Element Uniqueness: a special case

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Problem Given a read-only array containing \( n \) integers from the set \( \{1, 2, \ldots, n\} \), determine whether it is a permutation of \( (1, 2, \ldots, n) \), that is, whether there are any duplicate elements. Design an efficient algorithm which uses only \( O(\log n) \) bits as its work space.

An \( O(n \log n) \)-time algorithm [1] is known. It uses \( O(\log n) \) work space (more exactly, work space of \( O(\log^2 n) \) bits). It is not known whether there is an algorithm which runs in \( O(n \log n) \) time using only \( O(\log n) \) bits.

References