

API References

API Endpoints - Complete Reference Guide

1. Prediction Endpoints

POST /api/predict/churn

Purpose: Get real-time churn prediction for a specific customer

Input: { "customer_id": 12345 }

Output:

```
{  
  "customer_id": 12345,  
  "churn_probability": 0.78,  
  "risk_category": "Critical",  
  "top_reasons": [  
    "52 days since last booking (+0.34)",  
    "Searched competitors recently (+0.21)",  
    "Price-sensitive segment (+0.13)"  
],  
  "predicted_ltv": 45000,  
  "recommended_action": "Offer Tk 300 discount"  
}
```

Use Case: When admin/analyst clicks on a customer to see their churn risk

GET /api/predictions/at-risk

Purpose: List all customers with high churn risk (>60%)

Query Params: ?risk_level=high&limit=50&offset=0

Output: Array of customers sorted by churn probability (highest first)

Use Case: Dashboard showing "Customers Needing Immediate Attention"

GET /api/predictions/dashboard

Purpose: Summary statistics for the main dashboard

Output:

```
{  
    "total_customers": 10000,  
    "at_risk_count": 2340,  
    "critical_risk_count": 456,  
    "avg_churn_rate": 0.234,  
    "retention_rate": 0.766,  
    "risk_distribution": {  
        "low": 6500,  
        "medium": 1160,  
        "high": 1884,  
        "critical": 456  
    }  
}
```

Use Case: Top-level KPI cards on admin dashboard

2. Intervention Endpoints

GET /api/interventions/pending

Purpose: Show queue of AI-suggested interventions awaiting human approval

Output: List of pending interventions with customer details, suggested action, expected ROI

Use Case: "Intervention Approval Queue" page where admin reviews and approves/rejects AI suggestions

POST /api/interventions/approve

Purpose: Approve an AI-suggested intervention and trigger execution

Input:

```
{  
  "intervention_id": 789,  
  "approved_by": "admin_user_123",  
  "modifications": {  
    "discount_amount": 250 // Optional: override AI suggestion  
  }  
}
```

Action: Moves intervention to "approved" status, triggers notification service to send SMS/email

Use Case: Admin clicks "Approve" button on intervention card

POST /api/interventions/reject

Purpose: Reject an AI suggestion with optional reason

Input: { "intervention_id": 789, "reason": "Customer already contacted" }

Action: Marks intervention as rejected, logs reason for model improvement

Use Case: Admin clicks "Reject" button

GET /api/interventions/history

Purpose: View past interventions with outcomes

Query Params: ?customer_id=123&status=completed&date_from=2024-01-01

Output: Historical interventions showing: action taken, cost, whether customer returned, actual ROI

Use Case: "Intervention Performance" analytics page, A/B testing results

3. Customer Endpoints

GET /api/customers/:id

Purpose: Complete customer profile with all predictions and history

Output:

```
{  
    "customer_id": 12345,  
    "name": "Rahima Ahmed",  
    "location": "Dhaka",  
    "last_booking": "2024-09-10",  
    "total_bookings": 8,  
    "total_spent": 12400,  
    "churn_risk": 0.78,  
    "segment": "Price-Sensitive",  
    "loyalty_tier": "Silver",  
    "ltv_prediction": 45000,  
    "booking_history": [...],  
    "intervention_history": [...]  
}
```

Use Case: Customer detail view when admin clicks on a customer name

GET /api/customers/:id/loyalty

Purpose: Get customer's loyalty tier, benefits, and progress

Output:

```
{  
    "current_tier": "Silver",  
    "next_tier": "Gold",  
    "progress_to_next": 0.65,  
    "benefits": [  
        "10% discount on all services",  
        "Priority booking",  
        "Free AC maintenance reminder"  
    ],  
    "requirements_for_gold": {  
        "bookings_needed": 3,  
        "spend_needed": 5000  
    }  
}
```

```
    }  
}
```

Use Case: Customer-facing loyalty page, shows their tier badge and benefits

GET /api/customers/:id/offers

Purpose: Get personalized offers available for this customer

Output:

```
{  
  "active_offers": [  
    {  
      "offer_id": "DISC300",  
      "type": "discount",  
      "amount": 300,  
      "message": "We miss you! Tk 300 off your next booking",  
      "valid_until": "2024-12-01",  
      "services": ["AC", "Cleaning"]  
    }  
  ]  
}
```

Use Case: Customer portal "My Offers" section, or SMS/email content

POST /api/customers/:id/redeem

Purpose: Redeem a discount code during booking

Input: { "offer_code": "DISC300", "booking_amount": 1500 }

Output:

```
{  
  "success": true,  
  "discount_applied": 300,  
  "final_amount": 1200,
```

```
    "payment_methods": ["bKash", "Nagad", "Bank"]  
}
```

Action: Validates code, applies discount, logs redemption

Use Case: Checkout flow when customer enters discount code

4. Analytics Endpoints

GET /api/analytics/retention

Purpose: Retention metrics over time

Query Params: ?period=monthly&months=12

Output:

```
{  
  "current_retention_rate": 0.45,  
  "previous_retention_rate": 0.35,  
  "improvement": 0.10,  
  "monthly_trend": [  
    { "month": "2024-01", "retention": 0.35 },  
    { "month": "2024-02", "retention": 0.37 },  
    ...  
  ],  
  "cohort_retention": {  
    "month_0": 1.0,  
    "month_1": 0.68,  
    "month_3": 0.45,  
    "month_6": 0.38  
  }  
}
```

Use Case: Retention curve chart on analyst dashboard

GET /api/analytics/roi

Purpose: ROI tracking for interventions

Output:

```
{  
    "total_interventions": 1250,  
    "total_cost": 375000,  
    "customers_retained": 850,  
    "revenue_recovered": 42500000,  
    "roi_percentage": 11233,  
    "avg_roi_per_intervention": 33900,  
    "by_segment": {  
        "price_sensitive": { "roi": 8500, "count": 600 },  
        "high_value": { "roi": 25000, "count": 400 }  
    }  
}
```

Use Case: ROI dashboard showing financial impact of retention efforts

GET /api/analytics/segments

Purpose: Customer segment distribution and characteristics

Output:

```
{  
    "segments": [  
        {  
            "name": "Price-Sensitive",  
            "count": 3200,  
            "avg_ltv": 25000,  
            "churn_rate": 0.45,  
            "characteristics": "Frequent discount users, low avg spend"  
        },  
        {  
            "name": "High-Value Loyal",  
            "count": 1800,  
            "avg_ltv": 85000,  
            "churn_rate": 0.15,  
            "characteristics": "Loyal customers, high average lifetime value"  
        }  
    ]  
}
```

```
        "characteristics": "Monthly bookings, premium services"
    }
]
}
```

Use Case: Segment visualization pie chart, segment-specific strategies

GET /api/analytics/revenue

Purpose: Revenue recovery tracking

Output:

```
{
  "baseline_revenue": 520000000,
  "projected_loss_without_ai": 520000000,
  "actual_revenue_with_ai": 640000000,
  "revenue_recovered": 120000000,
  "monthly_breakdown": [...]
}
```

Use Case: Executive dashboard showing business impact in Tk

5. Admin Endpoints

POST /api/admin/retrain

Purpose: Trigger model retraining with latest data

Input: { "models": ["churn", "ltv", "segmentation"] }

Action: Starts background job to retrain specified models

Output: { "job_id": "retrain_20241101_001", "status": "started" }

Use Case: Admin clicks "Retrain Models" button monthly or when data patterns change

GET /api/admin/model-performance

Purpose: Monitor ML model health

Output:

```
{  
  "churn_model": {  
    "accuracy": 0.83,  
    "precision": 0.81,  
    "recall": 0.79,  
    "f1_score": 0.80,  
    "last_trained": "2024-10-15",  
    "prediction_count_today": 10000  
},  
  "ltv_model": {  
    "mae": 3200,  
    "rmse": 4500,  
    "r2_score": 0.76  

```

Use Case: Model monitoring dashboard, alerts if accuracy drops below threshold

POST /api/admin/settings

Purpose: Update system configuration

Input:

```
{  
  "churn_threshold": 0.65,  
  "intervention_auto_approve": false,  
  "max_discount_amount": 500,  
  "notification_channels": ["sms", "email"]  
}
```

Action: Updates system settings in database

Use Case: Settings page for configuring business rules and thresholds

Quick Reference Table

Endpoint	Method	Primary User	Key Purpose
/api/predict/churn	POST	Admin/Analyst	Get single customer risk
/api/predictions/at-risk	GET	Admin	List high-risk customers
/api/predictions/dashboard	GET	Admin	Dashboard KPIs
/api/interventions/pending	GET	Admin	Approval queue
/api/interventions/approve	POST	Admin	Approve AI suggestion
/api/interventions/reject	POST	Admin	Reject AI suggestion
/api/interventions/history	GET	Analyst	Past performance
/api/customers/:id	GET	Admin/Analyst	Full customer profile
/api/customers/:id/loyalty	GET	Customer	Tier & benefits
/api/customers/:id/offers	GET	Customer	Available discounts
/api/customers/:id/redeem	POST	Customer	Use discount code
/api/analytics/retention	GET	Analyst	Retention trends
/api/analytics/roi	GET	Analyst/Admin	Financial impact
/api/analytics/segments	GET	Analyst	Segment insights
/api/analytics/revenue	GET	Executive	Revenue recovery
/api/admin/retrain	POST	Admin	Update models
/api/admin/model-performance	GET	Admin	Model health
/api/admin/settings	POST	Admin	Configure system

This structure ensures clear separation of concerns: **Prediction** (AI outputs), **Intervention** (actions), **Customer** (profiles/offers), **Analytics** (insights), and **Admin** (system management).