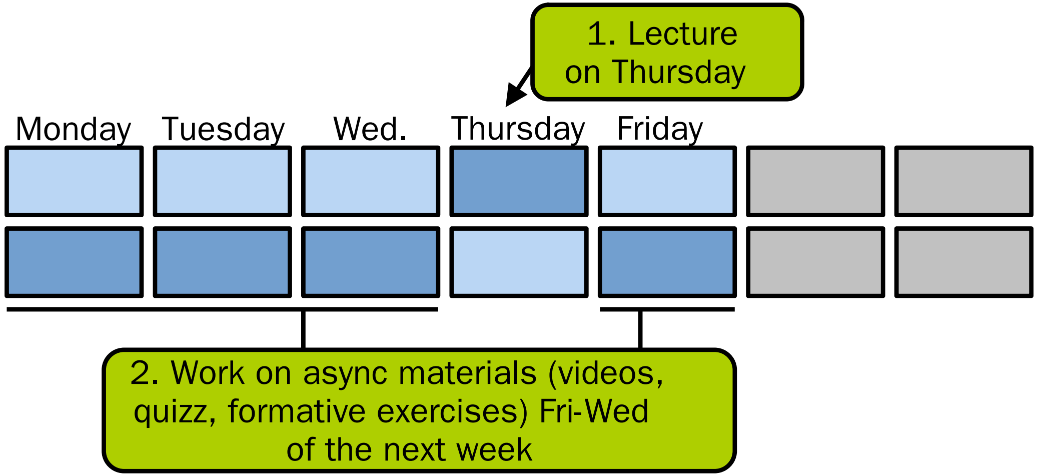
COMP26020 Programming Languages and Paradigms -- Part 1/C

Logistics

Part 1/C Organisation

Blended approach: live sessions + asynchronous videos & exercises



1. Lecture on Thursday

2. Work on async materials (videos, quizz, formative exercises) Fri-Wed of the next week

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    - A quiz (theory)
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4. **Drop-in Lab (AKA support) sessions**
    - Optional, come if you have any questions about the course or want to work on exercises
    - Every other week starting week of 02/10, Monday 12pm-2pm; Tuesday 2pm-4pm; and Friday 12pm-2pm, in *Kilburn 1.8 + 1.10*

Course Website

On Blackboard: https://bit.ly/3RFI935

- **Everything regarding part 1/C can be accessed from there:**
    - Schedule (what to do each week)
    - Videos, including live sessions recordings
    - Lecture slides & lecture notes
    - Summative lab exercise brief
    - Formative autocorrected programming exercises
    - Formative quizzes
    - Discussion board
    - Reading list

Required Software

All programming exercises should be done in a Linux 🐧 x86-64 (i.e. Intel CPU) environment with GCC 9/10/11. Several solutions:

- **Use the Department's machines**
- **Run Linux in an x86-64 VM**
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  - If you know what you are doing
  - Ubuntu 20.04/22.04 recommended

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- **Do NOT use native Windows/Mac or WSL environments**
  - Won't provide support on these and you may loose marks because of toolchain difference
- **Users of MacBooks with non Intel (i.e. M1) CPUs**: the general advice is to come on campus and use lab machines

Lecture Videos

- Videos and slides available on Blackboard here: https://bit.ly/3RnA42M

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  - https://olivierpierre.github.io/comp26020-lectures/
  - You will also find **lecture notes** there

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- Using the bottom-right links you can:
  - Download the file by clicking on its name
  - Get instructions on how to load and run it in a container that should run on Mac/Windows by clicking on the GitHub logo

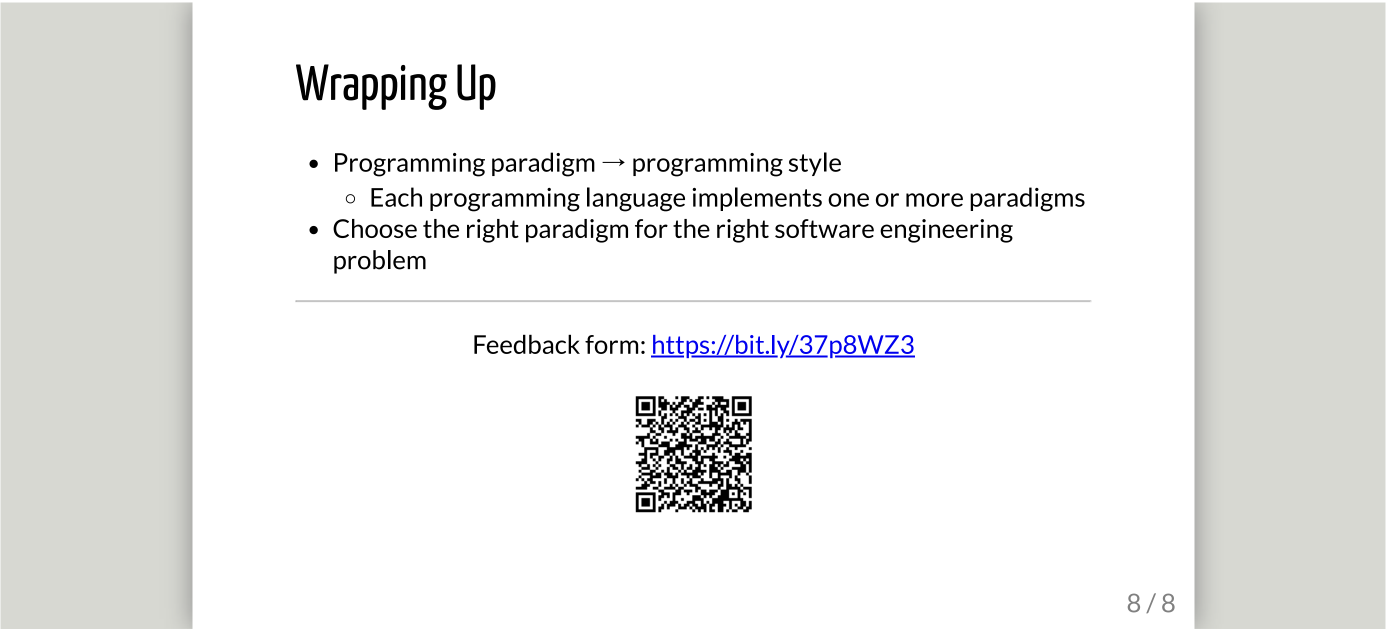
```c
#include <stdio.h>

int main() {
    printf("hello, world!\n");
    return 0;
}
```

00-logistics/sample-code.c

Feedback on Lectures

- Each slides deck ends with a link to a small optional feedback form
- It's fully anonymous, feel free to use it to tell what you think about the lecture in question
    - Your feedback will help to make the course better!



Wrapping Up

- Programming paradigm → programming style
    - Each programming language implements one or more paradigms
- Choose the right paradigm for the right software engineering problem

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Feedback form: https://bit.ly/37p8WZ3

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Lab Assignment (marked)

- Subject is already on Blackboard: https://bit.ly/3RsQln8
- Development of a matrix processing library in C
- Weight: 6.5% of the final COMP26020 mark
  - **50/50 coursework/exam weight split for the C part**

Autocorrected Programming Exercises (not marked)

https://olivierpierre.github.io/comp26020/

- A few exercises per week
  - Divided into **essential** and **additional** exercises
  - You should really try at least to do the essentials

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https://olivierpierre.github.io/comp26020/

- A few exercises per week
  - Divided into **essential** and **additional** exercises
  - You should really try at least to do the essentials
- Autocorrected with `check50`
- To trigger autocorrection, have your source code in the local folder and type on the command line:

```
check50 -l --ansi-log <exercise URL>
```

- URL is per-exercise, given on the page of each exercise

Installing Check50

- To install check50 on a recent Ubuntu/Debian distribution, open a terminal and type:

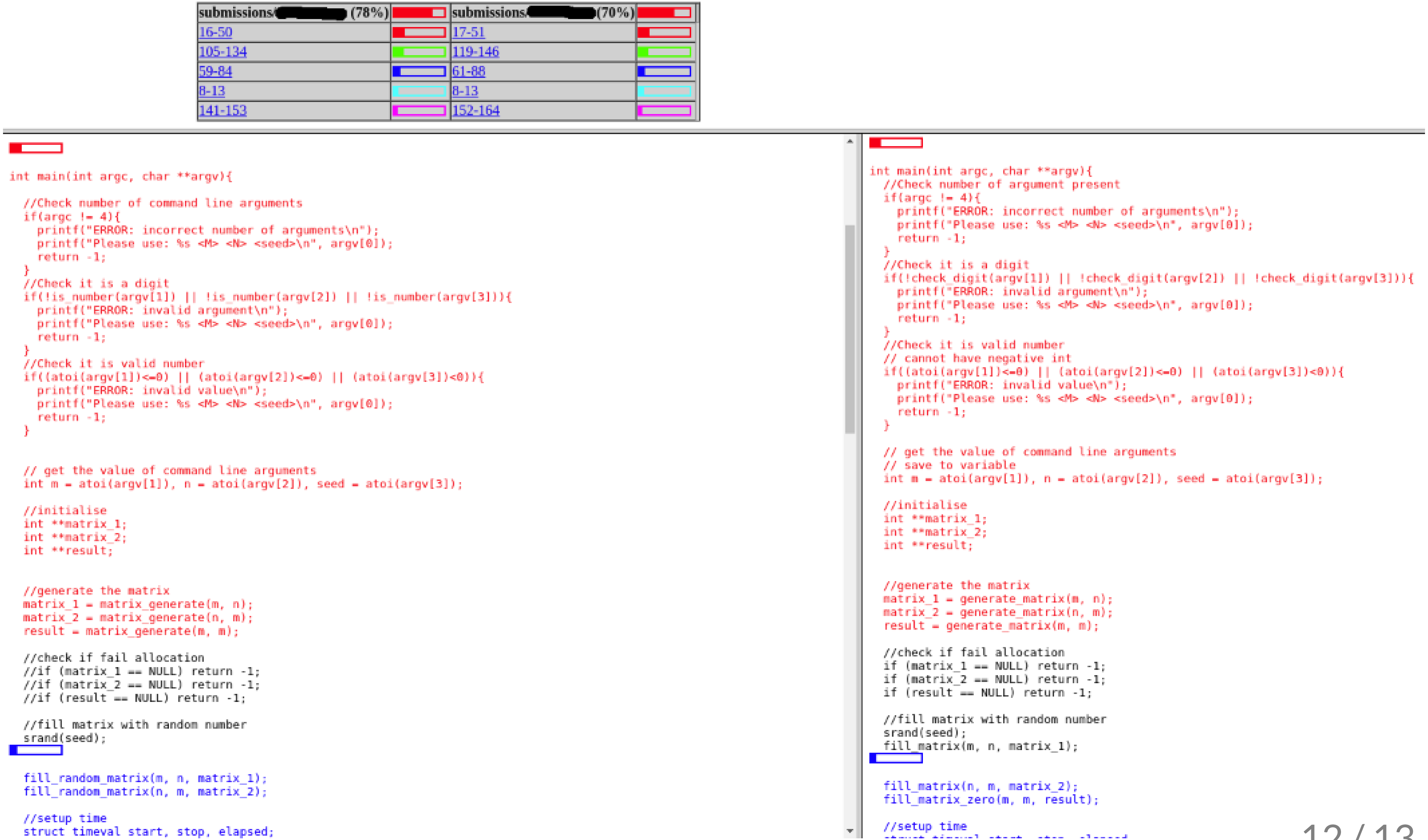
```
sudo apt update
sudo apt install python3-pip git
pip3 install check50
echo "export PATH=$PATH:$HOME/.local/bin" >> ~/.bashrc
source ~/.bashrc
```

- On a Department's machine:

```
pip3 install check50
echo "export PATH=$PATH:$HOME/.local/bin" >> ~/.bashrc
source ~/.bashrc
```

Quizzes

- A small quiz to complete each week, after having seen all the lecture materials
    - On Blackboard: https://bit.ly/3EKYb3C
    - Formative (unmarked)



submissions/[redacted] (78%)	🟥	submissions/[redacted](70%)	🟥
16-50	🟥	17-51	🟥
105-134	🟩	119-146	🟩
59-84	🟦	61-88	🟦
8-13	🟦	8-13	🟦
141-153	🟪	152-164	🟪

```
int main(int argc, char **argv){

  //Check number of command line arguments
  if(argc != 4){
    printf("ERROR: incorrect number of arguments\n");
    printf("Please use: %s <M> <N> <seed>\n", argv[0]);
    return -1;
  }
  //Check it is a digit
  if(!is_number(argv[1]) || !is_number(argv[2]) || !is_number(argv[3])){
    printf("ERROR: invalid argument\n");
    printf("Please use: %s <M> <N> <seed>\n", argv[0]);
    return -1;
  }
  //Check it is valid number
  if((atoi(argv[1])<=0) || (atoi(argv[2])<=0) || (atoi(argv[3])<0)){
    printf("ERROR: invalid value\n");
    printf("Please use: %s <M> <N> <seed>\n", argv[0]);
    return -1;
  }


  // get the value of command line arguments
  int m = atoi(argv[1]), n = atoi(argv[2]), seed = atoi(argv[3]);

  //initialise
  int **matrix_1;
  int **matrix_2;
  int **result;


  //generate the matrix
  matrix_1 = matrix_generate(m, n);
  matrix_2 = matrix_generate(n, m);
  result = matrix_generate(m, m);

  //check if fail allocation
  //if (matrix_1 == NULL) return -1;
  //if (matrix_2 == NULL) return -1;
  //if (result == NULL) return -1;

  //fill matrix with random number
  srand(seed);

  fill_random_matrix(m, n, matrix_1);
  fill_random_matrix(n, m, matrix_2);

  //setup time
  struct timeval start, stop, elapsed;
```

```
int main(int argc, char **argv){
  //Check number of argument present
  if(argc != 4){
    printf("ERROR: incorrect number of arguments\n");
    printf("Please use: %s <M> <N> <seed>\n", argv[0]);
    return -1;
  }
  //Check it is a digit
  if(!check_digit(argv[1]) || !check_digit(argv[2]) || !check_digit(argv[3])){
    printf("ERROR: invalid argument\n");
    printf("Please use: %s <M> <N> <seed>\n", argv[0]);
    return -1;
  }
  //Check it is valid number
  // cannot have negative int
  if((atoi(argv[1])<=0) || (atoi(argv[2])<=0) || (atoi(argv[3])<0)){
    printf("ERROR: invalid value\n");
    printf("Please use: %s <M> <N> <seed>\n", argv[0]);
    return -1;
  }

  // get the value of command line arguments
  // save to variable
  int m = atoi(argv[1]), n = atoi(argv[2]), seed = atoi(argv[3]);

  //initialise
  int **matrix_1;
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  //generate the matrix
  matrix_1 = generate_matrix(m, n);
  matrix_2 = generate_matrix(n, m);
  result = generate_matrix(m, m);

  //check if fail allocation
  if (matrix_1 == NULL) return -1;
  if (matrix_2 == NULL) return -1;
  if (result == NULL) return -1;

  //fill matrix with random number
  srand(seed);
  fill_matrix(m, n, matrix_1);

  fill_matrix(n, m, matrix_2);
  fill_matrix_zero(m, m, result);

  //setup time
  struct timeval start, stop, elapsed;
```

How to Get Help?

- Any question? in increasing order or urgency:
  - Step 1: Come to the next lab session (check your timetable)
  - Step 2: Discussion boards on Blackboard
    - https://bit.ly/3LqL37w
    - **Do not post answers there!**
  - Step 3 or if urgent: pierre.olivier@manchester.ac.uk