



Department of Information Technology A.Y. 2024-2025

Class: TY BTech-IT, Semester: VI

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ROLL NO: I011

BATCH: 01

1. **Aim:** To implement Bloom's filter.

2. **Requirements:** PC, Internet

3. **Theory:**

Students need to write the theory on the following points.

- Importance of Blooms filter
- Applications of Blooms filter

4. **Procedure**

- Implement the Bloom's filter in C/JAVA/Python
- Attach program code and Output.

CODE:

```
import java.util.BitSet;
import java.util.Random;

public class BloomFilter {    private
final int size;    private final BitSet
bitSet;    private final int
numHashFunctions;    private final
int[] hashSeeds;

    public BloomFilter(int size, int numHashFunctions) {
this.size = size;
        this.numHashFunctions = numHashFunctions;
this.bitSet = new BitSet(size);
        this.hashSeeds = new int[numHashFunctions];

        // Generate random seeds for hash functions
Random random = new Random();        for (int i
= 0; i < numHashFunctions; i++) {
hashSeeds[i] = random.nextInt();
        }
    }

    // Simple hash function
    private int hash(String data, int seed) {
int hash = 0;
```

```

    for (char c : data.toCharArray()) {

        hash = hash * 31 + c + seed; // A basic polynomial rolling hash
    }
    return Math.abs(hash % size);
}

// Insert element into Bloom Filter
public void add(String data) {
    for (int seed : hashSeeds) {
        int hash = hash(data, seed);
        bitSet.set(hash);
    }
}

// Check if element is possibly in the set
public boolean contains(String data) {
    for (int seed : hashSeeds) {
        int hash = hash(data, seed);
        if (!bitSet.get(hash)) {
            return false; // Definitely not in the set
        }
    }
    return true; // Probably in the set (but could be a false positive)
}

public static void main(String[] args) {
    BloomFilter bloomFilter = new BloomFilter(1000, 5); // 1000 bits, 5 hash functions

    // Adding elements
    bloomFilter.add("hello");
    bloomFilter.add("world");

    // Checking membership
    System.out.println("Contains 'hello': " + bloomFilter.contains("hello")); // True
    System.out.println("Contains 'world': " + bloomFilter.contains("world")); // True
    System.out.println("Contains 'java': " + bloomFilter.contains("java")); // False (most likely)
}

```

OUTPUT:

```

Contains 'hello': true
Contains 'world': true
Contains 'java': false

```

5. Conclusion:

- Summary of what was performed in the experiment.