

## Proiect

Implementarea algoritmului de sortare Quicksort, atat secvential, cat si paralel.

- Cele doua abordari vor fi dezvoltate in limbajul C/C++ .
- Ca frameworks dorite/ "preferate": MS-MPI.
- Sisteme/Frameworks de programare cu GPU: CUDA

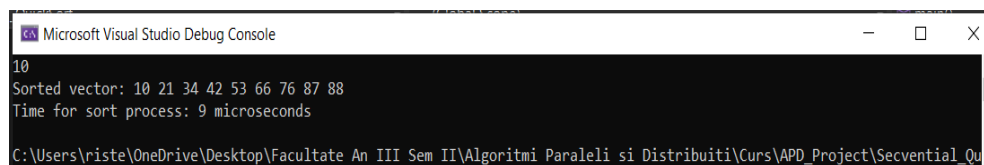
Detaliile fisierelor de teste ce vor fi rulate si analizate: se vor genera 6 teste astfel:

- ✓ primul fisier de test va contine 10 elemente, nr intregi, cuprinse intre 1 si 100 (`--fout << rand() % 100 + 1 << " ";` )
- ✓ urmatorul fisier va contine 50 de elemente cuprinse intre 1 si 1000 (`--fout << rand() % 1000 + 1 << " ";` )
- ✓ cel de-al treilea fisier va contine 100 de elemente cuprinse intre 1 si 10000 (`--fout << rand() % 10000 + 1 << " ";` )
- ✓ al patrulea fisier va contine 150 elemente cuprinse intre 1 si 100000 (`--fout << rand() % 100000 + 1 << " ";` )
- ✓ al cincilea fisier contine 200 de elemente cuprinse intre 1 si 1000000 (`--fout << rand() % 1000000 + 1 << " ";` )
- ✓ iar, al saselea fisier va contine 10000 de elemente cuprinse intre 1 si 1000000 (`--fout << rand() % 1000000 + 1 << " ";` )

Aceste teste vor fi incarcate, pentru a fi folosite, prin metoda “load\_test”.

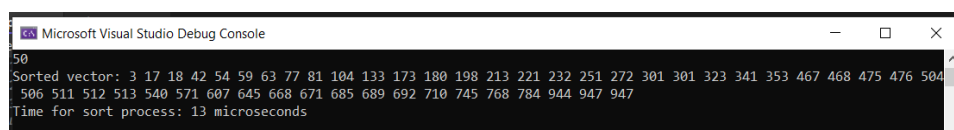
In urma rularii acestor teste, pe implementarea secventiala, au fost obtinuti urmatoorii timpi:

Test 1: dimensiune 10



```
Microsoft Visual Studio Debug Console
10
Sorted vector: 10 21 34 42 53 66 76 87 88
Time for sort process: 9 microseconds
C:\Users\riste\OneDrive\Desktop\Facultate An III Sem II\Algoritmi Paraleli si Distribuiti\Curs\APD_Project\Secvential_Qu
```

Test 2: dimensiune 50



```
Microsoft Visual Studio Debug Console
50
Sorted vector: 3 17 18 42 54 59 63 77 81 104 133 173 180 198 213 221 232 251 272 301 301 323 341 353 467 468 475 476 504
506 511 512 513 540 571 607 645 668 671 685 689 692 710 745 768 784 944 947 947
Time for sort process: 13 microseconds
```

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Test 3: dimensiune 100

```
Microsoft Visual Studio Debug Console
100
Sorted vector: 171 223 282 399 713 751 876 886 961 970 1000 1063 1141 1203 1376 1482 1610 1736 1860 1861 1911 1919 2141
2158 2188 2236 2330 2382 2410 2471 2638 2680 2728 2759 2762 3198 3226 3292 3340 3519 3559 3559 3765 3780 3920 3925 4011
4110 4120 4218 4255 4611 4660 4685 4773 4886 4889 5058 5076 5281 5286 5363 5705 5849 6031 6097 6110 6474 6490 6491 6524
6641 7330 7352 7480 7492 7504 7565 7685 7757 7777 7876 8055 8089 8091 8167 8244 8405 8658 8711 8764 8840 8845 9087 9155
9198 9306 9786 9941
Time for sort process: 15 microseconds
```

Test 4: dimensiune 150

```
Microsoft Visual Studio Debug Console
150
Sorted vector: 46 503 1101 1963 2177 3013 3247 4111 4209 4286 4483 4730 4753 4908 5306 5711 5899 6242 6419 6442 6479 6487
7 6506 6667 6790 7467 8160 8305 8481 8729 8795 8827 9546 9581 9762 9819 10132 10805 10895 11239 11283 11296 11317 11574
11619 11826 11869 12153 12221 12415 12538 12561 12598 12606 12666 12766 13417 13577 13606 13636 13981 14256 14279 14718
14923 14942 14974 15032 15072 15303 15422 15619 15730 15770 15857 15904 15905 15917 16421 16454 16552 16751 16904 17167
17257 17353 17800 17817 17871 18339 18396 18430 18496 18524 18611 19099 19250 19461 19594 20019 20516 20589 20752 21330
21351 21364 21380 21412 21584 22007 22023 22121 22594 22786 23999 24140 24358 24362 24709 25052 25322 25484 25686 25979
26333 27145 27190 27450 27533 28331 28509 28753 29136 29446 29498 29671 30345 30345 30677 31011 31099 31238 31560 31710
31764 32073 32127 32405 32417
Time for sort process: 29 microseconds
```

Test 5: dimensiune 200

```
Microsoft Visual Studio Debug Console
200
Sorted vector: 178 383 547 589 1238 1331 1415 1471 1522 1673 1784 1830 2032 2491 2679 3125 3232 3405 3489 3512 3530 3743
3752 3946 4096 4237 4382 4591 4804 4840 4848 5268 5280 5523 5779 6041 6153 6197 6274 6546 6618 7038 7229 7274 7396 7538
7724 7933 8056 8177 8244 8262 8427 8639 8691 8768 8977 9044 9512 9566 9575 9673 9990 10061 10145 10177 10386 10542 1057
10730 10865 10967 11062 11108 11389 11392 11610 11911 11950 11986 12046 12146 12225 12225 12491 12496 12639 13046 1315
0 13267 13293 13355 13750 14038 14263 14281 14441 14628 15018 15023 15150 15562 15614 15697 15997 16066 16521 16774 1684
16868 17585 17806 17883 18183 18285 18380 18644 18680 18750 18847 18936 18944 18981 19114 19144 19255 19320 19468 1956
8 19595 19697 19801 19871 20072 20092 20137 20607 21379 21803 21865 21895 21903 22161 22187 22214 22294 22410 22475 2279
2 23212 23512 24207 24217 24282 24307 24353 24912 25129 25151 25466 25478 25710 25791 25986 26534 26554 26572 26649 2674
4 26847 26930 27063 27255 27636 27802 28008 28057 28074 28289 28408 28522 28653 28832 29289 29733 29868 29964 30496 3060
4 30950 31067 31401 31574 31680 31879 31998 32165 32218 32321
Time for sort process: 39 microseconds
```

Test 6: dimensiune 1000

```
Microsoft Visual Studio Debug Console
18288 18288 18338 18348 18418 18465 18589 18503 18504 18521 18557 18561 18612 18618 18687 18708 18738 18754 18803 18818 18839
18851 18867 18870 18871 18914 18932 18937 18941 18952 18954 18980 18993 19003 19023 19039 19051 19082 19121 19123 19131
19195 19286 19289 19314 19384 19409 19412 19493 19581 19589 19610 19618 19638 19656 19656 19677 19684 19696 19849 19849
19853 19878 19946 20034 20037 20079 20128 20158 20264 20268 20292 20327 20360 20371 20392 20392 20477 20498 20532 20595
20619 20630 20673 20681 20723 20724 20727 20786 20796 20819 20834 20876 20903 20931 20973 21020 21057 21118 21146 21213
21230 21251 21256 21316 21319 21330 21333 21339 21354 21384 21449 21482 21493 21543 21570 21606 21620 21642 21661 21676
21708 21721 21759 21760 21833 21988 21993 22036 22073 22089 22151 22174 22191 22230 22242 22251 22301 22378 22398 22408
22422 22428 22473 22474 22502 22527 22540 22604 22660 22735 22736 22762 22777 22822 22841 22843 22881 22896 22968 23101
23113 23116 23166 23173 23216 23284 23362 23500 23548 23597 23616 23645 23672 23692 23711 23713 23718 23741 23761 23770
23781 23861 23881 23923 23933 24001 24214 24259 24288 24370 24455 24461 24487 24501 24590 24603 24612 24639 24641 24652
24653 24653 24704 24713 24782 24825 24865 24887 24924 24981 25051 25063 25134 25154 25157 25159 25160 25221 25248 25272
25284 25323 25345 25396 25403 25427 25482 25536 25610 25614 25618 25639 25648 25699 25719 25723 25767 25823 25831 25851
25949 25987 26004 26019 26021 26110 26119 26152 26177 26256 26282 26288 26306 26316 26375 26383 26421 26442 26450 26487
26521 26529 26612 26621 26670 26706 26715 26780 26783 26783 26815 26816 26829 26840 26868 26874 26891 26921 26947 26950
26976 27005 27100 27148 27190 27206 27228 27248 27250 27256 27338 27419 27434 27435 27457 27568 27592 27671 27736 27922
28095 28181 28198 28215 28251 28285 28304 28311 28338 28370 28448 28465 28519 28561 28569 28609 28613 28649 28675 28760
28775 28809 28842 28848 28850 28857 28908 28947 28968 28969 28985 29006 29015 29050 29050 29187 29243 29257 29266 29376
29449 29477 29505 29520 29554 29568 29586 29603 29627 29729 29779 30009 30223 30254 30298 30311 30322 30332 30333 30355
30371 30407 30408 30435 30464 30485 30496 30498 30514 30515 30519 30618 30619 30633 30657 30678 30732 30778 30804 30896
30922 30931 30980 30990 30999 31000 31002 31020 31033 31043 31068 31082 31114 31126 31164 31166 31220 31227 31235 31253
31320 31323 31354 31508 31566 31682 31684 31693 31695 31767 31771 31782 31947 31981 31986 32062 32067 32079 32099 32130
32158 32159 32163 32167 32173 32227 32286 32296 32347 32354 32373 32385 32395 32440 32449 32525 32532 32548 32553 32571
32580 32618 32624 32638
Time for sort process: 228 microseconds
```

Dimensiune test	Timp de rulare obtinut (µs)
10	9
50	13
100	15

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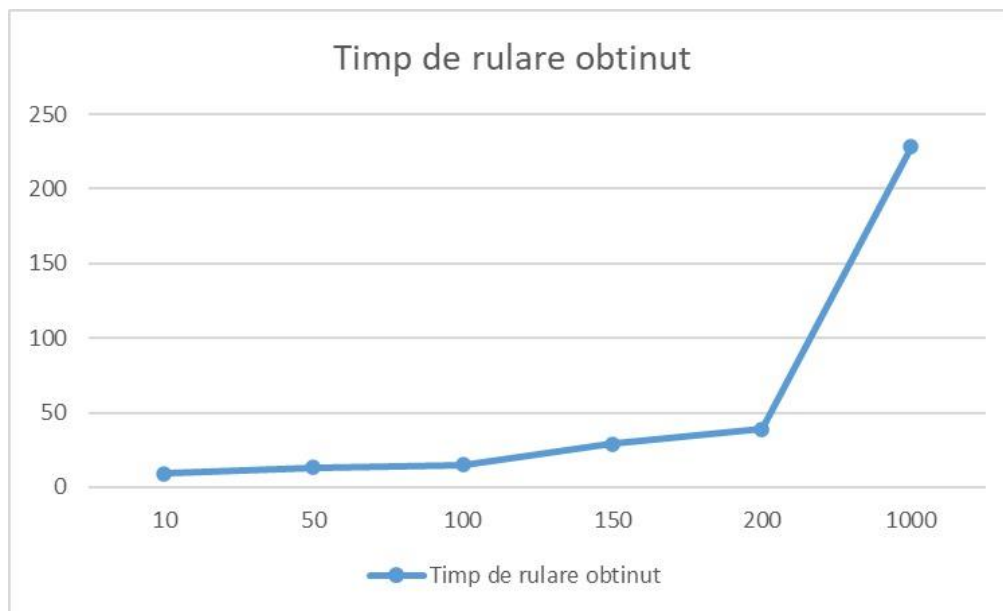
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150	29
200	39
1000	228

Acesti timpi de rulare sunt calculati doar pentru procesul de sortare a sirurilor respective.



Rezultatele anterioare au fost obtinute in urma rularii codului pentru implementarea secventiala a metodei de sortare QuickSort in limbajul C++, pe un laptop cu urmatoarele specificatii:

## Device specifications

Device name      DESKTOP-37UMB96  
Processor        AMD Athlon Gold 3150U with Radeon Graphics  
                     2.40 GHz  
Installed RAM    8.00 GB (5.92 GB usable)

## Local Disk (C:) - 237 GB



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**QuickSort**

Base speed: 2.40 GHz

Sockets: 1

Cores: 2

Logical processors: 4