**What is MySQLdb?**

MySQLdb is an interface for connecting to a MySQL database server from Python. It implements the Python Database API v2.0 and is built on top of the MySQL C API.

How do I Install MySQLdb?

Before proceeding, you make sure you have MySQLdb installed on your machine. Just type the following in your Python script and execute it −

#!/usr/bin/python

import MySQLdb

If it produces the following result, then it means MySQLdb module is not installed −

Traceback (most recent call last):

File "test.py", line 3, in <module>

import MySQLdb

ImportError: No module named MySQLdb

To install MySQLdb module, use the following command −

For Ubuntu, use the following command -

$ sudo apt-get install python-pip python-dev libmysqlclient-dev

For Fedora, use the following command -

$ sudo dnf install python python-devel mysql-devel redhat-rpm-config gcc

For Python command prompt, use the following command -

pip install MySQL-python

**Note** − Make sure you have root privilege to install above module.

Database Connection

Before connecting to a MySQL database, make sure of the followings −

* You have created a database TESTDB.
* You have created a table EMPLOYEE in TESTDB.
* This table has fields FIRST\_NAME, LAST\_NAME, AGE, SEX and INCOME.
* User ID "testuser" and password "test123" are set to access TESTDB.
* Python module MySQLdb is installed properly on your machine.
* You have gone through MySQL tutorial to understand [MySQL Basics.](https://www.tutorialspoint.com/mysql/index.htm)

Example

Following is the example of connecting with MySQL database "TESTDB"

#!/usr/bin/python

import MySQLdb

# Open database connection

db = MySQLdb.connect("localhost","testuser","test123","TESTDB" )

# prepare a cursor object using *cursor()* method

cursor = db.cursor()

# execute SQL query using *execute()* method.

cursor.execute("SELECT VERSION()")

# Fetch a single row using *fetchone()* method.

data = cursor.fetchone()

print "Database version : %s " % data

# disconnect from server

db.close()

While running this script, it is producing the following result in my Linux machine.

Database version : 5.0.45

If a connection is established with the datasource, then a Connection Object is returned and saved into **db** for further use, otherwise **db** is set to None. Next, **db** object is used to create a **cursor** object, which in turn is used to execute SQL queries. Finally, before coming out, it ensures that database connection is closed and resources are released.

Creating Database Table

Once a database connection is established, we are ready to create tables or records into the database tables using **execute** method of the created cursor.

Example

Let us create Database table EMPLOYEE −

#!/usr/bin/python

import MySQLdb

# Open database connection

db = MySQLdb.connect("localhost","testuser","test123","TESTDB" )

# prepare a cursor object using *cursor()* method

cursor = db.cursor()

# Drop table if it already exist using *execute()* method.

cursor.execute("DROP TABLE IF EXISTS EMPLOYEE")

# Create table as per requirement

sql = """CREATE TABLE EMPLOYEE (

FIRST\_NAME CHAR(20) NOT NULL,

LAST\_NAME CHAR(20),

AGE INT,

SEX CHAR(1),

INCOME FLOAT )"""

cursor.execute(sql)

# disconnect from server

db.close()

INSERT Operation

It is required when you want to create your records into a database table.

Example

The following example, executes SQL *INSERT* statement to create a record into EMPLOYEE table −

#!/usr/bin/python

import MySQLdb

# Open database connection

db = MySQLdb.connect("localhost","testuser","test123","TESTDB" )

# prepare a cursor object using *cursor()* method

cursor = db.cursor()

# Prepare SQL query to INSERT a record into the database.

sql = """INSERT INTO EMPLOYEE(FIRST\_NAME,

LAST\_NAME, AGE, SEX, INCOME)

VALUES ('Mac', 'Mohan', 20, 'M', 2000)"""

try:

# Execute the SQL command

cursor.execute(sql)

# Commit your changes in the database

db.commit()

except:

# Rollback in case there is any error

db.rollback()

# disconnect from server

db.close()

Above example can be written as follows to create SQL queries dynamically −

#!/usr/bin/python

import MySQLdb

# Open database connection

db = MySQLdb.connect("localhost","testuser","test123","TESTDB" )

# prepare a cursor object using *cursor()* method

cursor = db.cursor()

# Prepare SQL query to INSERT a record into the database.

sql = "INSERT INTO EMPLOYEE(FIRST\_NAME, \

LAST\_NAME, AGE, SEX, INCOME) \

VALUES ('%s', '%s', '%d', '%c', '%d' )" % \

('Mac', 'Mohan', 20, 'M', 2000)

try:

# Execute the SQL command

cursor.execute(sql)

# Commit your changes in the database

db.commit()

except:

# Rollback in case there is any error

db.rollback()

# disconnect from server

db.close()

Example

Following code segment is another form of execution where you can pass parameters directly −

..................................

user\_id = "test123"

password = "password"

con.execute('insert into Login values("%s", "%s")' % \

(user\_id, password))

..................................

READ Operation

READ Operation on any database means to fetch some useful information from the database.

Once our database connection is established, you are ready to make a query into this database. You can use either **fetchone()** method to fetch single record or **fetchall()** method to fetech multiple values from a database table.

* **fetchone()** − It fetches the next row of a query result set. A result set is an object that is returned when a cursor object is used to query a table.
* **fetchall()** − It fetches all the rows in a result set. If some rows have already been extracted from the result set, then it retrieves the remaining rows from the result set.
* **rowcount** − This is a read-only attribute and returns the number of rows that were affected by an execute() method.

Example

The following procedure queries all the records from EMPLOYEE table having salary more than 1000 −

#!/usr/bin/python

import MySQLdb

# Open database connection

db = MySQLdb.connect("localhost","testuser","test123","TESTDB" )

# prepare a cursor object using *cursor()* method

cursor = db.cursor()

sql = "SELECT \* FROM EMPLOYEE \

WHERE INCOME > '%d'" % (1000)

try:

# Execute the SQL command

cursor.execute(sql)

# Fetch all the rows in a list of lists.

results = cursor.fetchall()

for row in results:

fname = row[0]

lname = row[1]

age = row[2]

sex = row[3]

income = row[4]

# Now print fetched result

print "fname=%s,lname=%s,age=%d,sex=%s,income=%d" % \

(fname, lname, age, sex, income )

except:

print "Error: unable to fecth data"

# disconnect from server

db.close()

This will produce the following result −

fname=Mac, lname=Mohan, age=20, sex=M, income=2000

Update Operation

UPDATE Operation on any database means to update one or more records, which are already available in the database.

The following procedure updates all the records having SEX as **'M'**. Here, we increase AGE of all the males by one year.

Example

#!/usr/bin/python

import MySQLdb

# Open database connection

db = MySQLdb.connect("localhost","testuser","test123","TESTDB" )

# prepare a cursor object using *cursor()* method

cursor = db.cursor()

# Prepare SQL query to UPDATE required records

sql = "UPDATE EMPLOYEE SET AGE = AGE + 1

WHERE SEX = '%c'" % ('M')

try:

# Execute the SQL command

cursor.execute(sql)

# Commit your changes in the database

db.commit()

except:

# Rollback in case there is any error

db.rollback()

# disconnect from server

db.close()

DELETE Operation

DELETE operation is required when you want to delete some records from your database. Following is the procedure to delete all the records from EMPLOYEE where AGE is more than 20 −

Example

#!/usr/bin/python

import MySQLdb

# Open database connection

db = MySQLdb.connect("localhost","testuser","test123","TESTDB" )

# prepare a cursor object using *cursor()* method

cursor = db.cursor()

# Prepare SQL query to DELETE required records

sql = "DELETE FROM EMPLOYEE WHERE AGE > '%d'" % (20)

try:

# Execute the SQL command

cursor.execute(sql)

# Commit your changes in the database

db.commit()

except:

# Rollback in case there is any error

db.rollback()

# disconnect from server

db.close()

Performing Transactions

Transactions are a mechanism that ensures data consistency. Transactions have the following four properties −

* **Atomicity** − Either a transaction completes or nothing happens at all.
* **Consistency** − A transaction must start in a consistent state and leave the system in a consistent state.
* **Isolation** − Intermediate results of a transaction are not visible outside the current transaction.
* **Durability** − Once a transaction was committed, the effects are persistent, even after a system failure.

The Python DB API 2.0 provides two methods to either *commit* or *rollback* a transaction.

Example

You already know how to implement transactions. Here is again similar example −

# Prepare SQL query to DELETE required records

sql = "DELETE FROM EMPLOYEE WHERE AGE > '%d'" % (20)

try:

# Execute the SQL command

cursor.execute(sql)

# Commit your changes in the database

db.commit()

except:

# Rollback in case there is any error

db.rollback()

COMMIT Operation

Commit is the operation, which gives a green signal to database to finalize the changes, and after this operation, no change can be reverted back.

Here is a simple example to call **commit** method.

db.commit()

ROLLBACK Operation

If you are not satisfied with one or more of the changes and you want to revert back those changes completely, then use **rollback()** method.

Here is a simple example to call **rollback()** method.

db.rollback()

Disconnecting Database

To disconnect Database connection, use close() method.

db.close()

If the connection to a database is closed by the user with the close() method, any outstanding transactions are rolled back by the DB. However, instead of depending on any of DB lower level implementation details, your application would be better off calling commit or rollback explicitly.

Handling Errors

There are many sources of errors. A few examples are a syntax error in an executed SQL statement, a connection failure, or calling the fetch method for an already canceled or finished statement handle.

The DB API defines a number of errors that must exist in each database module. The following table lists these exceptions.

|  |  |
| --- | --- |
| **Sr.No.** | **Exception & Description** |
| 1 | **Warning**  Used for non-fatal issues. Must subclass StandardError. |
| 2 | **Error**  Base class for errors. Must subclass StandardError. |
| 3 | **InterfaceError**  Used for errors in the database module, not the database itself. Must subclass Error. |
| 4 | **DatabaseError**  Used for errors in the database. Must subclass Error. |
| 5 | **DataError**  Subclass of DatabaseError that refers to errors in the data. |
| 6 | **OperationalError**  Subclass of DatabaseError that refers to errors such as the loss of a connection to the database. These errors are generally outside of the control of the Python scripter. |
| 7 | **IntegrityError**  Subclass of DatabaseError for situations that would damage the relational integrity, such as uniqueness constraints or foreign keys. |
| 8 | **InternalError**  Subclass of DatabaseError that refers to errors internal to the database module, such as a cursor no longer being active. |
| 9 | **ProgrammingError**  Subclass of DatabaseError that refers to errors such as a bad table name and other things that can safely be blamed on you. |
| 10 | **NotSupportedError**  Subclass of DatabaseError that refers to trying to call unsupported functionality. |

Your Python scripts should handle these errors, but before using any of the above exceptions, make sure your MySQLdb has support for that exception. You can get more information about them by reading the DB API 2.0 specification.