

12. Data Persistence

The modules described in this chapter support storing Python data in a persistent form on disk. The `pickle` and `marshal` modules can turn many Python data types into a stream of bytes and then recreate the objects from the bytes. The various DBM-related modules support a family of hash-based file formats that store a mapping of strings to other strings.

The list of modules described in this chapter is:

- 12.1. `pickle` — Python object serialization
 - 12.1.1. Relationship to other Python modules
 - 12.1.1.1. Comparison with `marshal`
 - 12.1.1.2. Comparison with `json`
 - 12.1.2. Data stream format
 - 12.1.3. Module Interface
 - 12.1.4. What can be pickled and unpickled?
 - 12.1.5. Pickling Class Instances
 - 12.1.5.1. Persistence of External Objects
 - 12.1.5.2. Dispatch Tables
 - 12.1.5.3. Handling Stateful Objects
 - 12.1.6. Restricting Globals
 - 12.1.7. Performance
 - 12.1.8. Examples
- 12.2. `copyreg` — Register `pickle` support functions
 - 12.2.1. Example
- 12.3. `shelve` — Python object persistence
 - 12.3.1. Restrictions
 - 12.3.2. Example
- 12.4. `marshal` — Internal Python object serialization
- 12.5. `dbm` — Interfaces to Unix “databases”
 - 12.5.1. `dbm.gnu` — GNU’s reinterpretation of `dbm`
 - 12.5.2. `dbm.ndbm` — Interface based on `ndbm`
 - 12.5.3. `dbm.dumb` — Portable DBM implementation
- 12.6. `sqlite3` — DB-API 2.0 interface for SQLite databases
 - 12.6.1. Module functions and constants
 - 12.6.2. Connection Objects
 - 12.6.3. Cursor Objects
 - 12.6.4. Row Objects
 - 12.6.5. Exceptions
 - 12.6.6. SQLite and Python types
 - 12.6.6.1. Introduction
 - 12.6.6.2. Using adapters to store additional Python types in SQLite databases

- 12.6.6.2.1. Letting your object adapt itself
 - 12.6.6.2.2. Registering an adapter callable
- 12.6.6.3. Converting SQLite values to custom Python types
- 12.6.6.4. Default adapters and converters
- 12.6.7. Controlling Transactions
- 12.6.8. Using `sqlite3` efficiently
 - 12.6.8.1. Using shortcut methods
 - 12.6.8.2. Accessing columns by name instead of by index
 - 12.6.8.3. Using the connection as a context manager
- 12.6.9. Common issues
 - 12.6.9.1. Multithreading