

Assignment 4

UrbanWave: MongoDB Social Media Platform

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Aim

Design and implement a NoSQL schema for a social media platform called **UrbanWave** using MongoDB. The platform should support:

1. User profiles with India-based locations
2. Posts and Reels with multiple content categories
3. Following/Follower relationships
4. Location-based user discovery
5. Interest-based recommendations
6. Content analytics and trending features

Phase 1: Database Setup & Data Population

Sample Data Requirements

Users Sample Data

Username	Full Name	Age	Location	Screen Time (hrs/day)	Interest
aastha_01	Aastha Vadher	23	Mumbai	3.5	Tech & Innovation
aastha_02	Aastha Patel	24	Delhi	2.8	Coding & Startups
aastha_03	Aastha Sharma	22	Bengaluru	4.1	Travel & Food
aastha_04	Aastha Joshi	25	Pune	2.5	Art & Creativity
aastha_05	Aastha Mehta	23	Ahmedabad	3.9	Coding & Entrepreneurship
aastha_06	Aastha Desai	24	Hyderabad	3.2	AI & Machine Learning
aastha_07	Aastha Raval	22	Jaipur	2.9	Nature & Photography
aastha_08	Aastha Trivedi	26	Surat	4.4	Fitness & Lifestyle
aastha_09	Aastha Kapoor	25	Kolkata	3.0	Writing & Storytelling
aastha_10	Aastha Bhatt	23	Chandigarh	3.7	Motivation & Self-growth

Table 1: Users Sample Data

India Cities Coordinates

City	Latitude	Longitude
Mumbai	19.0760	72.8777
Delhi	28.7041	77.1025
Bengaluru	12.9716	77.5946
Pune	18.5204	73.8567
Ahmedabad	23.0225	72.5714
Hyderabad	17.3850	78.4867
Jaipur	26.9124	75.7873
Surat	21.1702	72.8311
Kolkata	22.5726	88.3639
Chandigarh	30.7333	76.7794

Table 2: India Cities Coordinates

article listings xcolor

MongoDB Collection Validator

```
1 // Create users collection with schema validation
2 db.createCollection("users", {
3   validator: {
4     $jsonSchema: {
5       bsonType: "object",
6       required: [
7         "username", "fullName", "email", "age", "bio",
8         "interests", "location", "screenTime",
9         "followersCount", "followingCount",
10        "isActive", "createdAt", "lastSeen"
11      ],
12      properties: {
13        username: { bsonType: "string" },
14        fullName: { bsonType: "string" },
15        email: {
16          bsonType: "string",
17          pattern: "^.+@.+\\" .+\""
18        },
19        age: {
20          bsonType: "int",
21          minimum: 13,
22          maximum: 100
23        },
24        bio: { bsonType: "string" },
25        interests: {
26          bsonType: "array",
27          items: { bsonType: "string" }
28        },
29        location: {
30          bsonType: "object",
31          required: ["city", "type", "coordinates"],
32          properties: {
33            city: { bsonType: "string" },
34            type: { enum: ["Point"] },
35            coordinates: {
36              bsonType: "array",
```

```

37         items: [{ bsonType: "double" }, { bsonType: "double" }],
38         minItems: 2,
39         maxItems: 2
40     }
41 }
42 },
43 screenTime: { bsonType: "int", minimum: 0 },
44 followersCount: { bsonType: "int", minimum: 0 },
45 followingCount: { bsonType: "int", minimum: 0 },
46 isActive: { bsonType: "bool" },
47 createdAt: { bsonType: "date" },
48 lastSeen: { bsonType: "date" }
49 }
50 }
51 }
52 )

```

User Creation and Insertion Code

```

1 db.users.insertMany([
2   {
3     _id: ObjectId("68b7fbf3e96bf8edff5b1bfe"),
4     username: "Aastha1_123",
5     fullName: "Aastha1",
6     email: "aastha1_123@gmail.com",
7     age: 29,
8     bio: "I Like Basketball",
9     interests: ["Sports", "Travel", "Food"],
10    location: {
11      city: "Mumbai",
12      type: "Point",
13      coordinates: [72.8777, 19.076]
14    },
15    screenTime: 105,
16    followersCount: 6000,
17    followingCount: 3000,
18    isActive: true,
19    createdAt: ISODate("2025-01-15T10:20:36.553Z"),
20    lastSeen: ISODate("2025-09-02T12:09:36.553Z")
21  },
22  {
23    _id: ObjectId("68b7fbf3e96bf8edff5b1bff"),
24    username: "Aastha2_234",
25    fullName: "Aastha2",
26    email: "aastha2_234@gmail.com",
27    age: 26,
28    bio: "Tech enthusiast and coder",
29    interests: ["Coding", "AI", "Gaming"],
30    location: {
31      city: "Delhi",
32      type: "Point",
33      coordinates: [77.1025, 28.7041]
34    },
35    screenTime: 210,
36    followersCount: 1200,
37    followingCount: 800,
38    isActive: true,

```

```

39     createdAt: ISODate("2024-11-10T08:15:12.553Z"),
40     lastSeen: ISODate("2025-09-01T18:45:20.553Z")
41   },
42   {
43     _id: ObjectId("68b7fbf3e96bf8edff5b1c00"),
44     username: "Aastha3_345",
45     fullName: "Aastha3",
46     email: "aastha3_345@gmail.com",
47     age: 31,
48     bio: "Love painting and creativity",
49     interests: ["Art", "Music", "Books"],
50     location: {
51       city: "Bengaluru",
52       type: "Point",
53       coordinates: [77.5946, 12.9716]
54     },
55     screenTime: 180,
56     followersCount: 3400,
57     followingCount: 2000,
58     isActive: false,
59     createdAt: ISODate("2025-02-20T09:30:00.553Z"),
60     lastSeen: ISODate("2025-09-03T11:00:36.932Z")
61   },
62   {
63     _id: ObjectId("68b7fbf3e96bf8edff5b1c01"),
64     username: "Aastha4_456",
65     fullName: "Aastha4",
66     email: "aastha4_456@gmail.com",
67     age: 24,
68     bio: "Adventure seeker",
69     interests: ["Travel", "Trekking", "Photography"],
70     location: {
71       city: "Pune",
72       type: "Point",
73       coordinates: [73.8567, 18.5204]
74     },
75     screenTime: 95,
76     followersCount: 850,
77     followingCount: 420,
78     isActive: true,
79     createdAt: ISODate("2024-12-05T07:50:36.553Z"),
80     lastSeen: ISODate("2025-08-29T20:30:10.553Z")
81   },
82   {
83     _id: ObjectId("68b7fbf3e96bf8edff5b1c02"),
84     username: "Aastha5_567",
85     fullName: "Aastha5",
86     email: "aastha5_567@gmail.com",
87     age: 27,
88     bio: "Yoga and mindfulness lover",
89     interests: ["Yoga", "Meditation", "Health"],
90     location: {
91       city: "Ahmedabad",
92       type: "Point",
93       coordinates: [72.5714, 23.0225]
94     },
95     screenTime: 150,
96     followersCount: 4200,
97     followingCount: 2500,

```

```

98     isActive: true,
99     createdAt: ISODate("2025-03-10T14:25:36.553Z"),
100    lastSeen: ISODate("2025-08-28T19:15:36.553Z")
101  },
102  {
103    _id: ObjectId("68b7fbf3e96bf8edff5b1c03"),
104    username: "Aastha6_678",
105    fullName: "Aastha6",
106    email: "aastha6_678@gmail.com",
107    age: 30,
108    bio: "Food vlogger at heart",
109    interests: ["Food", "Cooking", "Street Food"],
110    location: {
111      city: "Hyderabad",
112      type: "Point",
113      coordinates: [78.4867, 17.385]
114    },
115    screenTime: 220,
116    followersCount: 9800,
117    followingCount: 5000,
118    isActive: true,
119    createdAt: ISODate("2024-10-22T11:40:36.553Z"),
120    lastSeen: ISODate("2025-08-27T21:05:20.553Z")
121  },
122  {
123    _id: ObjectId("68b7fbf3e96bf8edff5b1c04"),
124    username: "Aastha7_789",
125    fullName: "Aastha7",
126    email: "aastha7_789@gmail.com",
127    age: 25,
128    bio: "Nature and animals are my peace",
129    interests: ["Wildlife", "Nature", "Hiking"],
130    location: {
131      city: "Jaipur",
132      type: "Point",
133      coordinates: [75.7873, 26.9124]
134    },
135    screenTime: 135,
136    followersCount: 3000,
137    followingCount: 1700,
138    isActive: true,
139    createdAt: ISODate("2025-01-05T06:15:36.553Z"),
140    lastSeen: ISODate("2025-08-26T13:00:00.553Z")
141  },
142  {
143    _id: ObjectId("68b7fbf3e96bf8edff5b1c05"),
144    username: "Aastha8_890",
145    fullName: "Aastha8",
146    email: "aastha8_890@gmail.com",
147    age: 28,
148    bio: "Fitness freak and marathon runner",
149    interests: ["Fitness", "Running", "Diet"],
150    location: {
151      city: "Surat",
152      type: "Point",
153      coordinates: [72.8311, 21.1702]
154    },
155    screenTime: 250,
156    followersCount: 15000,

```

```

157     followingCount: 6000,
158     isActive: true,
159     createdAt: ISODate("2024-09-18T09:00:36.553Z"),
160     lastSeen: ISODate("2025-08-25T22:00:36.553Z")
161   },
162   {
163     _id: ObjectId("68b7fbf3e96bf8edff5b1c06"),
164     username: "Aastha9_901",
165     fullName: "Aastha9",
166     email: "aastha9_901@gmail.com",
167     age: 32,
168     bio: "Books and coffee make my world",
169     interests: ["Books", "Writing", "Coffee"],
170     location: {
171       city: "Kolkata",
172       type: "Point",
173       coordinates: [88.3639, 22.5726]
174     },
175     screenTime: 120,
176     followersCount: 2700,
177     followingCount: 1600,
178     isActive: true,
179     createdAt: ISODate("2024-11-25T12:45:36.553Z"),
180     lastSeen: ISODate("2025-08-24T14:20:36.553Z")
181   },
182   {
183     _id: ObjectId("68b7fbf3e96bf8edff5b1c07"),
184     username: "Aastha10_012",
185     fullName: "Aastha10",
186     email: "aastha10_012@gmail.com",
187     age: 23,
188     bio: "Fashion and lifestyle blogger",
189     interests: ["Fashion", "Lifestyle", "Makeup"],
190     location: {
191       city: "Chandigarh",
192       type: "Point",
193       coordinates: [76.7794, 30.7333]
194     },
195     screenTime: 300,
196     followersCount: 20000,
197     followingCount: 9000,
198     isActive: true,
199     createdAt: ISODate("2025-04-12T15:30:36.553Z"),
200     lastSeen: ISODate("2025-08-23T09:45:36.553Z")
201   }
202 ])

```

Follower Database code

```

1 // Insert multiple follower-following relationships
2 db.follower.insertMany([
3   {
4     _id: ObjectId("68b6df8079dcbacd19c9f7fe"),
5     followerId: ObjectId("68b6df6479dcbacd19c9f7fd"),
6     followingId: ObjectId("68b6df6479dcbacd19c9f7fd"),
7     createdAt: ISODate("2025-09-02T12:13:52.638Z")
8   }

```

```

9   {
10    _id: ObjectId("68b7ff3fe96bf8edff5b1c12"),
11    followerId: ObjectId("68b7fbf3e96bf8edff5b1bfe"),
12    followingId: ObjectId("68b7fbf3e96bf8edff5b1bff"),
13    createdAt: ISODate("2025-01-17T07:22:00.000Z")
14  },
15  {
16    _id: ObjectId("68b7ff3fe96bf8edff5b1c13"),
17    followerId: ObjectId("68b7fbf3e96bf8edff5b1bfe"),
18    followingId: ObjectId("68b7fbf3e96bf8edff5b1c00"),
19    createdAt: ISODate("2025-08-12T13:43:00.000Z")
20  },
21  {
22    _id: ObjectId("68b7ff3fe96bf8edff5b1c14"),
23    followerId: ObjectId("68b7fbf3e96bf8edff5b1bfe"),
24    followingId: ObjectId("68b7fbf3e96bf8edff5b1c01"),
25    createdAt: ISODate("2025-02-25T10:49:00.000Z")
26  },
27  {
28    _id: ObjectId("68b7ff3fe96bf8edff5b1c15"),
29    followerId: ObjectId("68b7fbf3e96bf8edff5b1bfe"),
30    followingId: ObjectId("68b7fbf3e96bf8edff5b1c02"),
31    createdAt: ISODate("2025-06-02T06:44:00.000Z")
32  },
33  {
34    _id: ObjectId("68b7ff3fe96bf8edff5b1c16"),
35    followerId: ObjectId("68b7fbf3e96bf8edff5b1bfe"),
36    followingId: ObjectId("68b7fbf3e96bf8edff5b1c03"),
37    createdAt: ISODate("2025-03-18T14:24:00.000Z")
38  },
39  {
40    _id: ObjectId("68b7ff3fe96bf8edff5b1c17"),
41    followerId: ObjectId("68b7fbf3e96bf8edff5b1bfe"),
42    followingId: ObjectId("68b7fbf3e96bf8edff5b1c04"),
43    createdAt: ISODate("2025-09-05T03:54:00.000Z")
44  },
45  {
46    _id: ObjectId("68b7ff3fe96bf8edff5b1c18"),
47    followerId: ObjectId("68b7fbf3e96bf8edff5b1bfe"),
48    followingId: ObjectId("68b7fbf3e96bf8edff5b1c05"),
49    createdAt: ISODate("2025-12-21T06:02:00.000Z")
50  }
51  // ... continue for all other documents
52 ])

```

Post and Reel Insertion

```

1 // Insert multiple posts and reels
2 db.posts.insertMany([
3   {
4     _id: ObjectId("68b7fd52e96bf8edff5b1c08"),
5     userId: ObjectId("68b7fbf3e96bf8edff5b1bfe"),
6     type: "post",
7     content: "fitness",
8     caption: "Morning workout vibes",
9     hashtags: ["#fitness", "#workout", "#motivation"],
10    location: {

```

```

11     type: "Point",
12     coordinates: [72.5714, 23.0225],
13     city: "Ahmedabad"
14   },
15   likes: 120,
16   comments: 15,
17   shares: 5,
18   createdAt: ISODate("2025-08-20T09:15:00.000Z")
19 },
20 {
21   _id: ObjectId("68b7fd52e96bf8edff5b1c09"),
22   userId: ObjectId("68b7fbf3e96bf8edff5b1bff"),
23   type: "reel",
24   content: "coding",
25   caption: "Debugging at 3 AM",
26   hashtags: ["#coding", "#developer", "#buglife"],
27   location: {
28     type: "Point",
29     coordinates: [77.1025, 28.7041],
30     city: "Delhi"
31   },
32   likes: 450,
33   comments: 60,
34   shares: 25,
35   views: 12000,
36   createdAt: ISODate("2025-08-22T14:40:00.000Z")
37 },
38 {
39   _id: ObjectId("68b7fd52e96bf8edff5b1c0a"),
40   userId: ObjectId("68b7fbf3e96bf8edff5b1c00"),
41   type: "post",
42   content: "art",
43   caption: "Finished a watercolor painting",
44   hashtags: ["#art", "#painting", "#creativity"],
45   location: {
46     type: "Point",
47     coordinates: [72.8777, 19.076],
48     city: "Mumbai"
49   },
50   likes: 980,
51   comments: 85,
52   shares: 40,
53   createdAt: ISODate("2025-08-24T18:30:00.000Z")
54 },
55 {
56   _id: ObjectId("68b7fd52e96bf8edff5b1c0b"),
57   userId: ObjectId("68b7fbf3e96bf8edff5b1c01"),
58   type: "post",
59   content: "travel",
60   caption: "Exploring the streets of Kolkata",
61   hashtags: ["#travel", "#kolkata", "#wanderlust"],
62   location: {
63     type: "Point",
64     coordinates: [88.3639, 22.5726],
65     city: "Kolkata"
66   },
67   likes: 560,
68   comments: 34,
69   shares: 12,

```

```

70     createdAt: ISODate("2025-08-25T07:50:00.000Z")
71   },
72   {
73     _id: ObjectId("68b7fd52e96bf8edff5b1c0c"),
74     userId: ObjectId("68b7fbf3e96bf8edff5b1c02"),
75     type: "reel",
76     content: "health",
77     caption: "15 minute yoga session",
78     hashtags: ["#yoga", "#mindfulness", "#healthylife"],
79     location: {
80       type: "Point",
81       coordinates: [80.9462, 26.8467],
82       city: "Lucknow"
83     },
84     likes: 2000,
85     comments: 150,
86     shares: 80,
87     views: 25000,
88     createdAt: ISODate("2025-08-27T06:30:00.000Z")
89   },
90   {
91     _id: ObjectId("68b7fd52e96bf8edff5b1c0d"),
92     userId: ObjectId("68b7fbf3e96bf8edff5b1c03"),
93     type: "post",
94     content: "food",
95     caption: "Street food tour",
96     hashtags: ["#foodie", "#indore", "#streetfood"],
97     location: {
98       type: "Point",
99       coordinates: [75.8577, 22.7196],
100      city: "Indore"
101    },
102    likes: 8700,
103    comments: 500,
104    shares: 320,
105    createdAt: ISODate("2025-08-28T11:15:00.000Z")
106  },
107  {
108    _id: ObjectId("68b7fd52e96bf8edff5b1c0f"),
109    userId: ObjectId("68b7fbf3e96bf8edff5b1c05"),
110    type: "reel",
111    content: "fitness",
112    caption: "Hyderabad marathon training",
113    hashtags: ["#fitness", "#running", "#marathon"],
114    location: {
115      type: "Point",
116      coordinates: [78.4867, 17.385],
117      city: "Hyderabad"
118    },
119    likes: 5400,
120    comments: 280,
121    shares: 150,
122    views: 40000,
123    createdAt: ISODate("2025-08-29T05:20:00.000Z")
124  },
125  {
126    _id: ObjectId("68b7fd52e96bf8edff5b1c10"),
127    userId: ObjectId("68b7fbf3e96bf8edff5b1c06"),
128    type: "post",

```

```
129 |     content: "books",
130 |     caption: "Sunday morning with coffee and a novel",
131 |     hashtags: ["#books", "#reading", "#coffee"],
132 |     location: {
133 |       type: "Point",
134 |       coordinates: [85.1376, 25.5941],
135 |       city: "Patna"
136 |     },
137 |     likes: 870,
138 |     comments: 60,
139 |     shares: 18,
140 |     createdAt: ISODate("2025-08-30T09:00:00.000Z")
141 |   },
142 |   {
143 |     _id: ObjectId("68b7fd52e96bf8edff5b1c11"),
144 |     userId: ObjectId("68b7fbf3e96bf8edff5b1c07"),
145 |     type: "reel",
146 |     content: "fashion",
147 |     caption: "OOTD Bangalore vibes",
148 |     hashtags: ["#fashion", "#style", "#lifestyle"],
149 |     location: {
150 |       type: "Point",
151 |       coordinates: [77.5946, 12.9716],
152 |       city: "Bangalore"
153 |     },
154 |     likes: 12000,
155 |     comments: 850,
156 |     shares: 400,
157 |     views: 75000,
158 |     createdAt: ISODate("2025-08-31T19:30:00.000Z")
159 |   }
160 | )
])
```

Phase 2: Basic Database Operations

Task 2.1: CRUD Operations

1. Find all users from a specific city:

```
1 db.users.find(  
2   { "location.coordinates": [72.8777, 19.0760] }, // Mumbai  
3   { _id: 0, username: 1 }  
4 )
```

Output:

```
> db.users.find(  
  { "location.coordinates": [72.8777, 19.0760] }, // Mumbai  
  { _id: 0, username: 1 }  
);  
< {  
  username: 'Aastha3_345'  
}
```

2. Find users younger than 25 years:

```
1 db.users.find(  
2   { age: { $lt: 25 } },  
3   { _id: 0, username: 1 }  
4 )
```

Output:

```
> db.users.find(  
  { age: { $lt: 25 } },  
  { _id: 0, username: 1 }  
);  
< {  
  username: 'Aastha4_456'  
}  
{  
  username: 'Aastha10_012'  
}
```

3. Find users with screen time greater than 150 minutes:

```
1 db.users.find(  
2   { screenTime: { $gt: 2.5 } }, // > 150 minutes  
3   { _id: 0, username: 1 }  
4 )
```

Output:

```
> db.users.find(  
    { screenTime: { $gt: 2.5 } },  
    { _id: 0, username: 1 }  
);  
< [ {  
    username: 'Aastha1_123'  
},  
{  
    username: 'Aastha2_234'  
},  
{  
    username: 'Aastha3_345'  
},  
{  
    username: 'Aastha4_456'  
},  
{  
    username: 'Aastha5_567'  
},  
{  
    username: 'Aastha6_678'  
},  
{  
    username: 'Aastha7_789'  
},  
{  
    username: 'Aastha8_890'  
},  
{  
    username: 'Aastha9_901'  
},  
{  
    username: 'Aastha10_012'  
}]
```

4. Update a user's bio and interests:

```
1 db.users.updateOne(  
2   { username: "aastha_01" },  
3   { $set: { bio: "Tech Enthusiast", interests: ["AI", "Cybersecurity", "Travel"] } }  
4 )
```

Output:

```
> db.users.updateOne(  
  { username: "aastha1" },  
  {  
    $set: {  
      bio: "Tech enthusiast, traveler, and foodie",  
      interests: ["AI", "Cybersecurity", "Travel"]  
    }  
  }  
);  
< {  
  acknowledged: true,  
  insertedId: null,  
  matchedCount: 0,  
  modifiedCount: 0,  
  upsertedCount: 0  
}
```

5. Delete posts older than a specific date:

```
1 db.posts.deleteMany(  
2   { createdAt: { $lt: ISODate("2025-08-26T16:45:00.000Z") } }  
3 )
```

Before Deletion:

```
> db.posts.find(
  {},
  { _id: 0, caption: 1, createdAt: 1 }
).sort({ createdAt: 1 });

< [
  {
    caption: 'Morning workout vibes',
    createdAt: 2025-08-20T09:15:00.000Z
  },
  {
    caption: 'Debugging at 3 AM',
    createdAt: 2025-08-22T14:40:00.000Z
  },
  {
    caption: 'Finished a watercolor painting',
    createdAt: 2025-08-24T18:30:00.000Z
  },
  {
    caption: 'Exploring the streets of Kolkata',
    createdAt: 2025-08-25T07:50:00.000Z
  },
  {
    caption: 'Sharing quick study tips',
    createdAt: 2025-08-26T16:45:00.000Z
  },
  {
    caption: '15 minute yoga session',
    createdAt: 2025-08-27T06:30:00.000Z
  },
  {
    caption: 'Street food tour',
    createdAt: 2025-08-28T11:15:00.000Z
  },
  {
    caption: 'Hyderabad marathon training',
    createdAt: 2025-08-29T05:20:00.000Z
  },
  {
    caption: 'Sunday morning with coffee and a novel',
    createdAt: 2025-08-30T09:00:00.000Z
  },
  {
    caption: 'OOTD Bangalore vibes',
    createdAt: 2025-08-31T19:30:00.000Z
  }
]
```

Deletion:

```
> db.posts.deleteOne({
  createdAt: ISODate("2025-08-26T16:45:00.000Z")
});

< {
  acknowledged: true,
  deletedCount: 1
}
```

After Deletion:

```
> db.posts.find(
  {},
  { _id: 0, caption: 1, createdAt: 1 }
).sort({ createdAt: 1 });

< [
  {
    caption: 'Morning workout vibes',
    createdAt: 2025-08-20T09:15:00.000Z
  },
  {
    caption: 'Debugging at 3 AM',
    createdAt: 2025-08-22T14:40:00.000Z
  },
  {
    caption: 'Finished a watercolor painting',
    createdAt: 2025-08-24T18:30:00.000Z
  },
  {
    caption: 'Exploring the streets of Kolkata',
    createdAt: 2025-08-25T07:50:00.000Z
  },
  {
    caption: '15 minute yoga session',
    createdAt: 2025-08-27T06:30:00.000Z
  },
  {
    caption: 'Street food tour',
    createdAt: 2025-08-28T11:15:00.000Z
  },
  {
    caption: 'Hyderabad marathon training',
    createdAt: 2025-08-29T05:20:00.000Z
  },
  {
    caption: 'Sunday morning with coffee and a novel',
    createdAt: 2025-08-30T09:00:00.000Z
  },
  {
    caption: 'OOTD Bangalore vibes',
    createdAt: 2025-08-31T19:30:00.000Z
  }
]
```

Task 2.2: Data Filtering and Sorting

- Find posts of type "reel" with more than 100 likes:

```
1 db.posts.find(
2   { type: "reel", likes: { $gt: 100 } },
3   { _id: 0, caption: 1, content: 1, likes: 1, createdAt: 1 }
4 )
```

Output:

```
> db.posts.find(
  { type: "reel", likes: { $gt: 100 } },
  { _id: 0, caption: 1, content: 1, likes: 1, createdAt: 1 }
);
< [
  {
    content: 'coding',
    caption: 'Debugging at 3 AM',
    likes: 450,
    createdAt: 2025-08-22T14:40:00.000Z
  }
  {
    content: 'health',
    caption: '15 minute yoga session',
    likes: 2000,
    createdAt: 2025-08-27T06:30:00.000Z
  }
  {
    content: 'fitness',
    caption: 'Hyderabad marathon training',
    likes: 5400,
    createdAt: 2025-08-29T05:20:00.000Z
  }
  {
    content: 'fashion',
    caption: 'OOTD Bangalore vibes',
    likes: 12000,
    createdAt: 2025-08-31T19:30:00.000Z
  }
]
```

2. Sort users by followers count (descending):

```
1 db.users.find(
2   {},
3   { _id: 0, username: 1 }
4 ).sort({ followersCount: -1 })
```

Output:

```
> db.users.find(
  {},
  { _id: 0, username: 1 }
).sort({ followersCount: -1 });
< [
  {
    username: 'Aastha10_012'
  }
  {
    username: 'Aastha8_890'
  }
  {
    username: 'Aastha6_678'
  }
  {
    username: 'Aastha1_123'
  }
  {
    username: 'Aastha5_567'
  }
  {
    username: 'Aastha3_345'
  }
  {
    username: 'Aastha7_789'
  }
  {
    username: 'Aastha9_901'
  }
  {
    username: 'Aastha2_234'
  }
  {
    username: 'Aastha4_456'
  }
]
```

3. Find users with specific interests:

```
1 db.users.find({  
2   interests: { $all: ["travel", "photography"] }  
3 })
```

Output:

```
> db.users.find({  
    interests: { $all: ["travel", "photography"] }  
});  
<
```

4. Get posts from the last 30 days:

```
1 db.posts.find(  
2   { createdAt: { $gte: new Date(Date.now() - 30*24*60*60*1000) } },  
3   { _id: 0, caption: 1 }  
4 )
```

Output:

```
> db.posts.find(  
  { createdAt: { $gte: new Date(Date.now() - 30*24*60*60*1000) } },  
  { _id: 0, caption: 1 }  
);  
< {  
  caption: 'Morning workout vibes'  
}  
{  
  caption: 'Debugging at 3 AM'  
}  
{  
  caption: 'Finished a watercolor painting'  
}  
{  
  caption: 'Exploring the streets of Kolkata'  
}  
{  
  caption: '15 minute yoga session'  
}  
{  
  caption: 'Street food tour'  
}  
{  
  caption: 'Hyderabad marathon training'  
}  
{  
  caption: 'Sunday morning with coffee and a novel'  
}  
{  
  caption: 'OOTD Bangalore vibes'  
}
```

5. Find inactive users:

```
1 db.users.find(  
2   { isActive: false },  
3   { _id: 0, username: 1, lastSeen: 1 }  
4 )
```

Output:

```
> db.users.updateOne(  
    { username: "Aastha3_345" },    // find this user  
    {  
      $set: {  
        isActive: false,  
        lastSeen: new Date()    // set the current timestamp as last seen  
      }  
    }  
  );  
< {  
  acknowledged: true,  
  insertedId: null,  
  matchedCount: 1,  
  modifiedCount: 1,  
  upsertedCount: 0  
}  
> db.users.find(  
    { isActive: false },  
    { _id: 0, username: 1, lastSeen: 1 }  
  );  
< {  
  username: 'Aastha3_345',  
  lastSeen: 2025-09-03T11:00:36.932Z  
}
```

Phase 3: Geospatial Queries

Task 3.1: Location-Based Queries

1. Create a 2dsphere index:

```
1 db.users.createIndex({ location: "2dsphere" })
```

```
> db.users.createIndex({ location: "2dsphere" });
< location_2dsphere
```

Output:

Name & Definition	Type	Size	Usage	Properties	Status
> _id_	REGULAR ⓘ	36.9 KB	1 (since Thu Sep 04 2025)	UNIQUE ⓘ	READY
▽ location_2dsphere	GEOSPATIAL ⓘ	36.9 KB	0 (since Thu Sep 04 2025)		READY
location (2dsphere)					
> username_1	REGULAR ⓘ	20.5 KB	0 (since Thu Sep 04 2025)	UNIQUE ⓘ	READY
> email_1	REGULAR ⓘ	20.5 KB	0 (since Thu Sep 04 2025)	UNIQUE ⓘ	READY
> age_1	REGULAR ⓘ	20.5 KB	0 (since Thu Sep 04 2025)		READY
> screenTime_-1	REGULAR ⓘ	20.5 KB	0 (since Thu Sep 04 2025)		READY

2. Find users within 1000km radius of Ahmedabad:

```
1 db.users.aggregate([
2     { $geoNear: {
3         near: { type: "Point", coordinates: [72.5714, 23.0225] },
4         distanceField: "distanceInMeters",
5         maxDistance: 1000000,
6         spherical: true
7     }},
8     { $project: {
9         _id: 0,
10        name: "$username",
11        longitude: { $arrayElemAt: ["$location.coordinates", 0] },
12        latitude: { $arrayElemAt: ["$location.coordinates", 1] },
13        distanceInKm: { $round: [{ $divide: ["$distanceInMeters", 1000] }, 2] }
14    }
15 })
```

Output:

```
>_MONGOSH
> db.users.aggregate([
  {
    $geoNear: {
      near: { type: "Point", coordinates: [72.5714, 23.0225] }, // Ahmedabad
      distanceField: "distanceInMeters",
      maxDistance: 1000000,
      spherical: true
    }
  },
  {
    $project: {
      _id: 0,
      name: "$username",
      longitude: { $arrayElemAt: ["$location.coordinates", 0] },
      latitude: { $arrayElemAt: ["$location.coordinates", 1] },
      distanceInKm: { $round: [{ $divide: ["$distanceInMeters", 1000] }, 2] }
    }
  }
]);
< [
  {
    name: 'Aastha1_123',
    longitude: 72.5714,
    latitude: 23.0225,
    distanceInKm: 0
  },
  {
    name: 'Aastha6_678',
    longitude: 75.8577,
    latitude: 22.7196,
    distanceInKm: 338.74
  },
  {
    name: 'Aastha3_345',
    longitude: 72.8777,
    latitude: 19.076,
    distanceInKm: 440.47
  },
  {
    name: 'Aastha2_234',
    longitude: 77.1025,
    latitude: 28.7041,
    distanceInKm: 778.27
  }
]
```

```
{
  name: 'Aastha8_890',
  longitude: 78.4867,
  latitude: 17.385,
  distanceInKm: 880.48
}
{
  name: 'Aastha5_567',
  longitude: 80.9462,
  latitude: 26.8467,
  distanceInKm: 946.16
}
{
  name: 'Aastha7_789',
  longitude: 76.7794,
  latitude: 30.7333,
  distanceInKm: 954.4
}
```

3. Find the nearest user:

```
1 db.users.find({  
2   location: {  
3     $near: {  
4       $geometry: { type: "Point", coordinates: [72.6, 23.0] },  
5       $maxDistance: 1000000  
6     }  
7   }  
8 }).limit(1)
```

Output:

```
> db.users.find({  
  location: {  
    $near: {  
      $geometry: { type: "Point", coordinates: [72.6, 23.0] },  
      $maxDistance: 1000000 // optional: within 1000 km  
    }  
  }  
}).limit(1)  
< {  
  _id: ObjectId('68b7fbf3e96bf8edff5b1bfe'),  
  username: 'Aastha1_123',  
  fullName: 'Aastha1',  
  email: 'aastha1_123@gmail.com',  
  age: 29,  
  bio: 'Basketball for life',  
  interests: [  
    'Sports',  
    'Travel',  
    'Food'  
,  
    location: {  
      type: 'Point',  
      coordinates: [  
        72.5714,  
        23.0225  
      ]  
    },  
    screenTime: 105,  
    followersCount: 6000,  
    followingCount: 3000,  
    isActive: true,  
    createdAt: 2025-01-15T10:20:36.553Z,  
    lastSeen: 2025-09-02T12:09:36.553Z  
  ]
```

4. Get users from multiple cities:

```
1 db.users.find(  
2   { "location.city": { $in: ["Mumbai", "Kolkata", "Bengaluru"] } },  
3   { _id: 0, username: 1, "location.city": 1 }  
4 )
```

Output:

```
> db.users.find(  
  { "location.city": { $in: ["Mumbai", "Kolkata", "Bengaluru"] } },  
  { _id: 0, username: 1, "location.city": 1 }  
< {  
    username: 'Aastha1_123',  
    location: {  
      city: 'Mumbai'  
    }  
  }  
  {  
    username: 'Aastha3_345',  
    location: {  
      city: 'Bengaluru'  
    }  
  }  
  {  
    username: 'Aastha9_901',  
    location: {  
      city: 'Kolkata'  
    }  
  }
```

5. Calculate distance between two users:

```
1 db.users.aggregate([  
2   { $match: { username: { $in: ["Aastha1_123", "Aastha5_567"] } } },  
3   { $project: { username: 1, city: "$location.city", coordinates: "$location.  
  coordinates" } },  
4   { $group: { _id: null, users: { $push: "$$ROOT" } } },  
5   { $project: { user1: { $arrayElemAt: ["$users", 0] }, user2: { $arrayElemAt:  
  [ "$users", 1] } } },  
6   { $addFields: {  
7     distanceInKm: {  
8       $function: {  
9         body: function(coords1, coords2) {  
10           const [lon1, lat1] = coords1;  
11           const [lon2, lat2] = coords2;  
12           const toRad = (val) => (val * Math.PI) / 180;  
13           const R = 6371;  
14           const dLat = toRad(lat2 - lat1);  
15           const dLon = toRad(lon2 - lon1);  
16           const a = Math.sin(dLat / 2) ** 2 + Math.cos(toRad(lat1)) * Math.cos(  
             toRad(lat2)) * Math.sin(dLon / 2) ** 2;
```

```

17     const c = 2 * Math.atan2(Math.sqrt(a), Math.sqrt(1 - a));
18     return R * c;
19   },
20   args: ["$user1.coordinates", "$user2.coordinates"],
21   lang: "js"
22 }
23 }
24 ],
25 { $project: {
26   _id: 0,
27   "user1.username": 1,
28   "user1.city": 1,
29   "user2.username": 1,
30   "user2.city": 1,
31   distanceInKm: 1
32 }
33 ])

```

Output:

```

>_MONGOSH
> db.users.aggregate([
  {
    $match: {
      username: { $in: ["Aastha1_123", "Aastha5_567"] }
    }
  },
  {
    $project: {
      username: 1,
      city: "$location.city",
      coordinates: "$location.coordinates"
    }
  },
  {
    $group: {
      _id: null,
      users: { $push: "$$ROOT" }
    }
  },
  {
    $project: {
      user1: { $arrayElemAt: ["$users", 0] },
      user2: { $arrayElemAt: ["$users", 1] }
    }
  },
  {
    $addFields: {
      distanceInKm: {
        $divide: [
          {
            $function: {
              body: function(coords1, coords2) {
                // Haversine formula
                const [lon1, lat1] = coords1;
                const [lon2, lat2] = coords2;
                const toRad = (val) => (val * Math.PI) / 180;
                const R = 6371; // Earth radius in km
                const dLat = toRad(lat2 - lat1);
                const dLon = toRad(lon2 - lon1);
                const a =
                  Math.sin(dLat / 2) ** 2 +
                  Math.cos(toRad(lat1)) *
                  Math.cos(toRad(lat2)) *
                  Math.sin(dLon / 2) ** 2;
                const c = 2 * Math.atan2(Math.sqrt(a), Math.sqrt(1 - a));
                return R * c;
              },
            }
          ]
        }
      }
    }
  }
])

```

```
        },
        args: ["$user1.coordinates", "$user2.coordinates"],
        lang: "js"
    }
},
1
]
}
},
{
$project: {
    _id: 0,
    "user1.username": 1,
    "user1.city": 1,
    "user2.username": 1,
    "user2.city": 1,
    distanceInKm: 1
}
}
]);
< {
    user1: {
        username: 'Aastha1_123',
        city: 'Mumbai'
    },
    user2: {
        username: 'Aastha5_567',
        city: 'Ahmedabad'
    },
    distanceInKm: 439.97982267462703
}
```

Aggregation & Analytics

1. Trending content (Top 5 most liked posts):

```
1 db.posts.aggregate([
2   { $sort: { likes: -1 } },
3   { $limit: 5 }
4 ])
```

Output:

```
> db.posts.aggregate([
    { $sort: { likes: -1 } },
    { $limit: 5 },
    {
      $lookup: {
        from: "users",
        localField: "userId",
        foreignField: "_id",
        as: "user"
      }
    },
    { $unwind: "$user" },
    {
      $project: {
        _id: 0,
        post: "$caption", // or "$content" if caption is empty
        username: "$user.username"
      }
    }
  ]);
< [
  {
    post: 'OOTD Bangalore vibes',
    username: 'Aastha10_012'
  },
  {
    post: 'Street food tour',
    username: 'Aastha6_678'
  },
  {
    post: 'Hyderabad marathon training',
    username: 'Aastha8_890'
  },
  {
    post: '15 minute yoga session',
    username: 'Aastha5_567'
  },
  {
    post: 'Finished a watercolor painting',
    username: 'Aastha3_345'
  }
]
```

2. Most Active Users (Top 5 by Number of Posts):

```
1 db.posts.aggregate([
2   { $group: { _id: "$userId", totalPosts: { $sum: 1 } } },
3   { $sort: { totalPosts: -1 } },
4   { $limit: 5 },
5   { $lookup: {
6     from: "users",
7     localField: "_id",
8     foreignField: "_id",
9     as: "user"
10 },
11   { $unwind: "$user" },
12   { $project: { _id: 0, username: "$user.username", totalPosts: 1 } }
13 ])
```

Output:

```
> db.posts.aggregate([
  { $group: { _id: "$userId", totalPosts: { $sum: 1 } } },
  { $sort: { totalPosts: -1 } },
  { $limit: 5 },
  {
    $lookup: {
      from: "users",
      localField: "_id",
      foreignField: "_id",
      as: "user"
    }
  },
  { $unwind: "$user" },
  { $project: { _id: 0, username: "$user.username", totalPosts: 1 } }
]);
< [
  {
    totalPosts: 1,
    username: 'Aastha10_012'
  }
  {
    totalPosts: 1,
    username: 'Aastha9_901'
  }
  {
    totalPosts: 1,
    username: 'Aastha6_678'
  }
  {
    totalPosts: 1,
    username: 'Aastha1_123'
  }
  {
    totalPosts: 1,
    username: 'Aastha8_890'
  }
]
```

3. Top 3 Content Categories:

```
1 db.posts.aggregate([
2   { $group: { _id: "$content", totalPosts: { $sum: 1 } } },
3   { $sort: { totalPosts: -1 } },
4   { $limit: 3 }
5 ])
```

Output:

```
> db.posts.aggregate([
  { $group: { _id: "$content", totalPosts: { $sum: 1 } } },
  { $sort: { totalPosts: -1 } },
  { $limit: 3 }
]);
< [
  {
    _id: 'fitness',
    totalPosts: 2
  }
  {
    _id: 'health',
    totalPosts: 1
  }
  {
    _id: 'books',
    totalPosts: 1
  }
]
```

4. User Engagement Score:

```
1 db.posts.aggregate([
2   { $project: {
3     userId: 1,
4     engagement: { $add: ["$likes", "$comments", "$shares"] }
5   }},
6   { $group: { _id: "$userId", totalEngagement: { $sum: "$engagement" } } },
7   { $sort: { totalEngagement: -1 } },
8   { $lookup: {
9     from: "users",
10    localField: "_id",
11    foreignField: "_id",
12    as: "user"
13  }},
14  { $unwind: "$user" },
15  { $project: { _id: 0, username: "$user.username", totalEngagement: 1 } }
16 ])
```

Output:

```
>_MONGOSH
> db.posts.aggregate([
  {
    $project: {
      userId: 1,
      engagement: { $add: ["$likes", "$comments", "$shares"] }
    }
  },
  { $group: { _id: "$userId", totalEngagement: { $sum: "$engagement" } } },
  { $sort: { totalEngagement: -1 } },
  {
    $lookup: {
      from: "users",
      localField: "_id",
      foreignField: "_id",
      as: "user"
    }
  },
  { $unwind: "$user" },
  { $project: { _id: 0, username: "$user.username", totalEngagement: 1 } }
]);
< [
  {
    totalEngagement: 13250,
    username: 'Aastha10_012'
  },
  {
    totalEngagement: 9520,
    username: 'Aastha6_678'
  },
  {
    totalEngagement: 5830,
    username: 'Aastha8_890'
  },
  {
    totalEngagement: 2230,
    username: 'Aastha5_567'
  },
  {
    totalEngagement: 1105,
    username: 'Aastha3_345'
  },
  {
    totalEngagement: 948,
    username: 'Aastha9_901'
  },
  {
    totalEngagement: 606,
    username: 'Aastha4_456'
  },
  {
    totalEngagement: 535,
    username: 'Aastha2_234'
  }
]
```

5. Top Hashtags Used:

```
1 db.posts.aggregate([
2   { $unwind: "$hashtags" },
3   { $group: { _id: "$hashtags", count: { $sum: 1 } } },
4   { $sort: { count: -1 } }
5 ])
```

Output:

```
> db.posts.aggregate([
  { $unwind: "$hashtags" },
  { $group: { _id: "$hashtags", count: { $sum: 1 } } },
  { $sort: { count: -1 } },
  { $limit: 10 }
]);
< [
  {
    _id: '#fitness',
    count: 2
  },
  {
    _id: '#coffee',
    count: 1
  },
  {
    _id: '#mindfulness',
    count: 1
  },
  {
    _id: '#yoga',
    count: 1
  },
  {
    _id: '#motivation',
    count: 1
  },
  {
    _id: '#reading',
    count: 1
  },
  {
    _id: '#creativity',
    count: 1
  },
  {
    _id: '#indore',
    count: 1
  },
  {
    _id: '#developer',
    count: 1
  },
  {
    _id: '#lifestyle',
    count: 1
  }
]
```

Indexing for Performance

User Collection Indexes

```
1 db.users.createIndex({ username: 1 }, { unique: true })
2 db.users.createIndex({ email: 1 }, { unique: true })
3 db.users.createIndex({ age: 1 })
4 db.users.createIndex({ screenTime: -1 })
```

```
> db.users.createIndex({ username: 1 }, { unique: true });
    db.users.createIndex({ email: 1 }, { unique: true });
< email_1
> db.users.createIndex({ username: 1 }, { unique: true });
    db.users.createIndex({ email: 1 }, { unique: true });
< email_1
> db.users.createIndex({ age: 1 });
    db.users.createIndex({ screenTime: -1 });
< screenTime_-1
```

Output:

Name & Definition	Type	Size	Usage	Properties	Status
> _id_	REGULAR ⓘ	36.9 KB	1 (since Thu Sep 04 2025)	UNIQUE ⓘ	READY
✓ location_2dsphere	GEOSPATIAL ⓘ	36.9 KB	0 (since Thu Sep 04 2025)		READY
location (2dsphere)					
> username_1	REGULAR ⓘ	20.5 KB	0 (since Thu Sep 04 2025)	UNIQUE ⓘ	READY
> email_1	REGULAR ⓘ	20.5 KB	0 (since Thu Sep 04 2025)	UNIQUE ⓘ	READY
> age_1	REGULAR ⓘ	20.5 KB	0 (since Thu Sep 04 2025)		READY
> screenTime_-1	REGULAR ⓘ	20.5 KB	0 (since Thu Sep 04 2025)		READY

Advanced Real-World Scenarios in UrbanWave

1. Top Influencers (Users with Followers more than 10,000):

```
1 db.users.find(  
2   { followersCount: { $gt: 10000 } },  
3   { _id: 0, username: 1, followersCount: 1 }  
4 )
```

Output:

```
> db.users.find(  
  { followersCount: { $gt: 10000 } },  
  { _id: 0, username: 1, followersCount: 1 }  
)  
< [  
  {  
    username: 'Aastha8_890',  
    followersCount: 15000  
  },  
  {  
    username: 'Aastha10_012',  
    followersCount: 20000  
  }  
]
```

2. Friend-of-Friend Suggestions (2nd Degree Connections):

```
1 // Suggest users followed by your followers  
2 db.followers.aggregate([  
3   { $match: { followerId: ObjectId("68b7fbf3e96bf8edff5b1bfe") } },  
4   { $lookup: {  
5     from: "followers",  
6     localField: "followingId",  
7     foreignField: "followerId",  
8     as: "friendsOfFriends"  
9   }},  
10  { $unwind: "$friendsOfFriends" },  
11  { $project: { _id: 0, suggestedUser: "$friendsOfFriends.followingId" } }  
12 ])
```

Output:

```
> db.followers.aggregate([
  { $match: { followerId: ObjectId("68b7fbf3e96bf8edff5b1bfe") } },
  { $lookup: {
    from: "followers",
    localField: "followingId",
    foreignField: "followerId",
    as: "friendsOfFriends"
  }},
  { $unwind: "$friendsOfFriends" },
  { $project: { _id: 0, suggestedUser: "$friendsOfFriends.followingId" } }
])
< [
  {
    suggestedUser: ObjectId('68b7fbf3e96bf8edff5b1bfe')
  },
  {
    suggestedUser: ObjectId('68b7fbf3e96bf8edff5b1c00')
  },
  {
    suggestedUser: ObjectId('68b7fbf3e96bf8edff5b1c01')
  },
  {
    suggestedUser: ObjectId('68b7fbf3e96bf8edff5b1c02')
  },
  {
    suggestedUser: ObjectId('68b7fbf3e96bf8edff5b1c03')
  },
  {
    suggestedUser: ObjectId('68b7fbf3e96bf8edff5b1c04')
  }
]
```

3. Content Diversity Score (Different Categories per User):

```
1 db.posts.aggregate([
2   { $group: { _id: "$userId", categories: { $addToSet: "$content" } } },
3   { $project: {
4     username: "$_id",
5     diversityScore: { $size: "$categories" }
6   }},
7   { $sort: { diversityScore: -1 } }
8 ])
```

Output:

```
> db.posts.aggregate([
  { $group: { _id: "$userId", categories: { $addToSet: "$content" } }},
  { $project: {
    username: "$_id",
    diversityScore: { $size: "$categories" }
  }},
  { $sort: { diversityScore: -1 } }
])
< [
  {
    _id: ObjectId('68b7fbf3e96bf8edff5b1c02'),
    username: ObjectId('68b7fbf3e96bf8edff5b1c02'),
    diversityScore: 1
  },
  {
    _id: ObjectId('68b7fbf3e96bf8edff5b1bfe'),
    username: ObjectId('68b7fbf3e96bf8edff5b1bfe'),
    diversityScore: 1
  },
  {
    _id: ObjectId('68b7fbf3e96bf8edff5b1bff'),
    username: ObjectId('68b7fbf3e96bf8edff5b1bff'),
    diversityScore: 1
  },
  {
    _id: ObjectId('68b7fbf3e96bf8edff5b1c06'),
    username: ObjectId('68b7fbf3e96bf8edff5b1c06'),
    diversityScore: 1
  }
]
```