

# Library Management System

The library management system is designed to organize and manage various resources, entities, and their relationships within a library setting. At the core of this system are several key entities: **Author**, **Publisher**, **Category**, **Library\_Branch**, **Staff**, **Member**, **Book**, **Borrowing**, **Reservation**, and **Fine**.

Each **Author** has a unique Author\_ID and attributes including First\_Name, Last\_Name, and Nationality. Authors write books, forming a one-to-many relationship where an author can write multiple books, but each book is written by one author.

**Publishers** are identified by a unique Publisher\_ID and include attributes such as Publisher\_Name, Contact\_Email, and Contact\_Phone. Publishers are responsible for publishing books, creating another one-to-many relationship where each publisher can publish many books, but each book is published by one publisher.

**Books** are categorized under Category, which includes a unique Category\_ID and Category\_Name. A category can encompass multiple books, yet each book belongs to only one category, establishing a one-to-many relationship.

The **Library\_Branch** entity represents different branches of the library, each identified by a Branch\_ID and including attributes such as Branch\_Name, Location, and Phone. Each branch employs multiple staff members, forming a one-to-many relationship where each staff member is associated with one branch, but a branch can have many staff members.

**Staff** members, identified by Staff\_ID, have attributes including First\_Name, Last\_Name, Email, and Phone. Staff members process borrowing transactions, creating a many-to-one relationship where many borrowings can be processed by one staff member.

**Members** are patrons of the library, each identified by a Member\_ID with attributes such as First\_Name, Last\_Name, Email, Phone, Membership\_Date, and Date\_Of\_Birth. Members can borrow multiple books, and each borrowing transaction is associated with one member, establishing a many-to-one relationship.

**Books** are central to the system and are identified by a unique Book\_ID with attributes including Title, ISBN, Publication\_Year, and Price. Books can be borrowed and reserved by members. Each book can be borrowed multiple times (many-to-one) and can be reserved multiple times (many-to-one).

The **Borrowing** entity records the borrowing of books, identified by Borrowing\_ID, and includes attributes such as Borrow\_Date and Return\_Date. Each borrowing is associated with one member and

one book. Additionally, a borrowing transaction can incur multiple fines, forming a one-to-many relationship where one borrowing can result in many fines, but each fine is linked to a single borrowing.

The **Reservation** entity tracks book reservations, identified by `Reservation_ID`, and includes `Reservation_Date` and `Status`. Members can make multiple reservations, each reservation being linked to one member and one book, establishing a many-to-one relationship for both.

Lastly, **Fines** are imposed for overdue borrowings and are identified by `Fine_ID` with attributes such as `Amount` and `Payment_Date`. Each fine is associated with a specific borrowing, reflecting the one-to-many relationship.

This system efficiently manages the interactions between authors, publishers, categories, library branches, staff, members, books, borrowings, reservations, and fines, ensuring smooth operations and record-keeping within the library.