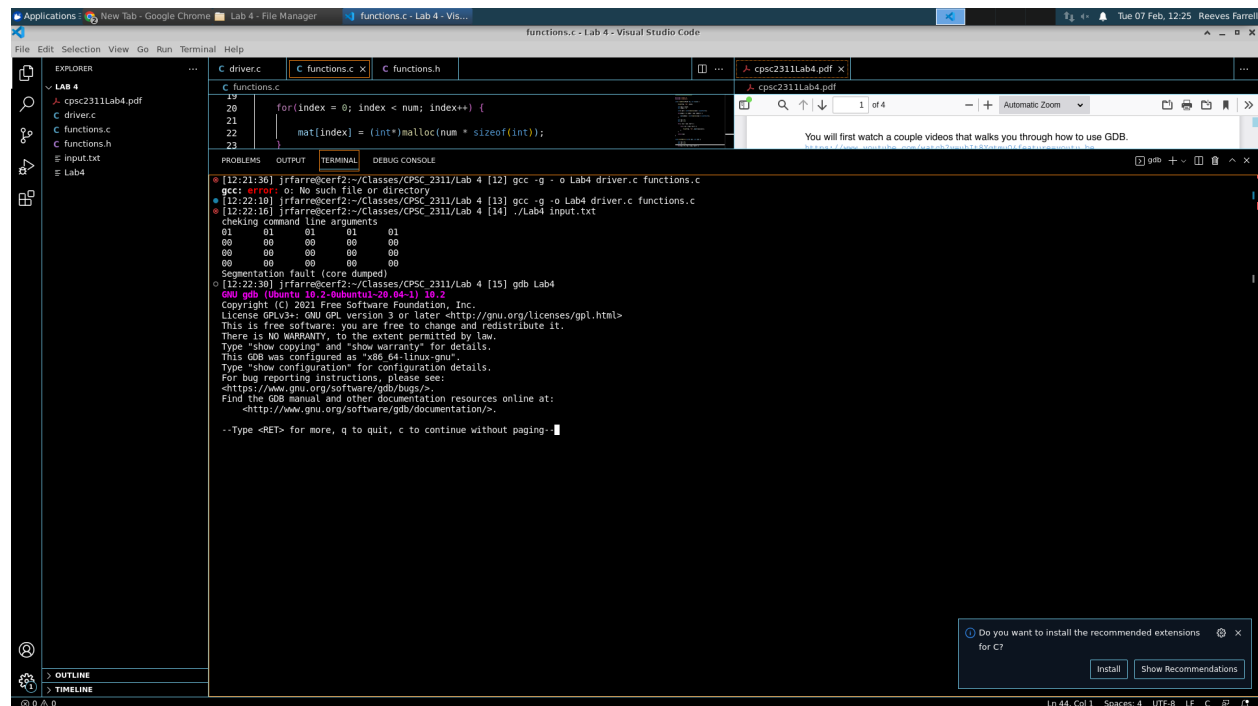


```
/******  
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*Instructor: Dr. Yvon Feaster  
*****
```



The screenshot shows the Visual Studio Code interface. The Explorer pane on the left shows the project structure for 'LAB 4', including files like 'cpsc2311Lab4.pdf', 'driver.c', 'functions.c', 'functions.h', 'input.txt', and 'Lab4'. The main editor window displays the contents of 'functions.c', which contains a C program with a loop that prints a matrix. The TERMINAL pane at the bottom shows the execution of the program using 'gcc' and 'gdb'. It displays the command line arguments, the memory dump, and the segmentation fault message. A notification at the bottom right asks if the user wants to install recommended extensions for C7.

```
functions.c  
19  
20     for(index = 0; index < num; index++) {  
21  
22         mat[index] = (int*)malloc(num * sizeof(int));  
23     }  
24  
25     for(index = 0; index < num; index++) {  
26  
27         for(col = 0; col < num; col++) {  
28             mat[index][col] = rand() % 255;  
29         }  
30     }  
31  
32     printMatrix(mat, num);  
33  
34     free(mat);  
35 }  
36  
37 #include <stdio.h>  
38 #include <stdlib.h>  
39 #include <time.h>  
40  
41 void printMatrix(int mat[], int num){  
42     for(index = 0; index < num; index++) {  
43         for(col = 0; col < num; col++) {  
44             printf("%2d\t", mat[index][col]);  
45             if(col % 4 == 3) printf("\n");  
46         }  
47     }  
48 }  
49  
50 int main(void){  
51     srand(time(NULL));  
52     int num = 5;  
53     int *mat;  
54     mat = (int *) malloc(num * sizeof(int));  
55     printMatrix(mat, num);  
56     free(mat);  
57     return 0;  
58 }
```

```
gdb Lab4  
Copyright (C) 2021 Free Software Foundation, Inc.  
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>  
This is free software; you are free to change and redistribute it.  
There is NO WARRANTY, to the extent permitted by law.  
Type "show copying" and "show warranty" for details.  
This GDB was configured as "x86_64-linux-gnu".  
Type "show configuration" for configuration details.  
For bug reporting instructions, please see:  
  <https://www.gnu.org/software/gdb/bugs/>.  
Find the GDB manual and other documentation resources online at:  
  <http://www.gnu.org/software/gdb/documentation/>.  
  
--Type <RET> for more, q to quit, c to continue without paging--
```

```
Reading symbols from Lab4...  
(gdb) run  
Starting program: /home/jrfarre/Classes/CPSC_2311/Lab 4/Lab4  
checking command line arguments  
not enough argument: ./exe filename  
[Inferior 1 (process 167050) exited with code 0377]  
(gdb) run input.txt  
Starting program: /home/jrfarre/Classes/CPSC_2311/Lab 4/Lab4 input.txt  
checking command line arguments  
01      01      01      01      01  
00      00      00      00      00  
00      00      00      00      00  
00      00      00      00      00  
  
Program received signal SIGSEGV, Segmentation fault.  
0x0000555555555453 in printMatrix (mat=0x55555555b8a0, num=5) at functions.c:49  
49     printf("%.2d\t", mat[row][col]);  
(gdb)
```

```
(gdb) where
#0  0x0000555555555453 in printMatrix (mat=0x55555555b8a0, num=5) at functions.c:49
#1  0x00005555555552dd in main (argc=2, argv=0x7fffffff488) at driver.c:33
(gdb) █
```

```
(gdb) b 49
No line 49 in the current file.
Make breakpoint pending on future shared library load? (y or [n]) y
Breakpoint 1 (49) pending.
(gdb) █
```

```
Undefined command: "breakpoint". Try "help".
(gdb) b 21
Breakpoint 1 at 0x1273: file driver.c, line 22.
(gdb) run input.txt
Starting program: /home/jrfarre/Classes/CPSC_2311/Lab 4/Lab4 input.txt
checking command line arguments

Breakpoint 1, main (argc=2, argv=0x7fffffff488) at driver.c:22
22      FILE* fp = fopen(argv[1], "r");
(gdb) step
10 new_fopen (filename=0x7fffffff7f1 "input.txt", mode=0x55555555604d "r") at iofoopen.c:85
85      iofoopen.c: No such file or directory.
(gdb) step
86      in iofoopen.c
(gdb) step
fopen_internal (is32=1, mode=0x55555555604d "r", filename=0x7fffffff7f1 "input.txt") at iofoopen.c:58
58      in iofoopen.c
(gdb) step
86      in iofoopen.c
(gdb) step in
No symbol "in" in current context.
(gdb) step2
Undefined command: "step2". Try "help".
(gdb) step
0x00007ffff7e11929 in __fopen_internal (is32=1, mode=0x55555555604d "r", filename=0x7fffffff7f1 "input.txt") at iofoopen.c:65
65      in iofoopen.c
(gdb) step
01      01      01      01      01
00      00      00      00      00
00      00      00      00      00
00      00      00      00      00

Program received signal SIGSEGV, Segmentation fault.
0x0000555555555453 in printMatrix (mat=0x55555555b8a0, num=5) at functions.c:50
50      printf("%.2d\t", mat[row][col]);
```

```
jrfarre@cerf2:~/Classes/CPSC_2311/Lab 4 [83] gcc -g -o Lab4 driver.c functions.c
jrfarre@cerf2:~/Classes/CPSC_2311/Lab 4 [84] ./Lab4 input.txt
checking command line arguments
01      01      01      01      01
01      01      01      01      01
01      01      01      01      01
01      01      01      01      01
01      01      01      01      01
jrfarre@cerf2:~/Classes/CPSC_2311/Lab 4 [85] █
```