Hackathon Candidate Problem-Solving Quiz

Problem Title: Detecting Missing Video Frames

Background

You're building a smart surveillance platform. The platform processes video feeds from smart cameras as a stream of image frames. Each frame has a unique, incremental number (1, 2, 3, …). However, due to network issues or hardware lag, some frames may not be received.

Your task is to analyze the received frame numbers and detect which frames are missing.

Problem Description

You are given an **unordered list of frame numbers** that the server received. Frame numbers start from 1, and the **highest number in the list** indicates the expected total number of frames.

Some frames are missing in the list. You need to write a function that:

1. Detects the missing frame ranges (gaps).
2. Identifies the **longest missing range**.
3. Counts the **total number of missing frames**.

Function Signature

```
def find_missing_ranges(frames: list[int]) -> dict:
    pass
```

Input

- frames: a list of integers ([1, 2, 3, 5, 6, 10, 11, 16])
    - The list is **unordered**.
    - Frame numbers are **positive integers starting from 1**.
    - Some numbers may be missing.
    - Do **not use built-in sort functions**, such as frames.sort().

Output

Return a dictionary with the following keys:

- "gaps": a list of [start, end] pairs showing missing frame ranges.
- "longest_gap": the gap with the most missing frames.
- "missing_count": the total number of missing frames.

Example

frames = [1, 2, 3, 5, 6, 10, 11, 16]

Expected Output:

```
{
   "gaps": [[4, 4], [7, 9], [12, 15]],
   "longest_gap": [12, 15],
   "missing_count": 8
}
```

Rules & Constraints

- Do **not** use sort() or similar built-in sorting functions.
- Do **not** use third-party libraries like NumPy or Pandas.
- Try to make the solution as **efficient** as possible.
- Assume there are **no duplicate frame numbers** in the input list.

Evaluation Criteria

- Correctness of the logic.
- Handling of edge cases.
- Efficiency and code clarity.
- Respecting the constraints (especially not using .sort()).