SD5913 / WEEK 07 / 22 OCTOBER 2026

Build something amazing.

Recap. Midterm. One class, two views. Your team’s next big idea.

POLYU DES°GN

Today

01 Before 10:00 / key slides from Weeks 1–6, then Ask Me Anything

02 10:00–10:30 / midterm on Canvas / 40 questions

03 10:30–10:35 / break

04 10:35–10:45 / ball classes demo, inspiration and team setup

05 10:45–11:00 / form your team and submit your idea

06 11:00–11:15 / submit one image mock-up

07 11:15–11:20 / check submissions and wrap up

Programs are instructions for changing state

STATE 0

Before

A blank canvas, a file, a number.

PROGRAM

Instructions

Step, step, step…

STATE 1

After

A picture, a saved file, a result.

POLYU DES°GN

Git and GitHub

Git tracks every change on your computer. `git-scm.com`

GitHub keeps a copy online and lets others see it. `github.com`

- `github.com/settings/education/benefits` — add your PolyU email first
- `github.com/git-guides`

GitHub Education only accepts a PolyU address — polyu.edu.hk, connect.polyu.hk and the other school-issued domains.

POLYU DES·GN

Three questions, all semester

Every exercise this week is one of these, and so is every quiz question:

- Here is code that runs. **What does it print?**
- Here is code that is wrong. **Where?**
- Here is a spec — a sentence about what it must do — and some code. **Does the code meet it?**

None of them ask you to write a program from a blank file. That comes later, and by then you will be able to tell whether what you wrote is right.

POLYU DES°GN

Six types, and that is most of it

```
3               int      a whole number
3.14            float    a number with a decimal point
"3"             str      text. The quotes are what make it text
True            bool     yes or no
[3, 1, 4]       list     several things, in order
{"n": 3}        dict     values you look up by name
```

You will meet tuple and set later. These six carry the whole course.

A cap never sits under a drawn cell

```
cap = (... and last_square_empty)
```

`last_square_empty` was set by the previous h in the same `w` — the cell **above**. So a cap is only drawn under an empty cell, and the picture can be checked: find a cap under a bar and the code is wrong.

That is a specification. A sentence about the output that is either true or false. To keep it true, the program has to remember one thing from the cell before — that is what `last_square_empty` is for.

A repo that does not say what it needs is not finished.

POLYU DES°GN

That is a loop, and that is all of it

```
for hour, height in enumerate(heights, start=1):
```

- **once for each item** — twenty-four numbers, twenty-four turns
- **the names change each turn** — `hour` and `height` mean something different every time round
- **the indented lines are what happens** — the four spaces are the loop

The same pattern can update a picture instead of printing a value.

POLYU DES°GN

A rule with a name

`def bar(height):` — something goes **in**, something comes **out**.

- The name in the brackets is a name for whatever you hand it. It exists only inside.
- No `return`, Python returns `None`; callers must handle that value.
- Four spaces of indentation say which lines are inside the function.

Check the returned value when you use a generated function.

POLYU DES°GN

Four rules for taking somebody else's numbers

CACHE

Fetch once, keep the file

Fetch, save the raw reply into `data/`, then parse the **file**. Your script runs with no internet, and the committed file is what makes the repo reproducible.

HTML

Same idea, messier

No JSON? A web page is a tree, and one line of BeautifulSoup walks it: `select("table.wikitable")`, then the rows. The typhoon season table on Wikipedia is one.

ROT

Watch the line rot

The tidal-stream endpoint behind week 2's rings moved in 2023 — fetch_tides.py says so in a comment. A cached file outlives the URL it came from.

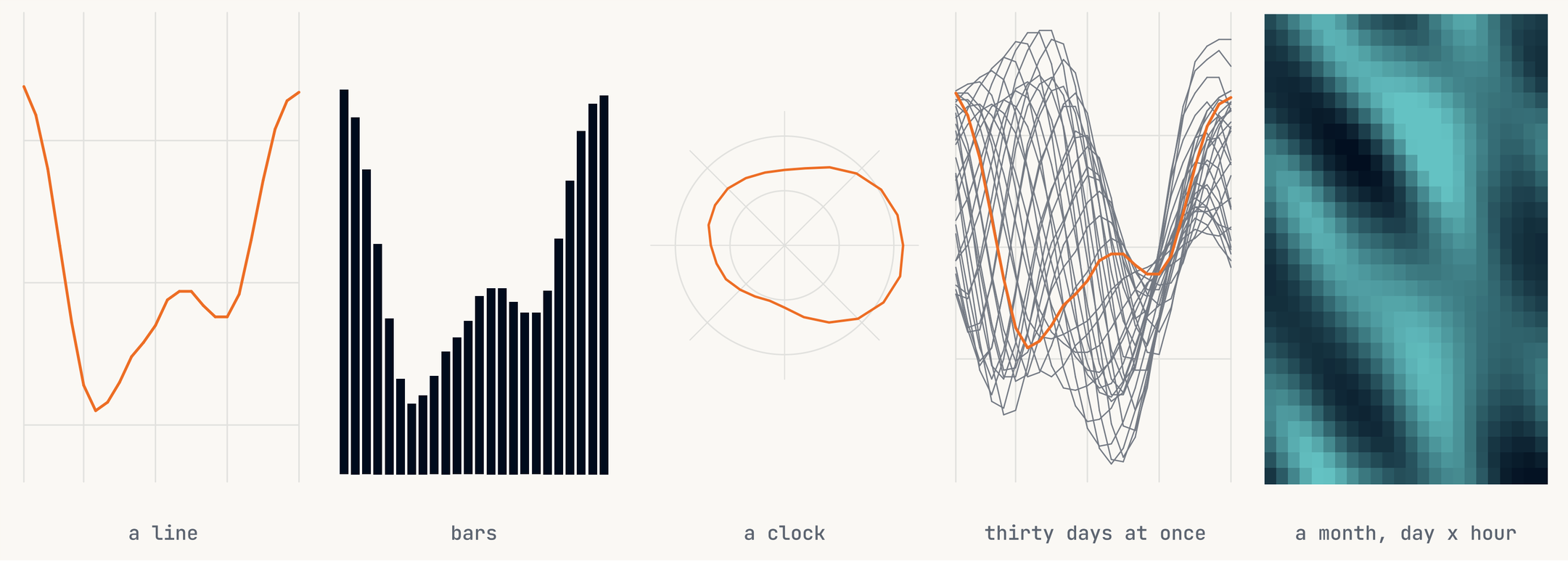
POLITE

Be polite

A `User-Agent` that says who you are and what for. One request, not a loop of them. You are a guest on somebody else's server.

POLYU DES°GN

The same numbers, five ways



a line · bars · the clock · thirty days overlaid · September as a grid, one row per day, one cell per hour

Three parts of the interaction

INPUT

A person chooses

The day selector supplies 17.

STATE

The app keeps the value

The current run sees day = 17.

RESPONSE

The surface changes

The chart draws that record.

POLYU DESIGN

One promise, four steps

01

Write the test

Say what response would convince you.

02

See it fail

Read the failure: does it point to the missing feature?

03

Add the route

Implement the smallest change that meets the promise.

04

Run it again

The same test now passes.

Ask for September

/tides?month=9

BROWSER

Frontend

Choose September

Ask for records



SERVER

Backend

Validate month

Read saved data

Return data. Draw in the browser.

POLYU DES·GN

200 OK · 30 daily records

BROWSER

Frontend

Choose a day

Draw 24 heights

JSON



SERVER

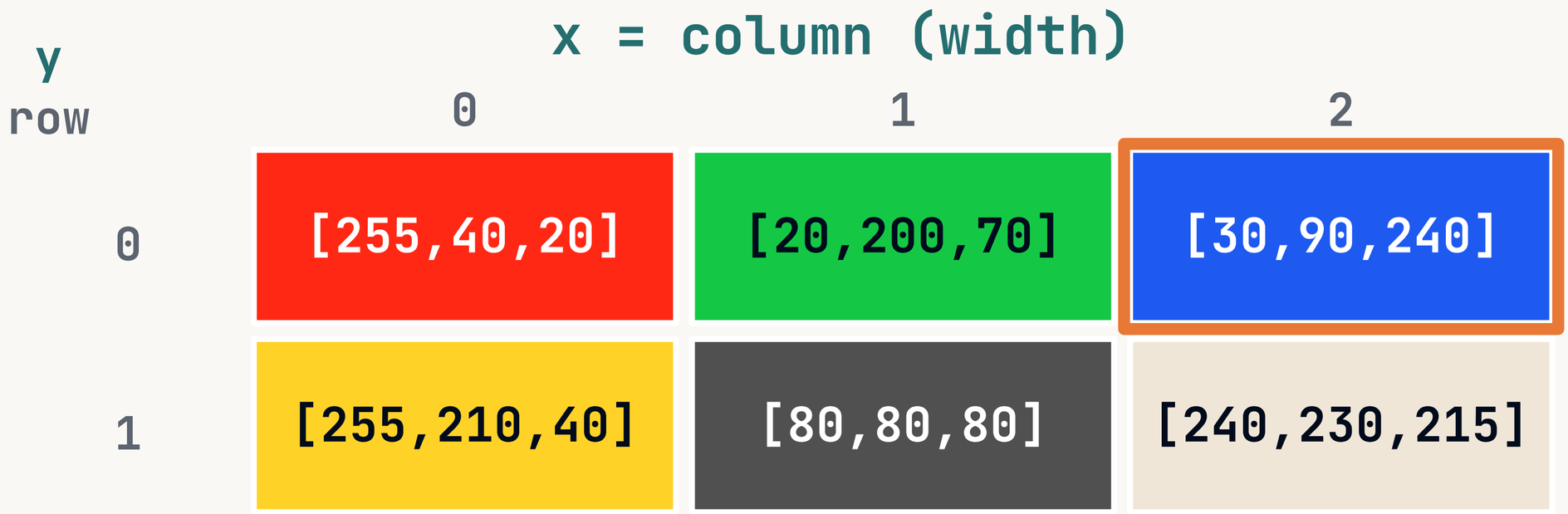
Backend

September records

Return JSON

POLYU DES·GN

One position. Three channel values.




```
pixel[y][x] = [red, green, blue]
```

POLYU DESIGN

Time is another axis of change

One RGB image: height x width x channels.

A raw frame sequence: frames x height x width x channels.

Playback speed and frame order shape the motion we perceive.

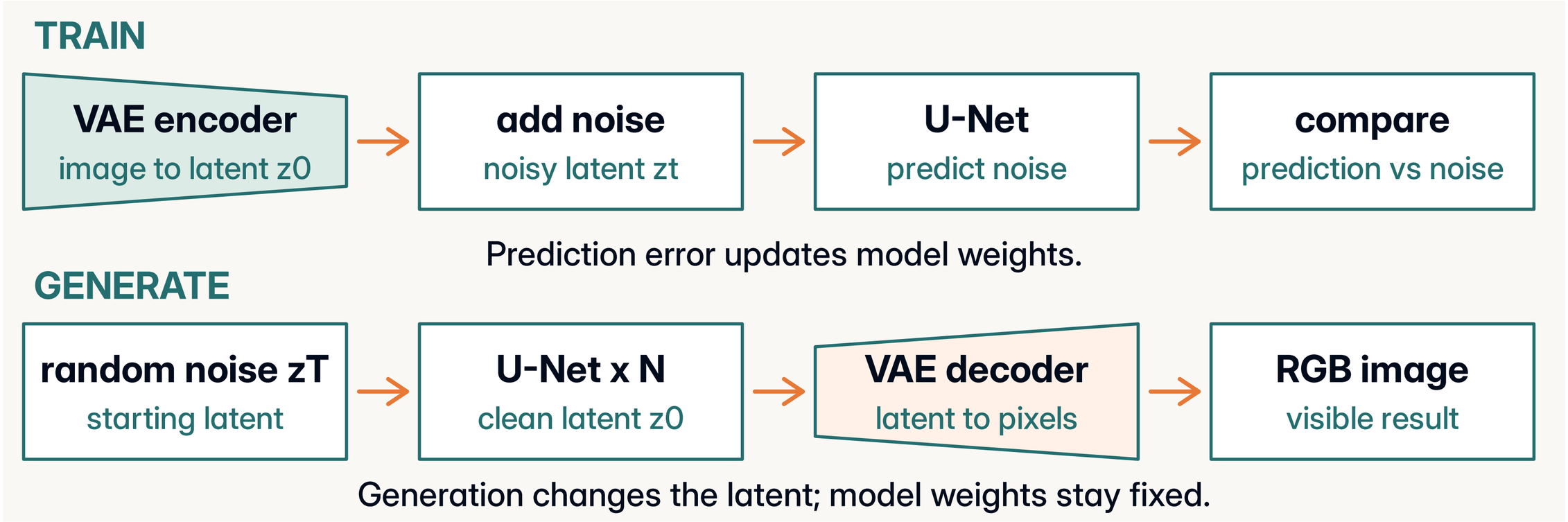
A simple animation is a list of still images in order.

```
frame 0 → time 0
frame 1 → time 0.2 s
frame 2 → time 0.4 s

same frames + new order = different
motion
```

POLYU DES·GN

Learn to remove noise; then use that skill.



Code: week05/diffusion/generate.py

POLYU DES°GN

A sound gives values positions in time

A mono sound can use a one-dimensional array.

Each number describes the signal at one instant.

The index tells us which sample comes next.

Zero is the centre of this signed signal.

```
samples = [
    0.00, 0.04, 0.08,
    0.04, 0.00, -0.04,
    -0.08, -0.04
]

print(samples[2])  # 0.08
```

POLYU DES°GN

A sample rate gives the sequence a duration

22,050 samples per second.

Two seconds need 44,100 mono samples.

Duration = sample count / sample rate.

```
sample_rate = 22050
seconds = 2

count = sample_rate * seconds
print(count)  # 44100

# one sample per time step
time = index / sample_rate
```

POLYU DES°GN

Frequency and sample rate

Keep SAMPLE_RATE at 22050.

Change FREQUENCY from 220 to 440.

Predict what changes and what stays the same.

```
# sample clock
SAMPLE_RATE = 22050

# repeating waveform
FREQUENCY = 440

# unchanged duration
SECONDS = 2
```

POLYU DES°GN

Ask me anything.

What still feels unclear?
Send your questions before the 10:00 test.

POLYU DES°GN

Get ready for Canvas.

40 multiple-choice questions. 30 minutes. Open book.

The test covers taught material from Weeks 1–6.

Open the quiz when instructed. Report access problems immediately.

Follow the announced rules for tools and collaboration.

Midterm quiz. 10:00–10:30.

Take a short break. Back at 10:35.

POLYU DES°GN

A class defines each ball.

```
class Ball:
    def __init__(self, x, y, vx, vy):
        self.x = x
        self.y = y
        self.vx = vx
        self.vy = vy
        self.radius = 1
```

Ball is the class. Each object gets its own position and velocity.

POLYU DES°GN

A method changes this ball.

```
class Ball:
    # __init__ is shown on the previous slide.

    def update(self, seconds):
        self.vy += GRAVITY * seconds
        self.x += self.vx * seconds
        self.y += self.vy * seconds
```

GRAVITY = 28. self is this ball; seconds is the time to advance.

POLYU DES·GN

Call red. Does blue move?

```
red = Ball(x=16, y=8, vx=14, vy=-5)
blue = Ball(x=44, y=14, vx=-10, vy=-9)

red.update(0.1)
print(f"red=({red.x:.2f}, {red.y:.2f})")
print(f"blue=({blue.x}, {blue.y})")
```

Predict first. Run ball.py to check which object moves.

POLYU DESIGN

Same motion. Two ways to draw it.

One simulation

red + blue

`x, y, vx, vy`

ASCII

R B

Pygame

Coloured circles

Both views read the same Ball objects.

POLYU DES°GN

Change the class. Watch both views.

From pfad: uv run week07/ball_both.py

Keep week07/ball.py open beside the two views.

Predict: what changes if GRAVITY goes from 28 to 56?

Save. Both views reset and use the edited class.

Example and optional practice

Build something amazing with your team.

POLYU DES•GN

What do you wish it did?

Choose an app you know, or a tool you genuinely need.

Observe one useful behaviour. Describe its inputs, outputs and edge cases.

Rebuild that interaction in your own way. Add the feature you wish existed.

Explore REA: tools for inspecting software

POLYU DES°GN

Two mechanics. A new experience.

What if a puzzle game had rhythm? What if a racing game changed with sound?

Combine mechanics around one compelling player action.

Give the result its own rules, look and sound.

Explore Melty’s game-remix examples

POLYU DES•GN

Start with the exciting part.

Imagine the version you would love to use or play.

Choose one interaction that makes the idea special.

What will a person do? What changes? What feedback tells them it worked?

Identify the hardest assumption. Make that your first experiment.

POLYU DES°GN

Find your people. Join one team.

Watch Gio demonstrate the actual Canvas group-registration route.

Form a team around an idea you want to build together.

Choose one representative for the text and image submissions.

Use the same team name on both. Ask for help if you need a team.

15 min

Form your team. Aim big.

Join the same Canvas team. Pick a direction everyone wants to make.

Describe who it is for, what they do, and how your app or game responds.

Name what you will reinvent or combine, and the first interaction you will test.

One representative submits one idea text on ClassPoint, with your team name.

15 min

Show what you want to build.

Sketch, mock up or generate one image of the app or game in use.

Show the main screen or moment of play. Label the action and response.

Match the idea you just submitted. A photographed paper sketch is fine.

The same representative submits one image on ClassPoint, with the team name.

POLYU DES°GN

One idea. One image. One team.

Your idea text and image mock-up are both visible in ClassPoint.

Both use the same team name and describe the same project.

Everyone has joined the correct Canvas team.

Reopen both submissions together; ask for help before leaving.

POLYU DES°GN

Turn the idea into a shared build.

One shared GitHub repository showing everyone's contributions.

Original code and multimedia. Credit the tools and assets you use.

Agree the project scope by Week 8.

Today's idea and mock-up are the starting point for that conversation.

POLYU DES°GN

Your interactive experience.

Due Sunday 1 November 2026, 23:59 HKT.

Build something with meaningful user input and clear feedback.

Submit your own GitHub repository URL on Canvas.

Follow the existing brief, README, PROCESS and credit requirements.

Aim big.
Build together.

An idea worth making. An interaction worth trying.

SD5913 / WEEK 07 / 22 OCTOBER 2026