**Fraud Detection and Risk Analysis in Cross River Bank**

**CRUD Operations**

**1. MongoDB Commands:**

**Sample Input:**

{

    "loan\_id": 2001,

    "customer\_id": 101,

    "feedback\_text": "The loan approval process was seamless, but the interest rate was slightly higher than expected.",

    "sentiment\_score": 0.7,

    "feedback\_category": "Approval Process",

    "escalation\_flag": false,

    "escalation\_reason": null,

    "timestamp": "2024-11-15T10:30:00Z"

}

Using insert document function in customer\_feedback table.

**2. Update Escalation Flags**

There is no document with loan ID: 2002 and customer\_id: 102

Hence updated loan\_id:1 (Please check Json File) using Update operation

{ "loan\_id": 1, "customer\_id": 525 },

{ $set: { "escalation\_reason": "Delayed response from customer service" } }

);

**3. Remove Duplicate Behavior Logs**

Removed duplicates using Aggregation stages

Stage1: **$group**

{ $group: { \_id: { customer\_id: "$customer\_id", timestamp: "$timestamp" }, uniqueLogs: { $first: "$$ROOT" } };

Stage2: **$replaceRoot**

{ $replaceRoot: { newRoot: "$uniqueLogs" }

**4. Retrieve Positive Feedback**

{ "sentiment\_score": { $gt: 0.5 } } received 1 result as no other file in customer feedback except the one entered manually has sentiment score of 0.7

**5. Fetch Logs for 'Missed Payment' Actions – 1216 Results**

{remarks:"Payment missed."}

**6. Aggregate Pipeline for Risk Scoring**

Aggregation stages used are as below:

Stage1: { $lookup: { from: "behavior\_logs", localField: "customer\_id", foreignField: "customer\_id", as: "behavior\_data" }

Stage2: { $unwind: "$behavior\_data" }

Stage3: { $group: { \_id: "$customer\_id", avgSentiment: { $avg: "$sentiment\_score" }, totalMissedPayments: { $sum: { $cond: [{ $eq: ["$behavior\_data.action", "Missed Payment"] }, 1, 0] } }, totalEscalations: { $sum: { $cond: [{ $eq: ["$escalation\_flag", true] }, 1, 0] } }, totalSessionDuration: { $sum: "$behavior\_data.session\_duration" } }

Stage4: $addFields: { risk\_score: { $add: [ { $multiply: ["$totalMissedPayments", 3] }, { $multiply: [{ $subtract: [1, "$avgSentiment"] }, 2] }, { $divide: ["$totalSessionDuration", 1000] }, "$totalEscalations" ] }

Stage5: { $sort: { risk\_score: -1 }

Stage6: { $limit: 10 }

**Summary**:

1. There are a total of 516 customers with high risk loans with 4 major Loan purposes
2. Customers that paid more than 30% of the loan amount are 825
3. There are 892 Missed EMI transactions per loan excluding multiple transactions. However, total missed EMIs are 1216
4. West Josephport has the Highest loan count of 11
5. There are 1000 customers associated with Cross River bank for more than 5 years
6. Total of 1000 customers have excellent repayment scores

**Conclusion**:

Although there are Outliers and missed EMIs, Cross River Bank is able to maintain a total of 75% of repayment rate. Almost half of their Loans are High Risk Loans which can be maintained at a ratio of 2:3 or 1:4 to increase the loan payment rates. There is a 50% Positive feedback received on basis of Repayment flexibility. However, more no of escalations are due to High Interest rates. Therefore, interest rates can be made competitive with other banks to improve.