Homework : 2
MongoDB

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Time taken: 3.5 Hrs.

Task-1:

A) We need to design a system that will track the fitness activities of the employees and reward them for maintaining their health.
    - Every employee is given a unique ID which they can choose to expose or hide
    - The employees can also choose to add their height, age, weight to their Aggiefit profile
    - Employees can choose their fitness plan and merge their fitness devices to an app. Each employee can have more than one fitness device.

    MongoDB was chosen because of its flexible data model
    Using MongoDB allowed the company to simplify its schema and remove the complexity; drastically reduce the number of queries; improve performance; and simplify growth as the data volume increases.

    Dynamic schemas and a flexible document model mean that a single MongoDB database can bring together diverse customer data – Like in this case we have:
    - users who want to stay anonymous
    - users who want to display one or more of height, age , weight etc
    - users with one or more type of gadgets

    MongoDB documents can vary in structure, which means documents from one system don't need to have all the same fields as documents from another.

    MongoDB's rich aggregation pipeline allows to capture and analyze data at scale. With an expressive query language, secondary indexes the aggregation framework and MapReduce, MongoDB lets you run fast analytics across multi-structured data within the database. You get fast personalization at scale.

    With its rich index and query support, including secondary, text search indexes and the aggregation framework ,MongoDB can run complex ad-hoc or reporting analytics in-place against gadget real-time data.

    On the other hand, relational database has much more rigid structure and schema has to be fixed. It cannot do in-place analysis on real time data as efficiently as Mongo DB. It also won't allow binary JSON format used for storing documents in collections which is designed to be efficient in size and speed, allowing MongoDB's high read/write throughput.

B) 1. The design can be made better by creating index using uid and also making it unique so duplicates can be avoided if we write multiple times
    db.fitness_x.createIndex({ "uid": 1 }, { unique: true })
    2. Enable authentication by doing the following in configuration file:
       auth = true

3. Collection-Level Access control can be implemented which allows administrators to grant privileges that are scoped to specific collections.
4. Monitor employees access to the database.
5.Remove auto incrementing default index

The following screenshots are results obtained on running all queries.

```
{u'_id': ObjectId('5bbd1e36cdadb24a8452990c'),
 u'activityDuration': [20, 45, 35, 40],
 u'age': 30,
 u'goal': {u'activityGoal': u'75min', u'stepGoal': 8000, u'weekGoal': 3},
 u'height': u'5ft10in',
 u'stepCount': [2034, 5432, 3056, 4302],
 u'tags': [u'ambitious'],
 u'uid': 1001,
 u'weight': u'190lbs'}
{u'_id': ObjectId('5bbd1e36cdadb24a8452990d'),
 u'activityDuration': [50, 4, 10, 60, 67, 10, 30, 45],
 u'gender': u'female',
 u'goal': {u'activityGoal': u'45min', u'stepGoal': 0, u'weekGoal': 4},
 u'tags': [u'activityOnly'],
 u'uid': 1002}
{u'_id': ObjectId('5bbd1e36cdadb24a8452990e'),
 u'division': u'HR',
 u'employeeID': 111001111,
 u'gender': u'male',
 u'goal': {u'activityGoal': u'NA', u'stepGoal': 10000, u'weekGoal': 5},
 u'height': u'5ft10in',
 u'stepCount': [6010,
                8900,
                10141,
                7543,
                6364,
                4901,
                351,
                204,
                5371,
                3454,
                6574,
                7856,
                9365,
                9646],
 u'tags': [u'active', u'stepOnly'],
 u'uid': 1003,
 u'weight': u'172lbs'}
{u'_id': ObjectId('5bc7ddf3405f32262ba1ee08'),
 u'activityDuration': [67, 48, 56, 15, 57, 20, 57, 15, 60, 10, 4, 3, 89],
 u'age': 45,
 u'goal': {u'activityGoal': u'60min', u'stepGoal': 0, u'weekGoal': 3},
 u'height': u'5ft1in',
 u'tags': [u'irregular', u'activityOnly'],
 u'uid': 1004,
 u'weight': u'160lbs'}
{u'_id': ObjectId('5bc7ddf3405f32262ba1ee09'),
 u'activityDuration': [56, 62, 48, 54],
 u'age': 50,
```

```
 u'gender': u'male',
 u'goal': {u'activityGoal': u'45min', u'stepGoal': 8000, u'weekGoal': 3},
 u'stepCount': [6792, 7832, 5876, 6453],
 u'tags': [u'active'],
 u'uid': 1005}
{u'_id': ObjectId('5bc7ddf3405f32262ba1ee0a'),
 u'goal': {u'activityGoal': u'NA', u'stepGoal': 5000, u'weekGoal': 7},
 u'stepCount': [7694, 4568, 2390, 6738, 1243, 132, 6785],
 u'tags': [u'irregular', u'stepOnly'],
 u'uid': 1006}
{u'_id': ObjectId('5bc7ddf3405f32262ba1ee0b'),
 u'activityDuration': [23, 14, 32, 12, 19, 32],
 u'goal': {u'activityGoal': u'30min', u'stepGoal': 1000, u'weekGoal': 7},
 u'stepCount': [543, 534, 231, 234, 241],
 u'tags': [u'beginner'],
 u'uid': 1007}
{u'_id': ObjectId('5bc7ddf3405f32262ba1ee0c'),
 u'activityDuration': [72, 75, 78, 45, 79, 86],
 u'competitors': [1009],
 u'goal': {u'activityGoal': u'90min', u'stepGoal': 12000, u'weekGoal': 5},
 u'gymDuration': [62, 61, 64, 0, 67, 69],
 u'height': u'5ft10in',
 u'stepCount': [10439, 10456, 10458, 3423, 10807, 11232],
 u'tags': [u'regular', u'sportsman', u'gymGoer', u'competitor'],
 u'uid': 1008,
 u'weight': u'178lbs'}
{u'_id': ObjectId('5bc7ddf3405f32262ba1ee0d'),
 u'activityDuration': [73, 68, 83, 79, 34, 86],
 u'competitors': [1008],
 u'goal': {u'activityGoal': u'90min', u'stepGoal': 12000, u'weekGoal': 5},
 u'gymDuration': [60, 58, 64, 62, 0, 64],
 u'height': u'5ft8in',
 u'stepCount': [10439, 10216, 11342, 11278, 4323, 11762],
 u'tags': [u'regular', u'sportsman', u'gymGoer', u'competitor'],
 u'uid': 1009,
 u'weight': u'183lbs'}
('number of employees in AggiefitDB', 9)
done with RQ1
{u'_id': ObjectId('5bc7ddf3405f32262ba1ee08'), u'uid': 1004}
{u'_id': ObjectId('5bc7ddf3405f32262ba1ee0a'), u'uid': 1006}
done with RQ2
{u'_id': ObjectId('5bbd1e36cdadb24a8452990d'), u'uid': 1002}
{u'_id': ObjectId('5bc7ddf3405f32262ba1ee08'), u'uid': 1004}
{u'_id': ObjectId('5bc7ddf3405f32262ba1ee0b'), u'uid': 1007}
done with RQ3
{u'_id': ObjectId('5bbd1e36cdadb24a8452990c'), u'totalActivityDuration': 140}
{u'_id': ObjectId('5bbd1e36cdadb24a8452990d'), u'totalActivityDuration': 276}
{u'_id': ObjectId('5bbd1e36cdadb24a8452990e'), u'totalActivityDuration': 0}
{u'_id': ObjectId('5bc7ddf3405f32262ba1ee08'), u'totalActivityDuration': 501}
{u'_id': ObjectId('5bc7ddf3405f32262ba1ee09'), u'totalActivityDuration': 220}
{u'_id': ObjectId('5bc7ddf3405f32262ba1ee0a'), u'totalActivityDuration': 0}
{u'_id': ObjectId('5bc7ddf3405f32262ba1ee0b'), u'totalActivityDuration': 132}
{u'_id': ObjectId('5bc7ddf3405f32262ba1ee0c'), u'totalActivityDuration': 435}
{u'_id': ObjectId('5bc7ddf3405f32262ba1ee0d'), u'totalActivityDuration': 423}
```