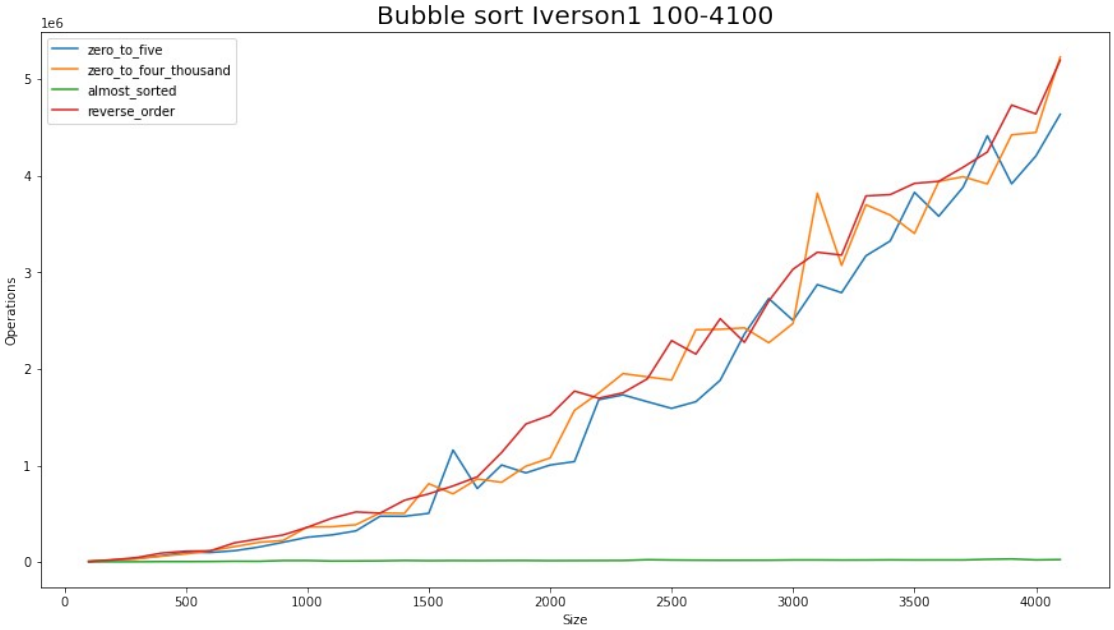
Bubble sort Iverson1

```
# Размерность 50 - 300
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(50, 301, 50):
    size.append(i)
array_type = ""
with open ("bubble_iverson1 50 - 300.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
```

```
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Bubble sort Iverson1 50 -300", fontsize= 20)
plt.legend(loc='best')
plt.show()


# Размерность 100 - 4100
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(100, 4101, 100):
    size.append(i)
array_type = ""
with open ("bubble_iverson1 100 - 4100.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Bubble sort Iverson1 100-4100", fontsize= 20)
plt.legend(loc='best')
plt.show()
```





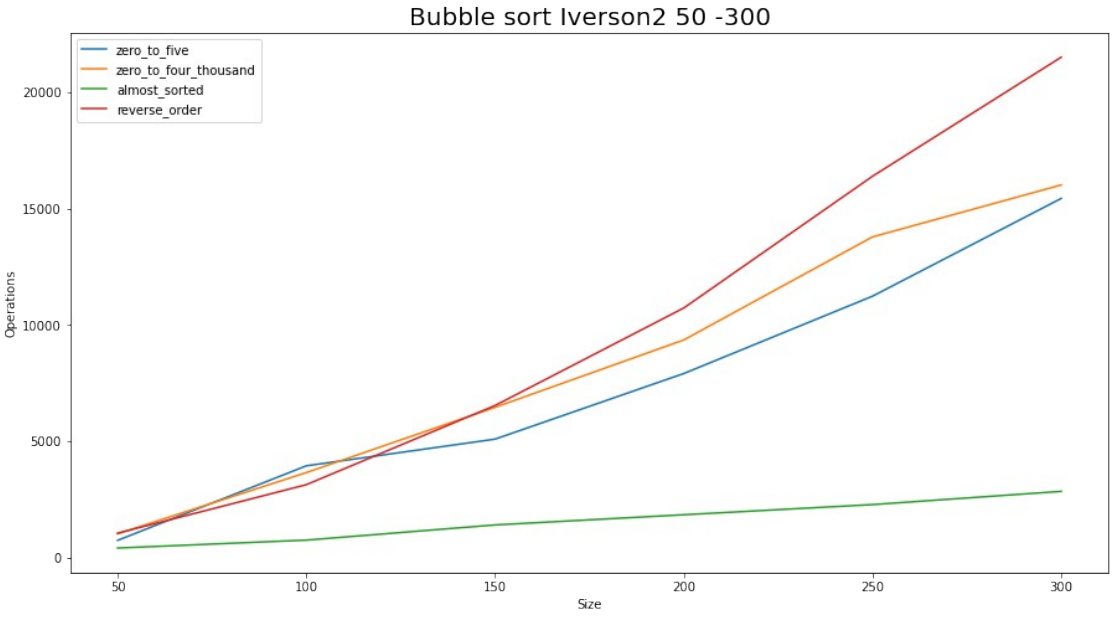
Bubble sort Iverson2

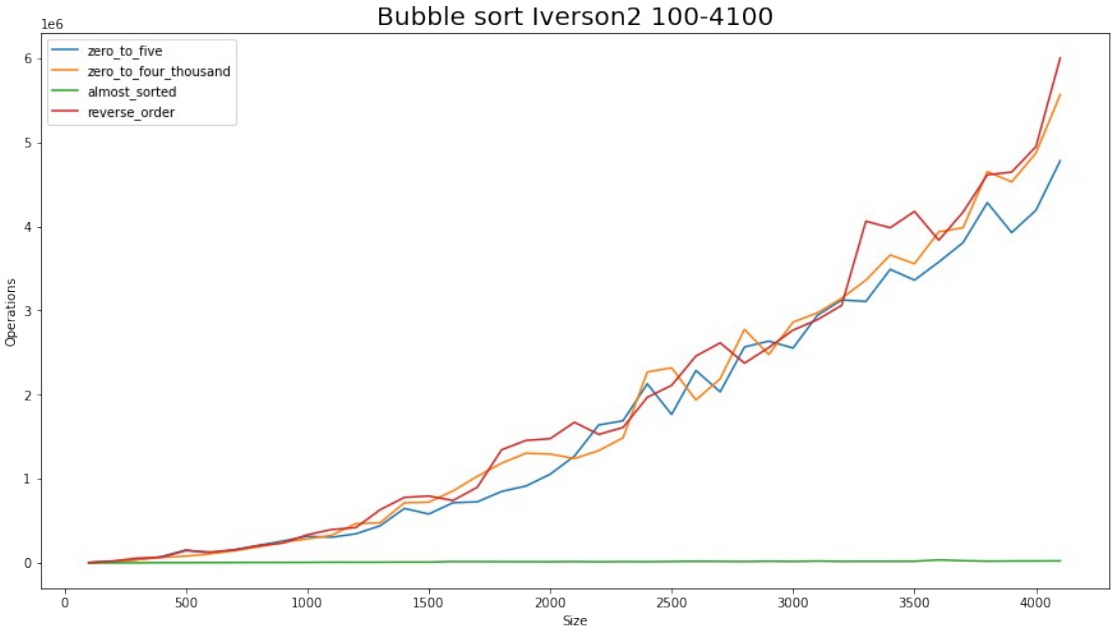
```
# Размерность 50 - 300
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(50, 301, 50):
    size.append(i)
array_type = ""
```

```
with open ("bubble_iverson2 50 - 300.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Bubble sort Iverson2 50 -300", fontsize= 20)
plt.legend(loc='best')
plt.show()


# Размерность 100 - 4100
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(100, 4101, 100):
    size.append(i)
array_type = ""
with open ("bubble_iverson2 100 - 4100.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
```

```
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Bubble sort Iverson2 100-4100", fontsize= 20)
plt.legend(loc='best')
plt.show()
```



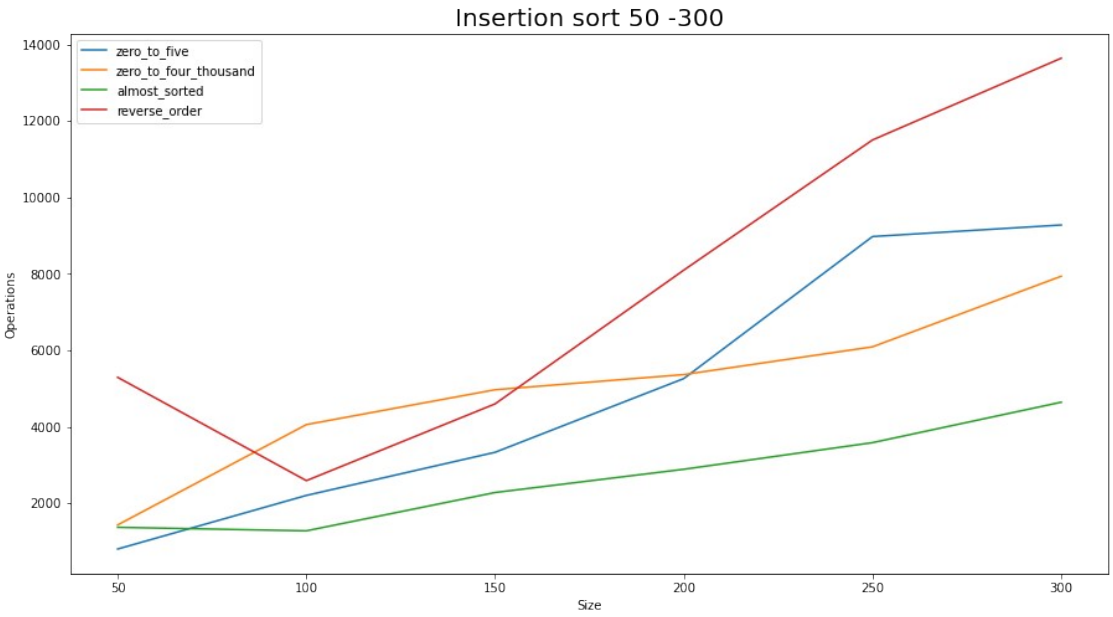


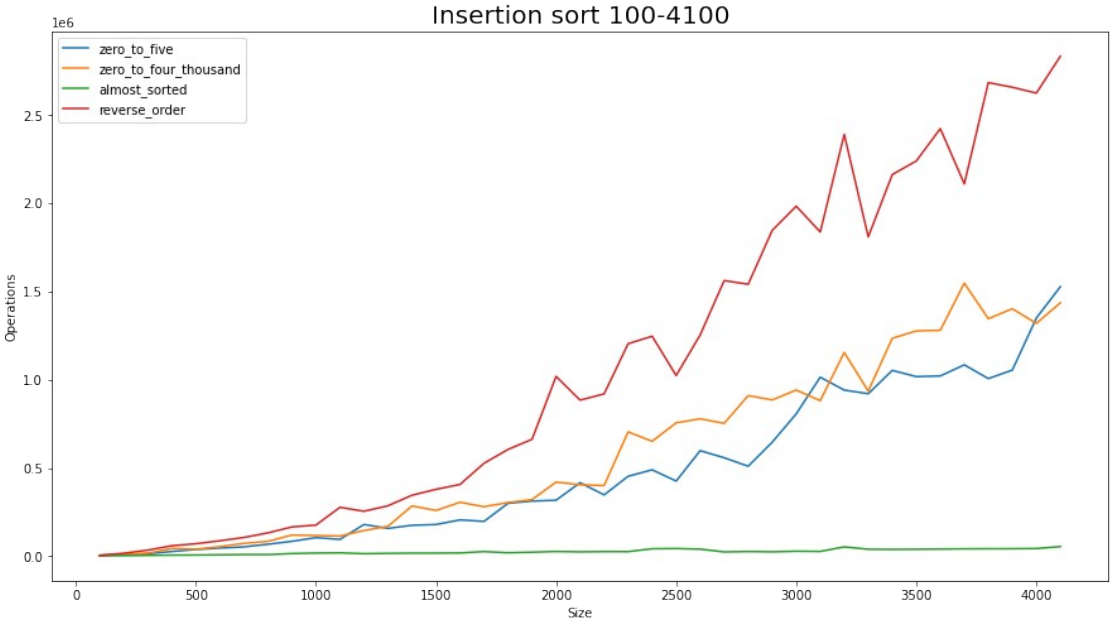
Insertion sort

```
# Размерность 50 - 300
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(50, 301, 50):
    size.append(i)
array_type = ""
with open ("insertion_sort 50 - 300.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
```

```
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Insertion sort 50 -300", fontsize= 20)
plt.legend(loc='best')
plt.show()


# Размерность 100 - 4100
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(100, 4101, 100):
    size.append(i)
array_type = ""
with open ("insertion_sort 100 - 4100.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Insertion sort 100-4100", fontsize= 20)
plt.legend(loc='best')
plt.show()
```





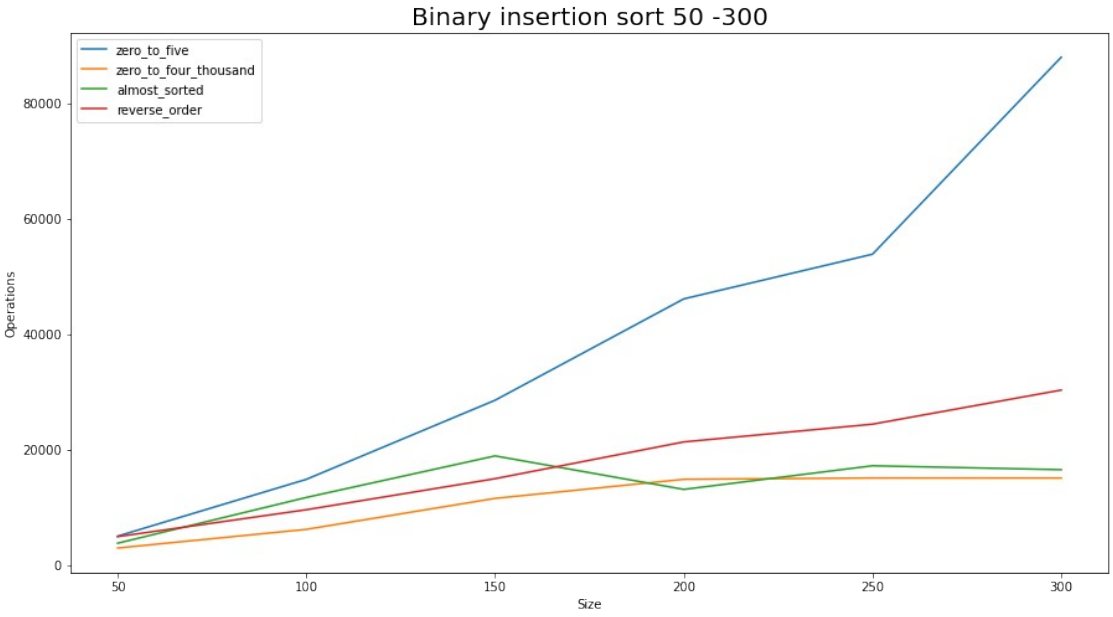
Binary insertion sort

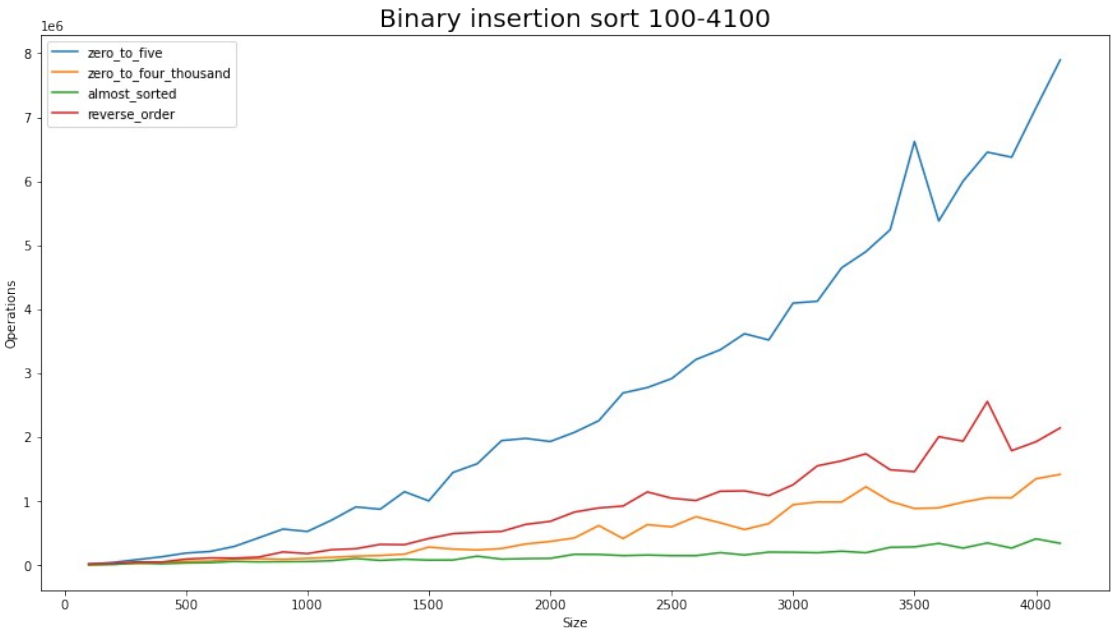
```
# Размерность 50 - 300
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(50, 301, 50):
    size.append(i)
array_type = ""
```

```
with open ("binary_insertion_sort 50 - 300.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Binary insertion sort 50 -300", fontsize= 20)
plt.legend(loc='best')
plt.show()


# Размерность 100 - 4100
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(100, 4101, 100):
    size.append(i)
array_type = ""
with open ("binary_insertion_sort 100 - 4100.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
```

```
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Binary insertion sort 100-4100", fontsize= 20)
plt.legend(loc='best')
plt.show()
```



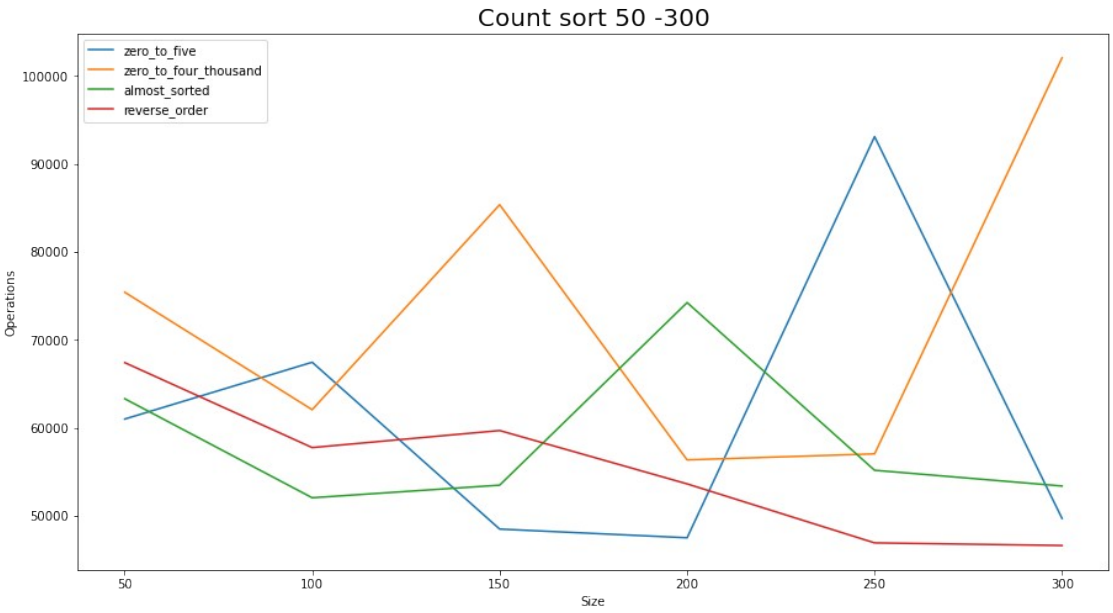


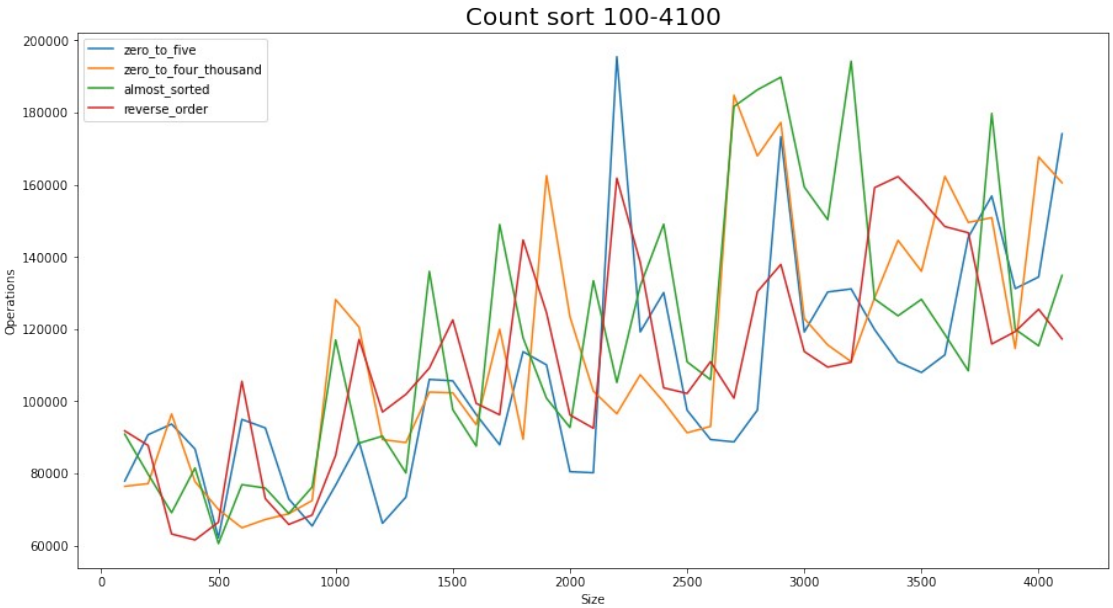
Count sort

```
# Размерность 50 - 300
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(50, 301, 50):
    size.append(i)
array_type = ""
with open ("count_sort 50 - 300.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
```

```
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Count sort 50 -300", fontsize= 20)
plt.legend(loc='best')
plt.show()


# Размерность 100 - 4100
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(100, 4101, 100):
    size.append(i)
array_type = ""
with open ("count_sort 100 - 4100.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Count sort 100-4100", fontsize= 20)
plt.legend(loc='best')
plt.show()
```





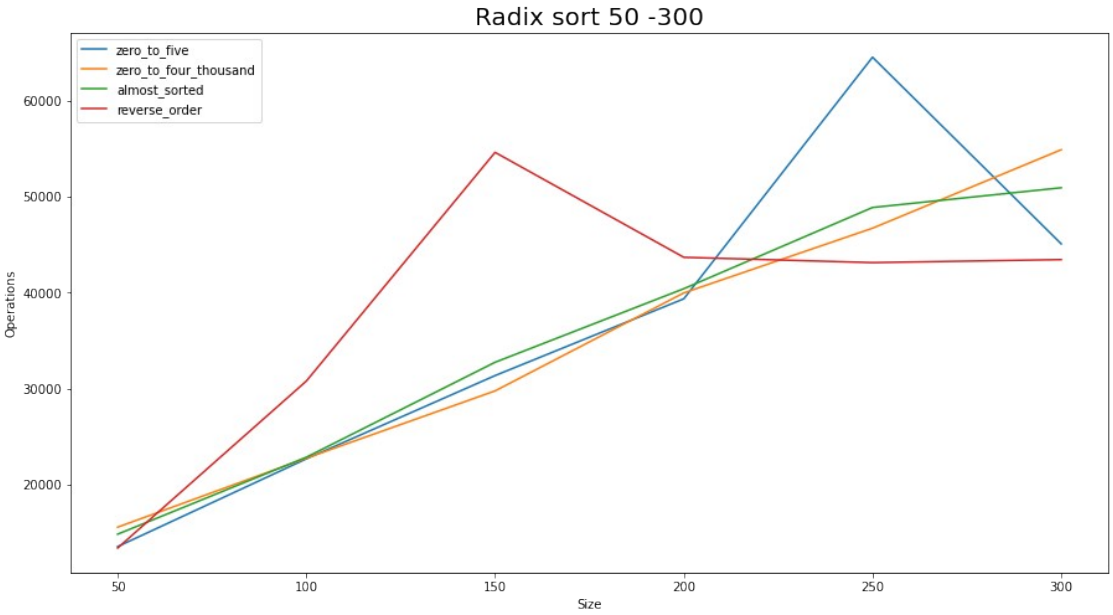
Radix sort

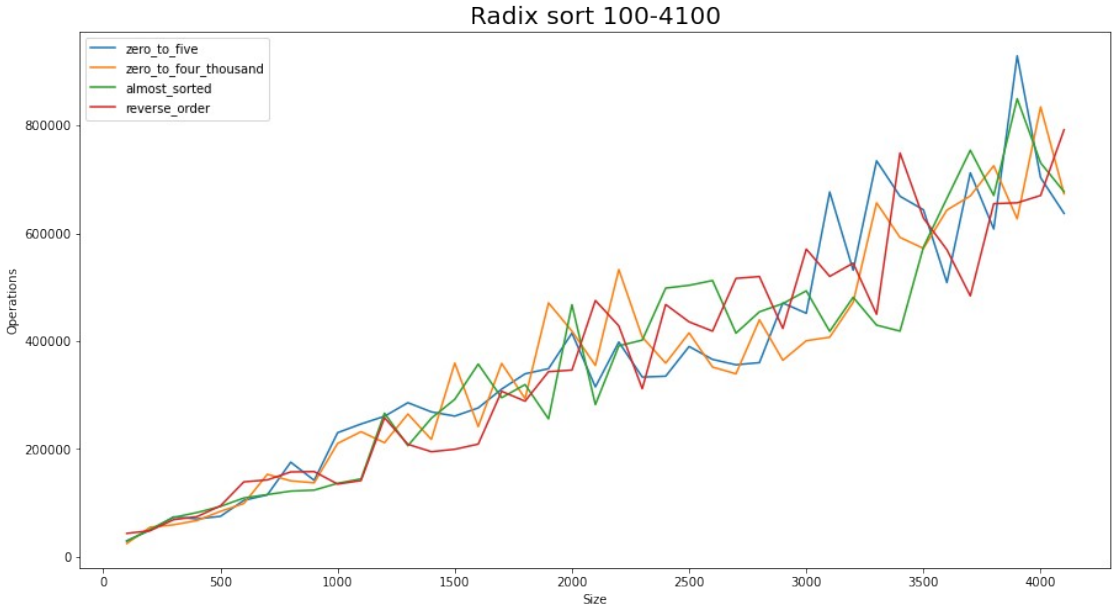
```
# Размерность 50 - 300
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(50, 301, 50):
    size.append(i)
array_type = ""
with open ("radix_sort 50 - 300.txt") as f:
```

```
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Radix sort 50 -300", fontsize= 20)
plt.legend(loc='best')
plt.show()


# Размерность 100 - 4100
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(100, 4101, 100):
    size.append(i)
array_type = ""
with open ("radix_sort 100 - 4100.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
```

```
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Radix sort 100-4100", fontsize= 20)
plt.legend(loc='best')
plt.show()
```



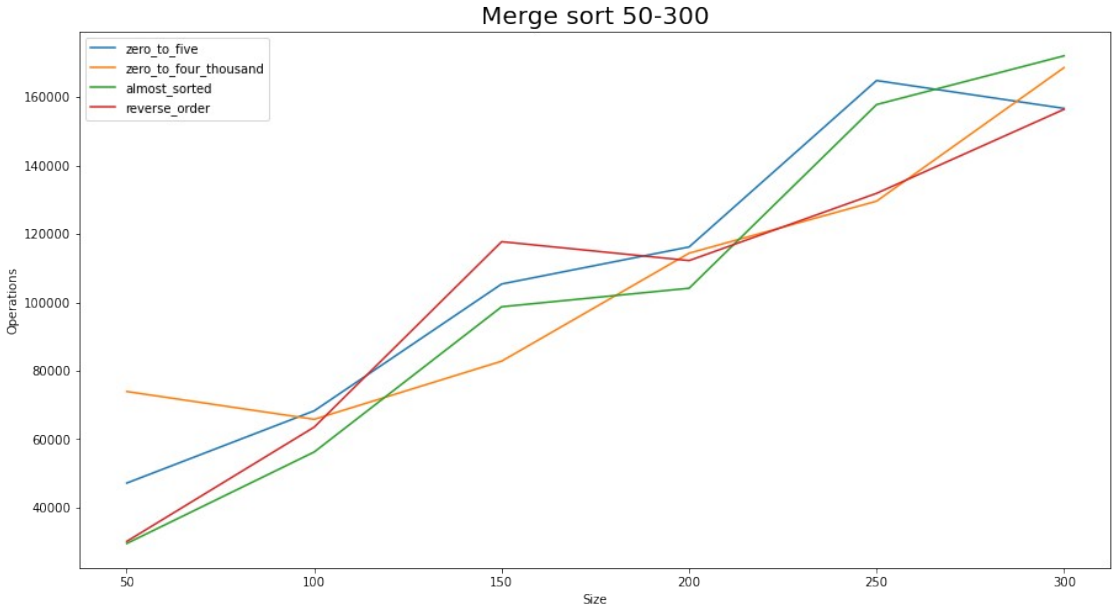


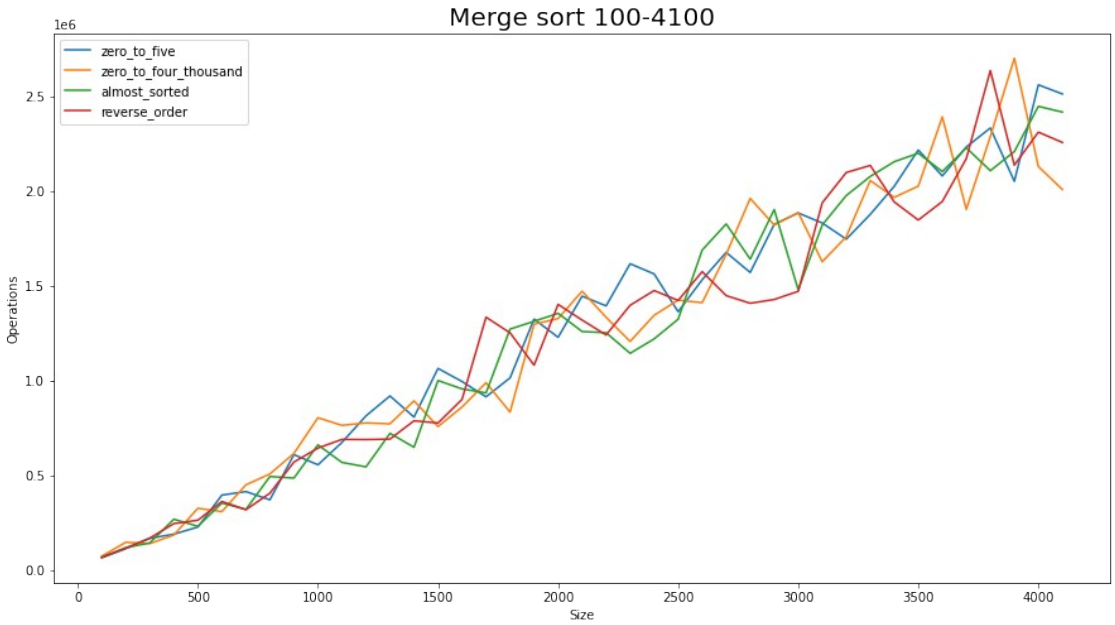
Merge sort

```
# Размерность 50 - 300
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(50, 301, 50):
    size.append(i)
array_type = ""
with open ("merge_sort 50 - 300.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
```

```
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Merge sort 50-300", fontsize= 20)
plt.legend(loc='best')
plt.show()


# Размерность 100 - 4100
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(100, 4101, 100):
    size.append(i)
array_type = ""
with open ("merge_sort 100 - 4100.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Merge sort 100-4100", fontsize= 20)
plt.legend(loc='upper left')
plt.show()
```





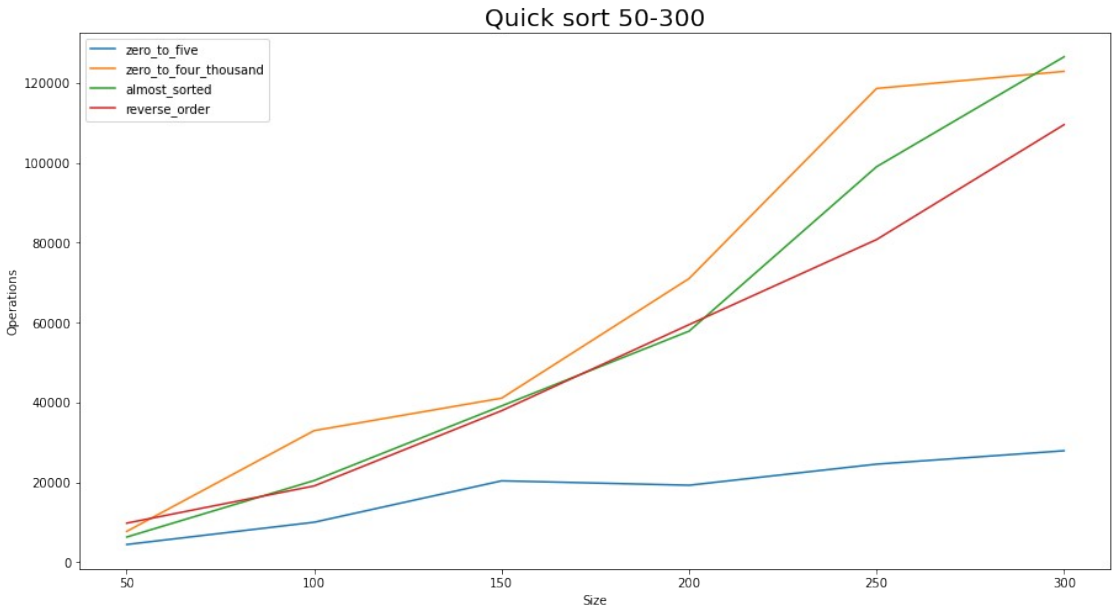
Quick sort

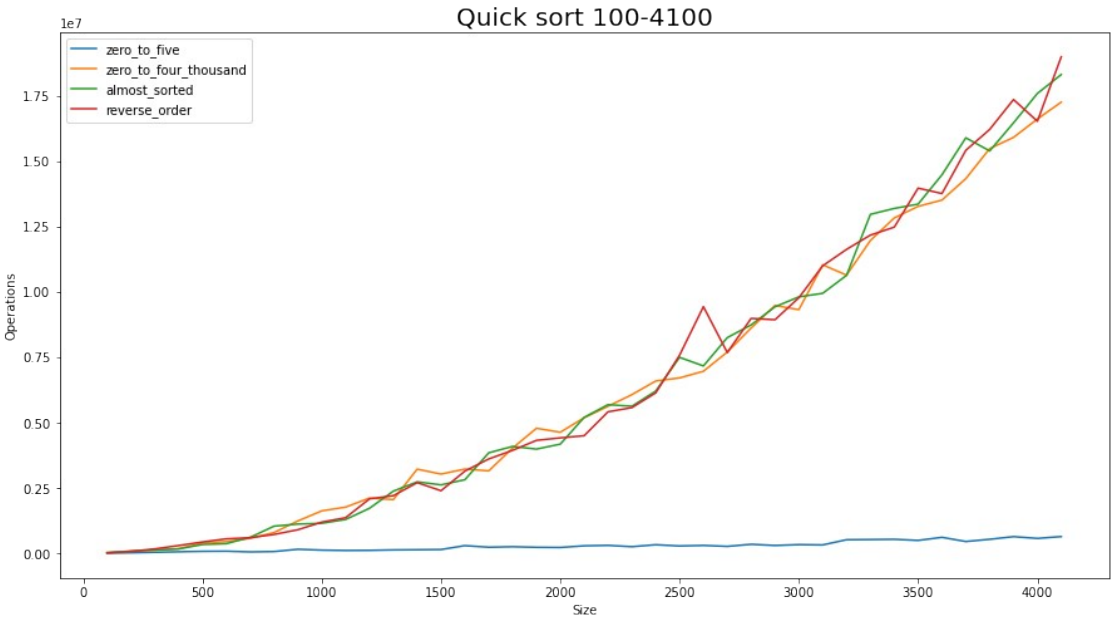
```
# Размерность 50 - 300
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(50, 301, 50):
    size.append(i)
array_type = ""
```

```
with open ("quick_sort 50 - 300.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Quick sort 50-300", fontsize= 20)
plt.legend(loc='best')
plt.show()


# Размерность 100 - 4100
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(100, 4101, 100):
    size.append(i)
array_type = ""
with open ("quick_sort 100 - 4100.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
```

```
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Quick sort 100-4100", fontsize= 20)
plt.legend(loc='upper left')
plt.show()
```



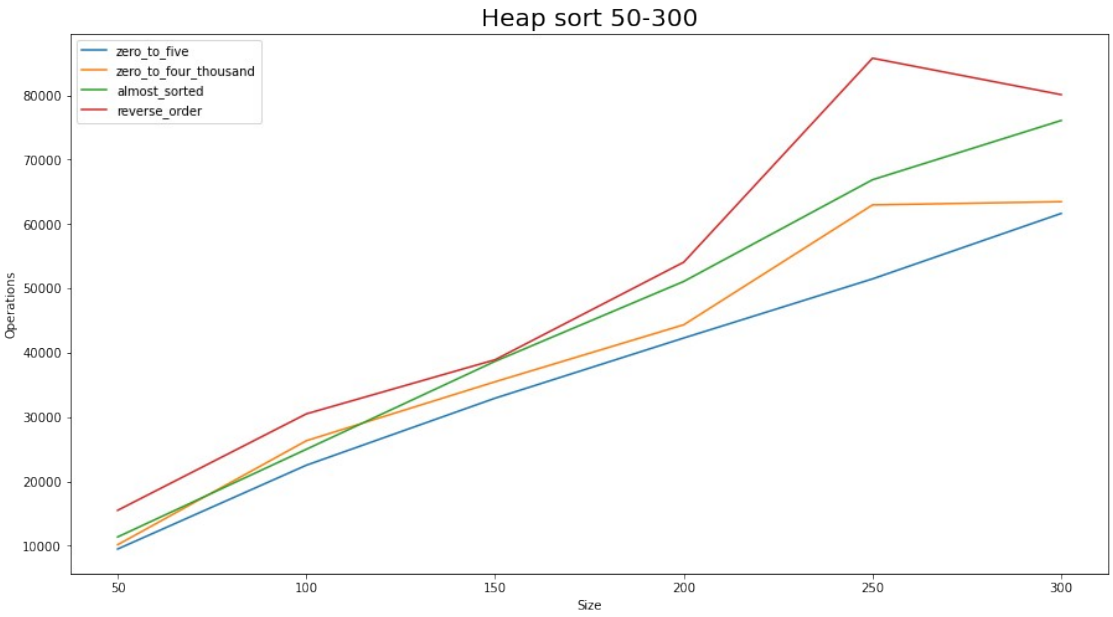


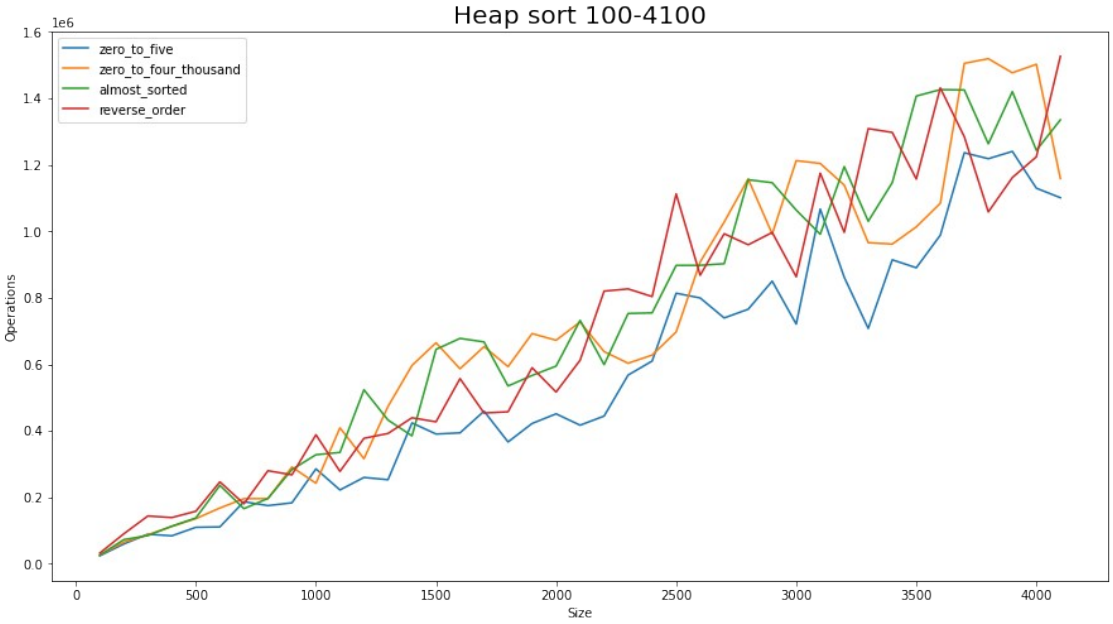
Heap sort

```
# Размерность 50 - 300
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(50, 301, 50):
    size.append(i)
array_type = ""
with open ("heap_sort 50 - 300.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
```

```
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Heap sort 50-300", fontsize= 20)
plt.legend(loc='best')
plt.show()


# Размерность 100 - 4100
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(100, 4101, 100):
    size.append(i)
array_type = ""
with open ("heap_sort 100 - 4100.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Heap sort 100-4100", fontsize= 20)
plt.legend(loc='upper left')
plt.show()
```





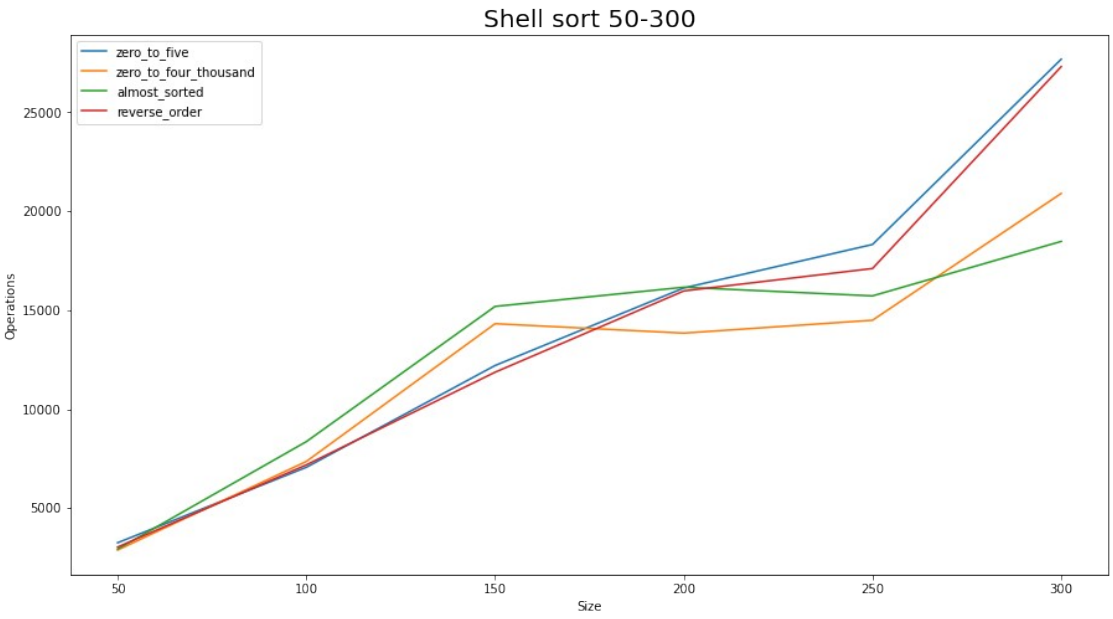
Shell sort

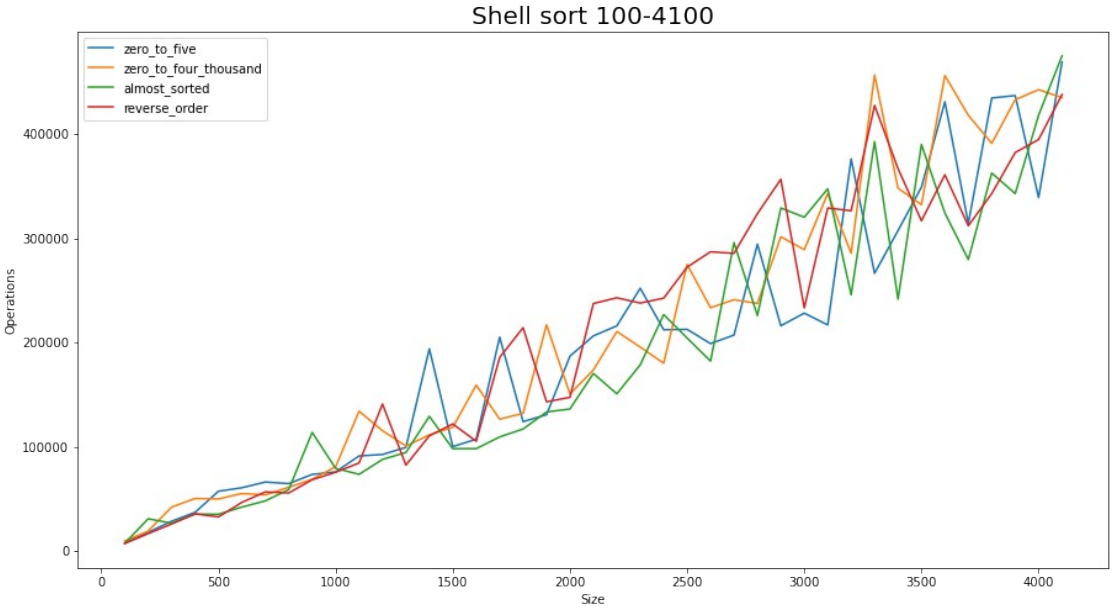
```
# Размерность 50 - 300
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(50, 301, 50):
    size.append(i)
array_type = ""
```

```
with open ("shell_sort 50 - 300.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Shell sort 50-300", fontsize= 20)
plt.legend(loc='best')
plt.show()


# Размерность 100 - 4100
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(100, 4101, 100):
    size.append(i)
array_type = ""
with open ("shell_sort 100 - 4100.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
```

```
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Shell sort 100-4100", fontsize= 20)
plt.legend(loc='upper left')
plt.show()
```



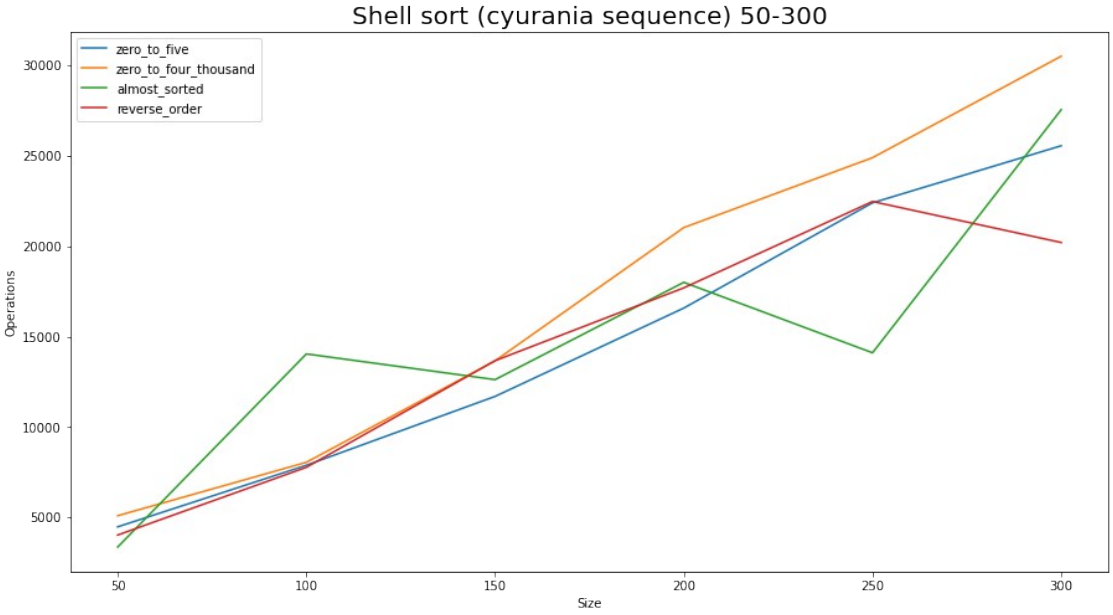


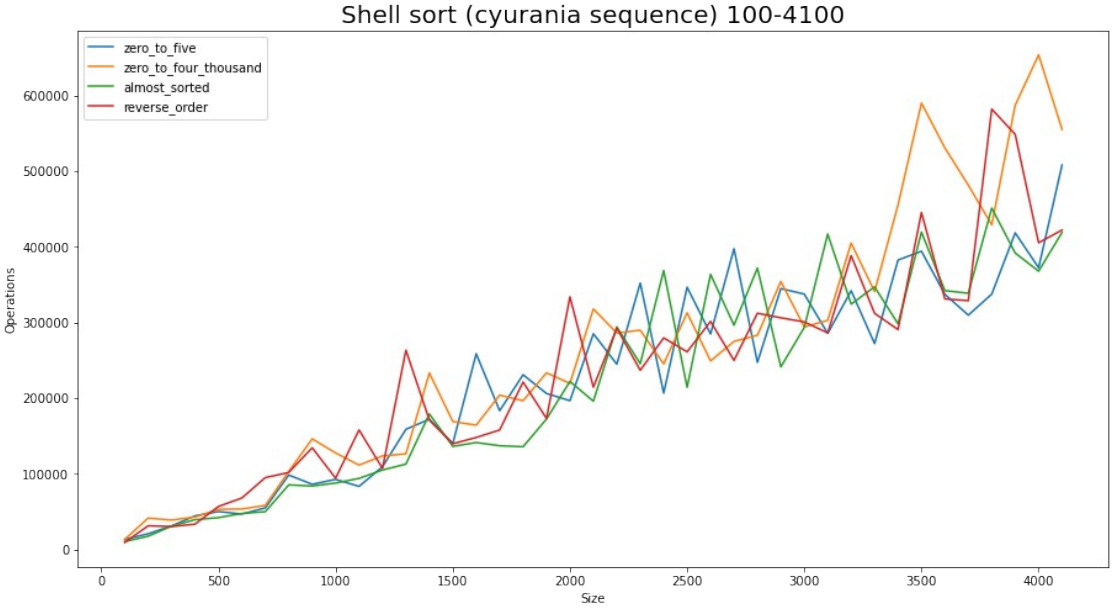
Shell sort (cyurania sequence)

```
# Размерность 50 - 300
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(50, 301, 50):
    size.append(i)
array_type = ""
with open ("cyurania_sequence 50 - 300.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
```

```
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Shell sort (cyurania sequence) 50-300", fontsize= 20)
plt.legend(loc='best')
plt.show()


# Размерность 100 - 4100
size = []
zero_to_five = []
zero_to_four_thousand = []
almost_sorted = []
reverse_order = []
for i in range(100, 4101, 100):
    size.append(i)
array_type = ""
with open ("cyurania_sequence 100 - 4100.txt") as f:
    for nums in f:
        if nums[0] == "R":
            array_type = nums[0:len(nums)-1]
            continue
        if array_type == "RandomZeroToFive":
            k = nums.split(" ")
            zero_to_five.append(int(k[1]))
        elif array_type == "RandomZeroToFourThousand":
            k = nums.split(" ")
            zero_to_four_thousand.append(int(k[1]))
        elif array_type == "RandomAlmostSorted":
            k = nums.split(" ")
            almost_sorted.append(int(k[1]))
        elif array_type == "RandomReverseOrder":
            k = nums.split(" ")
            reverse_order.append(int(k[1]))
fig, ax = plt.subplots()
fig.set_size_inches(15,8)
ax.set_xlabel("Size")
ax.set_ylabel("Operations")
ax.plot(size, zero_to_five, label = 'zero_to_five')
ax.plot(size, zero_to_four_thousand, label ="zero_to_four_thousand")
ax.plot(size, almost_sorted, label = "almost_sorted")
ax.plot(size, reverse_order, label = "reverse_order")
ax.set_title("Shell sort (cyurania sequence) 100-4100", fontsize= 20)
plt.legend(loc='upper left')
plt.show()
```


Shell sort (cyurania sequence) 50-300
zero_to_five
zero_to_four_thousand
almost_sorted
reverse_order
Operations
Size
30000
25000
20000
15000
10000
5000
50
100
150
200
250
300


Shell sort (cyurania sequence) 100-4100
zero_to_five
zero_to_four_thousand
almost_sorted
reverse_order
Operations
Size
600000
500000
400000
300000
200000
100000
0
0
500
1000
1500
2000
2500
3000
3500
4000