Approach #3: Locate and Analyze Problem Index [Accepted]

Intuition

Consider all indices p for which $\mathrm{A[p] > A[p+1]}$. If there are zero, the answer is `True`. If there are 2 or more, the answer is `False`, as more than one element of the array must be changed for A to be monotone increasing.

At the problem index p, we only care about the surrounding elements. Thus, immediately the problem is reduced to a very small size that can be analyzed by casework.

Algorithm

As before, let p be the unique problem index for which $\mathrm{A[p] > A[p+1]}$. If this is not unique or doesn't exist, the answer is `False` or `True` respectively. We analyze the following cases:

- If $\mathrm{p = 0}$, then we could make the array good by setting $\mathrm{A[p] = A[p+1]}$.
- If $\mathrm{p = len(A) - 2}$, then we could make the array good by setting $\mathrm{A[p+1] = A[p]}$.
- Otherwise, $\mathrm{A[p-1]}$, $\mathrm{A[p]}$, $\mathrm{A[p+1]}$, $\mathrm{A[p+2]}$ all exist, and:
    - We could change $\mathrm{A[p]}$ to be between $\mathrm{A[p-1]}$ and $\mathrm{A[p+1]}$ if possible, or;
    - We could change $\mathrm{A[p+1]}$ to be between $\mathrm{A[p]}$ and $\mathrm{A[p+2]}$ if possible.

Complexity Analysis

- Time Complexity: Let N be the length of the given array. We loop through the array once, so our time complexity is $O(N)$.

- Space Complexity: We only use p and i, and the answer itself as the additional space. The additional space complexity is $O(1)$.