Info

- Home page
- Contact via Teams
- Set chennel notifications on

The meaning of bytes

Lecture one

Excel example

- Excel tries to hide it by rounding

Python example

```
a = 0.1
b = 0.2
c = 0.3

print(a+b==c) #wtf



print(f"a={a:.20f}")
print(f"b={b:.20f}")
```

Exapmles of abstraction layers

- Excel does the math
- Car accelerator and brake
- For an aircraft it doesn't work
- Gravitational force acts between bodies of mass
- Time is monotonic

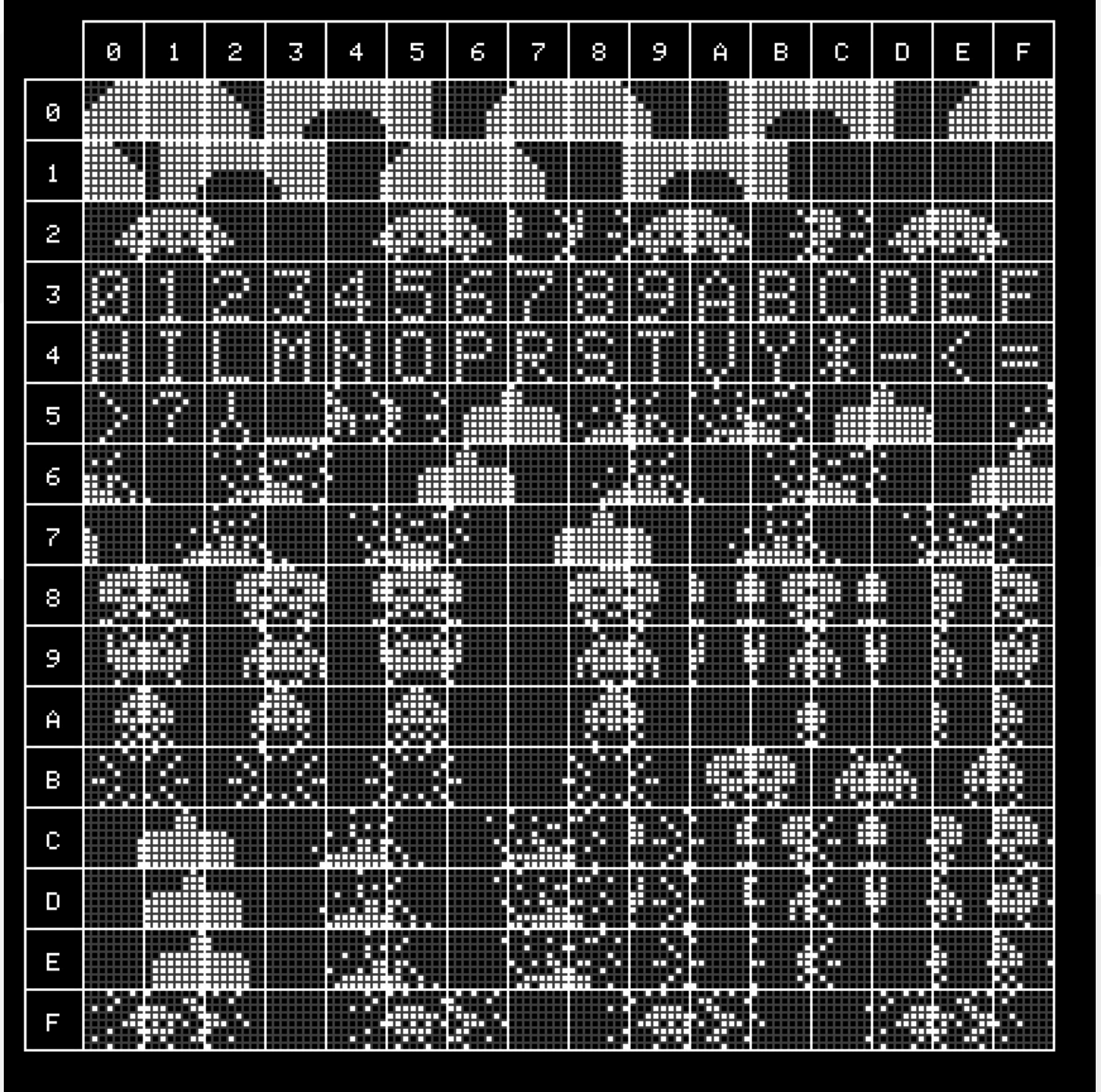
Time is not monotonic

- Never assume seconds are continuous!
- DST and NTC sync are trivial

Leap seconds

- Applications usually don’t see “23:59:60”
- **Historically**: a leap second is added about one every ~1.5–2 years on average
- **Reality**: completely irregular — sometimes yearly, sometimes gaps of many years
- **Recently**: none since 2016, and none expected very soon
- Google popularized leap smearing: Instead of adding 1 second suddenly, the clock is slowed slightly over hours

Memory doesn't store numbers


0 1 2 3 4 5 6 7 8 9 A B C D E F
0
1
2
3
4
5
6
7
8
9
A
B
C
D
E
F

The word integer comes from Latin

It’s built from

- in = “not”
- tangere = “to touch”

Literally: “not touched” → “unbroken / whole” It entered English in the 1500s as a whole number (positive, negative, or zero), i.e. not a fraction — something “undivided”.

Decimal fractions in binary

$$0.1_{10} = 0.0001100110011001100 11 \ldots_2$$

Repetition indicated:

$$0.1_{10} = 0.0001\overline{1001}_2$$

IEEE 754 type floats

https://edgar-seemann.de/converters/ieee754.html

Fractions in Python

Python int