TP_BDD_Conception

May 27, 2020

```
In [ ]: %reload_ext sql
        %config SqlMagic.displaycon = False
        %config SqlMagic.autolimit = 100
```

1 Travaux pratiques bases de données : conception

IMPORTANT : par défaut, la vérification des clefs étrangère n'est pas activée dans SQLite https://www.sqlite.org/foreignkeys.html, activez là avec la commande :

```
PRAGMA foreign_keys=1;
```

```
In [89]: %%sql

         PRAGMA foreign_keys=1;
```

Done.

```
Out[89]: []
```

1.1 Exercice : variations sur le thème de la clef primaire

On considère le script SQL suivant :

```sql
CREATE TABLE Classe(
  id INTEGER PRIMARY KEY,
  description TEXT
);

CREATE TABLE Herite(
  enfant INT REFERENCES Classe(id),
  parent INT REFERENCES Classe(id),
  PRIMARY KEY (enfant, parent)
);

INSERT INTO Classe VALUES(0, 'chose');
INSERT INTO Classe VALUES(1, 'animal');
```

```
INSERT INTO Classe VALUES(2, 'humain');
INSERT INTO Classe VALUES(3, 'enseignant');
INSERT INTO Classe VALUES(4, 'chat');
INSERT INTO Classe VALUES(5, 'science');

INSERT INTO Herite VALUES(1, 0);
INSERT INTO Herite VALUES(2, 1);
INSERT INTO Herite VALUES(3, 2);
INSERT INTO Herite VALUES(4, 1);
INSERT INTO Herite VALUES(3, 5);

In [125]: %sql sqlite:///exo1-q1.db

In [126]: %%sql

        CREATE TABLE Classe(
          id INTEGER PRIMARY KEY,
          description TEXT
        );

        CREATE TABLE Herite(
          enfant INT REFERENCES Classe(id),
          parent INT REFERENCES Classe(id),
          PRIMARY KEY (enfant, parent)
        );

        INSERT INTO Classe VALUES(0, 'chose');
        INSERT INTO Classe VALUES(1, 'animal');
        INSERT INTO Classe VALUES(2, 'humain');
        INSERT INTO Classe VALUES(3, 'enseignant');
        INSERT INTO Classe VALUES(4, 'chat');
        INSERT INTO Classe VALUES(5, 'science');

        INSERT INTO Herite VALUES(1, 0);
        INSERT INTO Herite VALUES(2, 1);
        INSERT INTO Herite VALUES(3, 2);
        INSERT INTO Herite VALUES(4, 1);
        INSERT INTO Herite VALUES(3, 5);

(sqlite3.OperationalError) table Classe already exists
[SQL: CREATE TABLE Classe( id INTEGER PRIMARY KEY,
  description TEXT
);]
(Background on this error at: http://sqlalche.me/e/e3q8)
```

Exercice : on veut s'habituer aux messages d'erreurs standards :

- insérez un nouveau tuple avec INSERT INTO Classe VALUES(0, 'patate');. Quel est le message d'erreur ? Idem avec INSERT INTO Herite VALUES(1, 0);

- insérez un nouveau tuple avec `INSERT INTO Herite VALUES(0, 42);`. Quel est le message d'erreur ? (*NB* : si vous n'en avez pas, c'est que les clefs étrangères ne sont pas activées !)

```
In [127]: %%sql

          INSERT INTO Classe VALUES(0, 'patate');

          --IntegrityError: (sqlite3.IntegrityError) UNIQUE constraint failed: Classe.id
          [SQL: INSERT INTO Classe VALUES(0, 'patate');]


    ---------------------------------------------------------------------------

    IntegrityError                            Traceback (most recent call last)

    ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/base.py in _execute_context(sel
    1283                    self.dialect.do_execute(
 -> 1284                        cursor, statement, parameters, context
    1285                    )


    ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/default.py in do_execute(self,
    589     def do_execute(self, cursor, statement, parameters, context=None):
 --> 590         cursor.execute(statement, parameters)
    591


    IntegrityError: UNIQUE constraint failed: Classe.id


The above exception was the direct cause of the following exception:


    IntegrityError                            Traceback (most recent call last)

    <ipython-input-127-ff608e20959d> in <module>
 ----> 1 get_ipython().run_cell_magic('sql', '', "\nINSERT INTO Classe VALUES(0, 'patate');


    ~/.local/lib/python3.6/site-packages/IPython/core/interactiveshell.py in run_cell_magic
    2360     def system_raw(self, cmd):
    2361         """Call the given cmd in a subprocess using os.system on Windows or
 -> 2362         subprocess.call using the system shell on other platforms.
    2363
    2364         Parameters


    <decorator-gen-157> in execute(self, line, cell, local_ns)
```

```
~/.local/lib/python3.6/site-packages/IPython/core/magic.py in <lambda>(f, *a, **k)
    185     """Decorator factory for methods in Magics subclasses.
    186     """
--> 187
    188     validate_type(magic_kind)
    189



<decorator-gen-156> in execute(self, line, cell, local_ns)



~/.local/lib/python3.6/site-packages/IPython/core/magic.py in <lambda>(f, *a, **k)
    185     """Decorator factory for methods in Magics subclasses.
    186     """
--> 187
    188     validate_type(magic_kind)
    189



~/.local/lib/python3.6/site-packages/sql/magic.py in execute(self, line, cell, local_ns
    215
    216         try:
--> 217             result = sql.run.run(conn, parsed["sql"], self, user_ns)
    218
    219             if (



~/.local/lib/python3.6/site-packages/sql/run.py in run(conn, sql, config, user_namespac
    365             else:
    366                 txt = sqlalchemy.sql.text(statement)
--> 367                 result = conn.session.execute(txt, user_namespace)
    368             _commit(conn=conn, config=config)
    369             if result and config.feedback:



~/.local/lib/python3.6/site-packages/sqlalchemy/engine/base.py in execute(self, object_
   1018             )
   1019         else:
-> 1020             return meth(self, multiparams, params)
   1021
   1022     def _execute_function(self, func, multiparams, params):



~/.local/lib/python3.6/site-packages/sqlalchemy/sql/elements.py in _execute_on_connecti
    296     def _execute_on_connection(self, connection, multiparams, params):
    297         if self.supports_execution:
```

```
--> 298                return connection._execute_clauseelement(self, multiparams, params)
    299            else:
    300                raise exc.ObjectNotExecutableError(self)


    ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/base.py in _execute_clauseelemer
    1137                distilled_params,
    1138                compiled_sql,
 -> 1139                distilled_params,
    1140            )
    1141            if self._has_events or self.engine._has_events:


    ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/base.py in _execute_context(sel:
    1322            except BaseException as e:
    1323                self._handle_dbapi_exception(
 -> 1324                    e, statement, parameters, cursor, context
    1325                )
    1326


    ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/base.py in _handle_dbapi_excepti
    1516                elif should_wrap:
    1517                    util.raise_(
 -> 1518                        sqlalchemy_exception, with_traceback=exc_info[2], from_=e
    1519                    )
    1520                else:


    ~/.local/lib/python3.6/site-packages/sqlalchemy/util/compat.py in raise_(***failed reso
    176
    177            try:
--> 178                raise exception
    179            finally:
    180                # credit to


    ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/base.py in _execute_context(sel:
    1282                    if not evt_handled:
    1283                        self.dialect.do_execute(
 -> 1284                            cursor, statement, parameters, context
    1285                        )
    1286


    ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/default.py in do_execute(self, o
    588
    589        def do_execute(self, cursor, statement, parameters, context=None):
```

```
    --> 590            cursor.execute(statement, parameters)
        591
        592        def do_execute_no_params(self, cursor, statement, context=None):


        IntegrityError: (sqlite3.IntegrityError) UNIQUE constraint failed: Classe.id
    [SQL: INSERT INTO Classe VALUES(0, 'patate');]
    (Background on this error at: http://sqlalche.me/e/gkpj)
```

In [128]: %%sql

```
        INSERT INTO Herite VALUES(1, 0);

        --IntegrityError: (sqlite3.IntegrityError) UNIQUE constraint failed: Herite.enfant, I
        [SQL: INSERT INTO Herite VALUES(1, 0);]


        ---------------------------------------------------------------------------

        IntegrityError                              Traceback (most recent call last)

      ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/base.py in _execute_context(sel:
        1283                    self.dialect.do_execute(
    -> 1284                        cursor, statement, parameters, context
        1285                    )


      ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/default.py in do_execute(self, o
        589     def do_execute(self, cursor, statement, parameters, context=None):
    --> 590            cursor.execute(statement, parameters)
        591


        IntegrityError: UNIQUE constraint failed: Herite.enfant, Herite.parent


    The above exception was the direct cause of the following exception:


        IntegrityError                              Traceback (most recent call last)

        <ipython-input-128-aea883e35b1c> in <module>
    ----> 1 get_ipython().run_cell_magic('sql', '', '\nINSERT INTO Herite VALUES(1, 0);\n\n--I:


      ~/.local/lib/python3.6/site-packages/IPython/core/interactiveshell.py in run_cell_magic
        2360     def system_raw(self, cmd):
```

```
      2361              """Call the given cmd in a subprocess using os.system on Windows or
-> 2362              subprocess.call using the system shell on other platforms.
      2363
      2364              Parameters


   <decorator-gen-157> in execute(self, line, cell, local_ns)


   ~/.local/lib/python3.6/site-packages/IPython/core/magic.py in <lambda>(f, *a, **k)
      185      """Decorator factory for methods in Magics subclasses.
      186      """
--> 187
      188      validate_type(magic_kind)
      189


   <decorator-gen-156> in execute(self, line, cell, local_ns)


   ~/.local/lib/python3.6/site-packages/IPython/core/magic.py in <lambda>(f, *a, **k)
      185      """Decorator factory for methods in Magics subclasses.
      186      """
--> 187
      188      validate_type(magic_kind)
      189


   ~/.local/lib/python3.6/site-packages/sql/magic.py in execute(self, line, cell, local_n:
      215
      216          try:
--> 217              result = sql.run.run(conn, parsed["sql"], self, user_ns)
      218
      219              if (


   ~/.local/lib/python3.6/site-packages/sql/run.py in run(conn, sql, config, user_namespa:
      365              else:
      366                  txt = sqlalchemy.sql.text(statement)
--> 367                  result = conn.session.execute(txt, user_namespace)
      368              _commit(conn=conn, config=config)
      369              if result and config.feedback:


   ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/base.py in execute(self, object
     1018                  )
     1019          else:
-> 1020              return meth(self, multiparams, params)
```

```
   1021
   1022      def _execute_function(self, func, multiparams, params):


 ~/.local/lib/python3.6/site-packages/sqlalchemy/sql/elements.py in _execute_on_connect:
    296      def _execute_on_connection(self, connection, multiparams, params):
    297          if self.supports_execution:
--> 298              return connection._execute_clauseelement(self, multiparams, params)
    299          else:
    300              raise exc.ObjectNotExecutableError(self)


 ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/base.py in _execute_clauseelemer
   1137                  distilled_params,
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   1322          except BaseException as e:
   1323              self._handle_dbapi_exception(
-> 1324                  e, statement, parameters, cursor, context
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   1517                  util.raise_(
-> 1518                      sqlalchemy_exception, with_traceback=exc_info[2], from_=e
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 ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/base.py in _execute_context(sel:
   1282                  if not evt_handled:
   1283                      self.dialect.do_execute(
-> 1284                          cursor, statement, parameters, context
```

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```
     1285                              )
     1286


     ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/default.py in do_execute(self, 
     588
     589        def do_execute(self, cursor, statement, parameters, context=None):
 --> 590            cursor.execute(statement, parameters)
     591
     592        def do_execute_no_params(self, cursor, statement, context=None):


     IntegrityError: (sqlite3.IntegrityError) UNIQUE constraint failed: Herite.enfant, Herit
  [SQL: INSERT INTO Herite VALUES(1, 0);]
  (Background on this error at: http://sqlalche.me/e/gkpj)
```

In [130]: %%sql

```
     INSERT INTO Herite VALUES(0, 42);


     --IntegrityError: (sqlite3.IntegrityError) FOREIGN KEY constraint failed
     [SQL: INSERT INTO Herite VALUES(0, 42);]



     ----------------------------------------------------------------------


     IntegrityError                            Traceback (most recent call last)

     ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/base.py in _execute_context(sel
    1283                         self.dialect.do_execute(
  -> 1284                             cursor, statement, parameters, context
    1285                         )


     ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/default.py in do_execute(self, 
     589        def do_execute(self, cursor, statement, parameters, context=None):
 --> 590            cursor.execute(statement, parameters)
     591


     IntegrityError: UNIQUE constraint failed: Herite.enfant, Herite.parent


  The above exception was the direct cause of the following exception:


     IntegrityError                                Traceback (most recent call last)
```

```
    <ipython-input-130-66b1f41292c5> in <module>
----> 1 get_ipython().run_cell_magic('sql', '', '\nINSERT INTO Herite VALUES(0, 42);\n\n--


    ~/.local/lib/python3.6/site-packages/IPython/core/interactiveshell.py in run_cell_magic
   2360    def system_raw(self, cmd):
   2361        """Call the given cmd in a subprocess using os.system on Windows or
-> 2362        subprocess.call using the system shell on other platforms.
   2363
   2364        Parameters


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--> 187
    188        validate_type(magic_kind)
    189


    <decorator-gen-156> in execute(self, line, cell, local_ns)


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    215
    216            try:
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    218
    219                if (


    ~/.local/lib/python3.6/site-packages/sql/run.py in run(conn, sql, config, user_namespace
    365                else:
    366                    txt = sqlalchemy.sql.text(statement)
--> 367                    result = conn.session.execute(txt, user_namespace)
    368                _commit(conn=conn, config=config)
```

```
           369                 if result and config.feedback:


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          1022     def _execute_function(self, func, multiparams, params):


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->  1324                 e, statement, parameters, cursor, context
          1325             )
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    ~/.local/lib/python3.6/site-packages/sqlalchemy/util/compat.py in raise_(***failed reso
           176
           177         try:
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           179         finally:
```

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```
     180              # credit to


     ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/base.py in _execute_context(sel
     1282                    if not evt_handled:
     1283                        self.dialect.do_execute(
  -> 1284                            cursor, statement, parameters, context
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     1286


     ~/.local/lib/python3.6/site-packages/sqlalchemy/engine/default.py in do_execute(self,
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     589     def do_execute(self, cursor, statement, parameters, context=None):
  --> 590         cursor.execute(statement, parameters)
     591
     592     def do_execute_no_params(self, cursor, statement, context=None):


     IntegrityError: (sqlite3.IntegrityError) UNIQUE constraint failed: Herite.enfant, Herit
  [SQL: INSERT INTO Herite VALUES(0, 42);]
  (Background on this error at: http://sqlalche.me/e/gkpj)
```

In [131]: %%sql

```
     INSERT INTO Herite VALUES(0, 1);
```

1 rows affected.

Out[131]: []

In [132]: %%sql

```
     SELECT * FROM Herite;
```

Done.

Out[132]: [(1, 0), (2, 1), (3, 2), (4, 1), (3, 5), (0, 42), (0, 1)]

Exercice : dessinez un diagramme Entité-Association du schéma de cette base. Ensuite,
représentez graphiquement *le contenu* de cette base par une hiérarchie entre les classes.

• Premier diagramme :