Welcome to the

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Skills Bootcamp - 2D Lists

The session will start shortly...

Questions? Drop them in the chat. We'll have dedicated moderators answering questions.

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Cyber Security Session Housekeeping

- The use of disrespectful language is prohibited in the questions, this is a supportive, learning environment for all - please engage accordingly. **(Fundamental British Values: Mutual Respect and Tolerance)**

- No question is daft or silly - **ask them!**

- There are **Q&A sessions** midway and at the end of the session, should you wish to ask any follow-up questions.

- If you have any questions outside of this lecture, or that are not answered during this lecture, please do submit these for upcoming Academic Sessions. You can submit these questions here: **Questions**

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Cyber Security Session Housekeeping cont.

- For all **non-academic questions**, please submit a query:

  www.hyperiondev.com/support

- We would love your **feedback** on lectures: **Feedback on Lectures**

- Find all the lecture **content** in you **Lecture Backpack** on GitHub.

- If you are hearing impaired, please kindly use your computer's function through Google chrome to enable captions.

Safeguarding & Welfare

We are committed to all our students and staff feeling safe and happy; we want to make sure there is always someone you can turn to if you are worried about anything.

If you are feeling upset or unsafe, are worried about a friend, student or family member, or you feel like something isn't right, speak to our safeguarding team:

Ian Wyles
Designated Safeguarding Lead

Simone Botes

Nurhaan Snyman

Rafiq Manan

Ronald Munodawafa

Tevin Pitts

Scan to report a safeguarding concern

or email the Designated Safeguarding Lead:
Ian Wyles
safeguarding@hyperiondev.com

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Stay Safe Series:

Mastering Online Safety One week at a Time

While the digital world can be a wonderful place to make education and learning accessible to all, it is unfortunately also a space where harmful threats like online radicalization, extremist propaganda, phishing scams, online blackmail and hackers can flourish.

As a component of this BootCamp the *Stay Safe Series* will guide you through essential measures in order to protect yourself & your community from online dangers, whether they target your privacy, personal information or even attempt to manipulate your beliefs.

Security Reminder

Stay Vigilant and Practice Safe Habits

- Always remember: the biggest security risk is often human error. Stay vigilant by following the basics—never share your passwords, double-check any suspicious links or emails, and avoid connecting to unknown public Wi-Fi networks without using a VPN. Cybersecurity is as much about good habits as it is about technology.

Learning Objectives & Outcomes

- Define a 2D list and explain its structure.
- Describe how a 2D list organises data in rows and columns.
- Modify specific elements within a 2D list using index positions.
- Analyse the structure of a 2D list and determine how it can represent a matrix or table format.
- Compare different methods of creating a 2D list, such as manual entry vs. loop-generated lists.

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2D Lists

- Imagine you're planning a big family gathering. Each person has preferences for where they want to sit at the table, and you want to keep track of each seat and who will sit in it. You decide to organise a seating chart using a grid, where each row is a different side of the table, and each column is a seat at that side.

2-D array

	col1	col2	col3	col4
row1				
row2				
row3				

Polls

Please have a look at the poll notification and select an option.

How comfortable are you with using lists (1D lists) in programming?

A. Very comfortable
B. Somewhat comfortable
C. A little comfortable
D. Not comfortable at all

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Polls

Please have a look at the poll notification and select an option.

Have you ever worked with data organised in rows and columns, like in a spreadsheet or table?

A. Yes, frequently
B. Occasionally
C. Rarely
D. Never

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2D Lists

- **Definition**: A 2D list, or matrix, is a list of lists in Python, often visualized as a grid or table.

- **Purpose**: Useful for storing tabular data, such as a spreadsheet or matrix, where data is organized in rows and columns.

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Structure of a 2D List

- **Format:** 2D_list = [[element1, element2], [element3, element4], ...]
- This represents a 3x3 matrix (3 rows and 3 columns).

```
matrix = [

    [1, 2, 3],

    [4, 5, 6],

    [7, 8, 9]

    ]
```

Creating a 2D List

Manual Creation:

- Directly specify elements using nested lists.

Using Loops:

- Create an empty list and populate it with values.

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Creating a 2D List

```python
rows, cols = 3, 3

matrix = []

for i in range(rows):
    row = []
    for j in range(cols):
        row.append(0)
    matrix.append(row)

# Print the matrix to verify
for row in matrix:
    print(row)
```

Snipped

Accessing Elements in a 2D List

- Syntax: 2D_list[row][column]

```python
index.py
1   matrix = [
2       [1, 2, 3],
3       [4, 5, 6],
4       [7, 8, 9]
5   ]
6   print(matrix[0][1])   # Output: 2
7
```
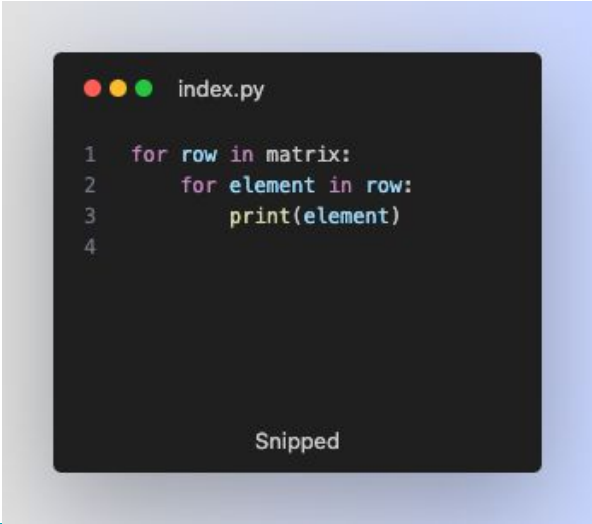
Snipped

Looping Through a 2D List

Nested Loops:

- Use a nested for loop to access each element in the 2D list.


```python
for row in matrix:
    for element in row:
        print(element)
```

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Looping Through a 2D List

- Access by Index:

```python
for i in range(len(matrix)):
    for j in range(len(matrix[i])):
        print(matrix[i][j])
```

Snipped

Applications of 2D lists

- **Tabular Data:**
  - Used in applications that handle tables or grids, like spreadsheets.
- **Matrices in Mathematics:**
  - Represent mathematical matrices for operations like addition, subtraction, multiplication.
- **Image Processing:**
  - Represent pixel values in images (grayscale images can be represented as a 2D list of intensity values).

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Summary

- 2D Lists allow structured data storage in rows and columns.

- Access & Modification through 2D_list[row][column] syntax.

- Looping & Manipulation: Nested loops are essential for working with 2D lists.

- Applications: Widely used in data science, game development, and image processing.

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Example Exercise

Find the Maximum Value in a 2D List

- **Hint:** Traverse each element and keep track of the highest value.

```python
matrix = [
    [3, 5, 7],
    [1, 9, 4],
    [8, 2, 6]
]
```

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Questions and Answers

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Thank you for attending

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