

Python code:

1.(testGraph.py)

import pandas as pd

import neo4j

from neo4j import GraphDatabase

print("Pandas version:", pd.\_\_version\_\_)

uri = "bolt://localhost:7689" # Change to your address and port

username = "neo4j" # Change to your credentials

password = "12345678" # Change to your password

class AdvancedNeo4jExample:

def \_\_init\_\_(self, uri, user, password):

self.driver = GraphDatabase.driver(uri, auth=(user, password))

def close(self):

self.driver.close()

def create\_greeting(self, message):

with self.driver.session() as session:

greeting = session.write\_transaction(self.\_create\_and\_return\_greeting, message)

print(greeting)

@staticmethod

def \_create\_and\_return\_greeting(tx, message):

result = tx.run("CREATE (a:Greeting) "

"SET a.message = $message "

"RETURN a.message + ', from the Neo4j database!' AS greeting", message=message)

return result.single()[0]

def create\_and\_check\_nodes(self):

with self.driver.session() as session:

# Creating nodes

session.run("CREATE (p:Person {name: 'Alice'}), (c:Country {name: 'Wonderland'})")

# Creating a connection

session.run("MATCH (p:Person), (c:Country) WHERE p.name = 'Alice' AND c.name = 'Wonderland' "

"CREATE (p)-[:LIVES\_IN]->(c)")

# Creation verification

persons = session.run("MATCH (p:Person) RETURN p.name AS name").value()

countries = session.run("MATCH (c:Country) RETURN c.name AS name").value()

print("Persons:", persons)

print("Countries:", countries)

# Update nodes

session.run("MATCH (p:Person {name: 'Alice'}) SET p.age = 30")

# Checking for updates

age = session.run("MATCH (p:Person {name: 'Alice'}) RETURN p.age AS age").single()[0]

print("Alice's age:", age)

# Deleting nodes and connections

session.run("MATCH (p:Person)-[r:LIVES\_IN]->(c:Country) DELETE p, c, r")

# Deletion verification

check = session.run("MATCH (p:Person) RETURN p").data()

print("Remaining nodes after deletion:", check)

# Using the class

advanced\_example = AdvancedNeo4jExample(uri, username, password)

advanced\_example.create\_greeting("Hello world")

advanced\_example.create\_and\_check\_nodes()

advanced\_example.close()

2.(testGraph1.py)

# -\*- coding: utf-8 -\*-

"""

Created on Sat Jul 6 22:45:15 2024

@author: shmot

"""

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print("Pandas version:", pd.\_\_version\_\_)

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class AdvancedNeo4jExample:

def \_\_init\_\_(self, uri, user, password):

self.driver = GraphDatabase.driver(uri, auth=(user, password))

def close(self):

self.driver.close()

def create\_greeting(self, message):

with self.driver.session() as session:

greeting = session.write\_transaction(self.\_create\_and\_return\_greeting, message)

print(greeting)

@staticmethod

def \_create\_and\_return\_greeting(tx, message):

result = tx.run("CREATE (a:Greeting) "

"SET a.message = $message "

"RETURN a.message + ', from the Neo4j database!' AS greeting", message=message)

return result.single()[0]

def create\_and\_check\_nodes(self):

with self.driver.session() as session:

# Creating nodes

session.run("""

CREATE (alice:Person {name: 'Alice', age: 30}),

(bob:Person {name: 'Bob', age: 25}),

(carol:Person {name: 'Carol', age: 33}),

(wonderland:Country {name: 'Wonderland'}),

(neverland:Country {name: 'Neverland'})

""")

# Creating a connection

session.run("""

MATCH (alice:Person {name: 'Alice'}), (bob:Person {name: 'Bob'}), (carol:Person {name: 'Carol'}),

(wonderland:Country {name: 'Wonderland'}), (neverland:Country {name: 'Neverland'})

CREATE (alice)-[:LIVES\_IN]->(wonderland),

(bob)-[:LIVES\_IN]->(neverland),

(alice)-[:KNOWS]->(bob),

(alice)-[:WORKS\_WITH]->(carol),

(carol)-[:LIVES\_IN]->(wonderland)

""")

# Creation verification

persons = session.run("MATCH (p:Person) RETURN p.name AS name").values()

countries = session.run("MATCH (c:Country) RETURN c.name AS name").values()

print("Persons:", [person[0] for person in persons])

print("Countries:", [country[0] for country in countries])

# Using the class

advanced\_example = AdvancedNeo4jExample(uri, username, password)

advanced\_example.create\_greeting("Hello world")

advanced\_example.create\_and\_check\_nodes()

advanced\_example.close()

Cypher code:

1.(simpleGraph.cql)

// Creating nodes

CREATE (alice:Person {name: 'Alice', age: 30}),

(bob:Person {name: 'Bob', age: 25}),

(carol:Person {name: 'Carol', age: 33}),

(wonderland:Country {name: 'Wonderland'}),

(neverland:Country {name: 'Neverland'});

// # Creating a connection

MATCH (alice:Person {name: 'Alice'}), (bob:Person {name: 'Bob'}), (carol:Person {name: 'Carol'}),

(wonderland:Country {name: 'Wonderland'}), (neverland:Country {name: 'Neverland'})

CREATE (alice)-[:LIVES\_IN]->(wonderland),

(bob)-[:LIVES\_IN]->(neverland),

(alice)-[:KNOWS]->(bob),

(alice)-[:WORKS\_WITH]->(carol),

(carol)-[:LIVES\_IN]->(wonderland);

// Checking the creation of nodes and connections

MATCH (p:Person)

RETURN p.name AS Name, p.age AS Age;

MATCH (c:Country)

RETURN c.name AS Country;

// Display of all nodes and connections in the graph

MATCH (n)-[r]->(m)

RETURN n, r, m;

// Deleting nodes an  relationships

MATCH (p)

DETACH DELETE p;

2.(difficultGraph.cql)

// load movies

// This is an initialization script for the movie graph.

// Run it only once. ;)

// Have you run it twice? Use `MATCH (n) WHERE (n:Person OR n:Movie) DETACH DELETE n` to start over.

CREATE (TheMatrix:Movie {title:'The Matrix', released:1999, tagline:'Welcome to the Real World'})

CREATE (Keanu:Person {name:'Keanu Reeves', born:1964})

CREATE (Carrie:Person {name:'Carrie-Anne Moss', born:1967})

CREATE (Laurence:Person {name:'Laurence Fishburne', born:1961})

CREATE (Hugo:Person {name:'Hugo Weaving', born:1960})

CREATE (AndyW:Person {name:'Andy Wachowski', born:1967})

CREATE (LanaW:Person {name:'Lana Wachowski', born:1965})

CREATE (JoelS:Person {name:'Joel Silver', born:1952})

CREATE

  (Keanu)-[:ACTED\_IN {roles:['Neo']}]->(TheMatrix),

  (Carrie)-[:ACTED\_IN {roles:['Trinity']}]->(TheMatrix),

  (Laurence)-[:ACTED\_IN {roles:['Morpheus']}]->(TheMatrix),

  (Hugo)-[:ACTED\_IN {roles:['Agent Smith']}]->(TheMatrix),

  (AndyW)-[:DIRECTED]->(TheMatrix),

  (LanaW)-[:DIRECTED]->(TheMatrix),

  (JoelS)-[:PRODUCED]->(TheMatrix)

CREATE (Emil:Person {name:"Emil Eifrem", born:1978})

CREATE (Emil)-[:ACTED\_IN {roles:["Emil"]}]->(TheMatrix)

CREATE (TheMatrixReloaded:Movie {title:'The Matrix Reloaded', released:2003, tagline:'Free your mind'})

CREATE

  (Keanu)-[:ACTED\_IN {roles:['Neo']}]->(TheMatrixReloaded),

  (Carrie)-[:ACTED\_IN {roles:['Trinity']}]->(TheMatrixReloaded),

  (Laurence)-[:ACTED\_IN {roles:['Morpheus']}]->(TheMatrixReloaded),

  (Hugo)-[:ACTED\_IN {roles:['Agent Smith']}]->(TheMatrixReloaded),

  (AndyW)-[:DIRECTED]->(TheMatrixReloaded),

  (LanaW)-[:DIRECTED]->(TheMatrixReloaded),

  (JoelS)-[:PRODUCED]->(TheMatrixReloaded)

CREATE (TheMatrixRevolutions:Movie {title:'The Matrix Revolutions', released:2003, tagline:'Everything that has a beginning has an end'})

CREATE

  (Keanu)-[:ACTED\_IN {roles:['Neo']}]->(TheMatrixRevolutions),

  (Carrie)-[:ACTED\_IN {roles:['Trinity']}]->(TheMatrixRevolutions),

  (Laurence)-[:ACTED\_IN {roles:['Morpheus']}]->(TheMatrixRevolutions),

  (Hugo)-[:ACTED\_IN {roles:['Agent Smith']}]->(TheMatrixRevolutions),

  (AndyW)-[:DIRECTED]->(TheMatrixRevolutions),

  (LanaW)-[:DIRECTED]->(TheMatrixRevolutions),

  (JoelS)-[:PRODUCED]->(TheMatrixRevolutions)

CREATE (TheDevilsAdvocate:Movie {title:"The Devil's Advocate", released:1997, tagline:'Evil has its winning ways'})

CREATE (Charlize:Person {name:'Charlize Theron', born:1975})

CREATE (Al:Person {name:'Al Pacino', born:1940})

CREATE (Taylor:Person {name:'Taylor Hackford', born:1944})

CREATE

  (Keanu)-[:ACTED\_IN {roles:['Kevin Lomax']}]->(TheDevilsAdvocate),

  (Charlize)-[:ACTED\_IN {roles:['Mary Ann Lomax']}]->(TheDevilsAdvocate),

  (Al)-[:ACTED\_IN {roles:['John Milton']}]->(TheDevilsAdvocate),

  (Taylor)-[:DIRECTED]->(TheDevilsAdvocate)

CREATE (AFewGoodMen:Movie {title:"A Few Good Men", released:1992, tagline:"In the heart of the nation's capital, in a courthouse of the U.S. government, one man will stop at nothing to keep his honor, and one will stop at nothing to find the truth."})

CREATE (TomC:Person {name:'Tom Cruise', born:1962})

CREATE (JackN:Person {name:'Jack Nicholson', born:1937})

CREATE (DemiM:Person {name:'Demi Moore', born:1962})

CREATE (KevinB:Person {name:'Kevin Bacon', born:1958})

CREATE (KieferS:Person {name:'Kiefer Sutherland', born:1966})

CREATE (NoahW:Person {name:'Noah Wyle', born:1971})

CREATE (CubaG:Person {name:'Cuba Gooding Jr.', born:1968})

CREATE (KevinP:Person {name:'Kevin Pollak', born:1957})

CREATE (JTW:Person {name:'J.T. Walsh', born:1943})

CREATE (JamesM:Person {name:'James Marshall', born:1967})

CREATE (ChristopherG:Person {name:'Christopher Guest', born:1948})

CREATE (RobR:Person {name:'Rob Reiner', born:1947})

CREATE (AaronS:Person {name:'Aaron Sorkin', born:1961})

CREATE

  (TomC)-[:ACTED\_IN {roles:['Lt. Daniel Kaffee']}]->(AFewGoodMen),

  (JackN)-[:ACTED\_IN {roles:['Col. Nathan R. Jessup']}]->(AFewGoodMen),

  (DemiM)-[:ACTED\_IN {roles:['Lt. Cdr. JoAnne Galloway']}]->(AFewGoodMen),

  (KevinB)-[:ACTED\_IN {roles:['Capt. Jack Ross']}]->(AFewGoodMen),

  (KieferS)-[:ACTED\_IN {roles:['Lt. Jonathan Kendrick']}]->(AFewGoodMen),

  (NoahW)-[:ACTED\_IN {roles:['Cpl. Jeffrey Barnes']}]->(AFewGoodMen),

  (CubaG)-[:ACTED\_IN {roles:['Cpl. Carl Hammaker']}]->(AFewGoodMen),

  (KevinP)-[:ACTED\_IN {roles:['Lt. Sam Weinberg']}]->(AFewGoodMen),

  (JTW)-[:ACTED\_IN {roles:['Lt. Col. Matthew Andrew Markinson']}]->(AFewGoodMen),

  (JamesM)-[:ACTED\_IN {roles:['Pfc. Louden Downey']}]->(AFewGoodMen),

  (ChristopherG)-[:ACTED\_IN {roles:['Dr. Stone']}]->(AFewGoodMen),

  (AaronS)-[:ACTED\_IN {roles:['Man in Bar']}]->(AFewGoodMen),

  (RobR)-[:DIRECTED]->(AFewGoodMen),

  (AaronS)-[:WROTE]->(AFewGoodMen)

CREATE (TopGun:Movie {title:"Top Gun", released:1986, tagline:'I feel the need, the need for speed.'})

CREATE (KellyM:Person {name:'Kelly McGillis', born:1957})

CREATE (ValK:Person {name:'Val Kilmer', born:1959})

CREATE (AnthonyE:Person {name:'Anthony Edwards', born:1962})

CREATE (TomS:Person {name:'Tom Skerritt', born:1933})

CREATE (MegR:Person {name:'Meg Ryan', born:1961})

CREATE (TonyS:Person {name:'Tony Scott', born:1944})

CREATE (JimC:Person {name:'Jim Cash', born:1941})

CREATE

  (TomC)-[:ACTED\_IN {roles:['Maverick']}]->(TopGun),

  (KellyM)-[:ACTED\_IN {roles:['Charlie']}]->(TopGun),

  (ValK)-[:ACTED\_IN {roles:['Iceman']}]->(TopGun),

  (AnthonyE)-[:ACTED\_IN {roles:['Goose']}]->(TopGun),

  (TomS)-[:ACTED\_IN {roles:['Viper']}]->(TopGun),

  (MegR)-[:ACTED\_IN {roles:['Carole']}]->(TopGun),

  (TonyS)-[:DIRECTED]->(TopGun),

  (JimC)-[:WROTE]->(TopGun)

CREATE (JerryMaguire:Movie {title:'Jerry Maguire', released:2000, tagline:'The rest of his life begins now.'})

CREATE (ReneeZ:Person {name:'Renee Zellweger', born:1969})

CREATE (KellyP:Person {name:'Kelly Preston', born:1962})

CREATE (JerryO:Person {name:"Jerry O'Connell", born:1974})

CREATE (JayM:Person {name:'Jay Mohr', born:1970})

CREATE (BonnieH:Person {name:'Bonnie Hunt', born:1961})

CREATE (ReginaK:Person {name:'Regina King', born:1971})

CREATE (JonathanL:Person {name:'Jonathan Lipnicki', born:1996})

CREATE (CameronC:Person {name:'Cameron Crowe', born:1957})

CREATE

  (TomC)-[:ACTED\_IN {roles:['Jerry Maguire']}]->(JerryMaguire),

  (CubaG)-[:ACTED\_IN {roles:['Rod Tidwell']}]->(JerryMaguire),

  (ReneeZ)-[:ACTED\_IN {roles:['Dorothy Boyd']}]->(JerryMaguire),

  (KellyP)-[:ACTED\_IN {roles:['Avery Bishop']}]->(JerryMaguire),

  (JerryO)-[:ACTED\_IN {roles:['Frank Cushman']}]->(JerryMaguire),

  (JayM)-[:ACTED\_IN {roles:['Bob Sugar']}]->(JerryMaguire),

  (BonnieH)-[:ACTED\_IN {roles:['Laurel Boyd']}]->(JerryMaguire),

  (ReginaK)-[:ACTED\_IN {roles:['Marcee Tidwell']}]->(JerryMaguire),

  (JonathanL)-[:ACTED\_IN {roles:['Ray Boyd']}]->(JerryMaguire),

  (CameronC)-[:DIRECTED]->(JerryMaguire),

  (CameronC)-[:PRODUCED]->(JerryMaguire),

  (CameronC)-[:WROTE]->(JerryMaguire)

CREATE (StandByMe:Movie {title:"Stand By Me", released:1986, tagline:"For some, it's the last real taste of innocence, and the first real taste of life. But for everyone, it's the time that memories are made of."})

CREATE (RiverP:Person {name:'River Phoenix', born:1970})

CREATE (CoreyF:Person {name:'Corey Feldman', born:1971})

CREATE (WilW:Person {name:'Wil Wheaton', born:1972})

CREATE (JohnC:Person {name:'John Cusack', born:1966})

CREATE (MarshallB:Person {name:'Marshall Bell', born:1942})

CREATE

  (WilW)-[:ACTED\_IN {roles:['Gordie Lachance']}]->(StandByMe),

  (RiverP)-[:ACTED\_IN {roles:['Chris Chambers']}]->(StandByMe),

  (JerryO)-[:ACTED\_IN {roles:['Vern Tessio']}]->(StandByMe),

  (CoreyF)-[:ACTED\_IN {roles:['Teddy Duchamp']}]->(StandByMe),

  (JohnC)-[:ACTED\_IN {roles:['Denny Lachance']}]->(StandByMe),

  (KieferS)-[:ACTED\_IN {roles:['Ace Merrill']}]->(StandByMe),

  (MarshallB)-[:ACTED\_IN {roles:['Mr. Lachance']}]->(StandByMe),

  (RobR)-[:DIRECTED]->(StandByMe)

CREATE (AsGoodAsItGets:Movie {title:'As Good as It Gets', released:1997, tagline:'A comedy from the heart that goes for the throat.'})

CREATE (HelenH:Person {name:'Helen Hunt', born:1963})

CREATE (GregK:Person {name:'Greg Kinnear', born:1963})

CREATE (JamesB:Person {name:'James L. Brooks', born:1940})

CREATE

  (JackN)-[:ACTED\_IN {roles:['Melvin Udall']}]->(AsGoodAsItGets),

  (HelenH)-[:ACTED\_IN {roles:['Carol Connelly']}]->(AsGoodAsItGets),

  (GregK)-[:ACTED\_IN {roles:['Simon Bishop']}]->(AsGoodAsItGets),

  (CubaG)-[:ACTED\_IN {roles:['Frank Sachs']}]->(AsGoodAsItGets),

  (JamesB)-[:DIRECTED]->(AsGoodAsItGets)

CREATE (WhatDreamsMayCome:Movie {title:'What Dreams May Come', released:1998, tagline:'After life there is more. The end is just the beginning.'})

CREATE (AnnabellaS:Person {name:'Annabella Sciorra', born:1960})

CREATE (MaxS:Person {name:'Max von Sydow', born:1929})

CREATE (WernerH:Person {name:'Werner Herzog', born:1942})

CREATE (Robin:Person {name:'Robin Williams', born:1951})

CREATE (VincentW:Person {name:'Vincent Ward', born:1956})

CREATE

  (Robin)-[:ACTED\_IN {roles:['Chris Nielsen']}]->(WhatDreamsMayCome),

  (CubaG)-[:ACTED\_IN {roles:['Albert Lewis']}]->(WhatDreamsMayCome),

  (AnnabellaS)-[:ACTED\_IN {roles:['Annie Collins-Nielsen']}]->(WhatDreamsMayCome),

  (MaxS)-[:ACTED\_IN {roles:['The Tracker']}]->(WhatDreamsMayCome),

  (WernerH)-[:ACTED\_IN {roles:['The Face']}]->(WhatDreamsMayCome),

  (VincentW)-[:DIRECTED]->(WhatDreamsMayCome)

CREATE (SnowFallingonCedars:Movie {title:'Snow Falling on Cedars', released:1999, tagline:'First loves last. Forever.'})

CREATE (EthanH:Person {name:'Ethan Hawke', born:1970})

CREATE (RickY:Person {name:'Rick Yune', born:1971})

CREATE (JamesC:Person {name:'James Cromwell', born:1940})

CREATE (ScottH:Person {name:'Scott Hicks', born:1953})

CREATE

  (EthanH)-[:ACTED\_IN {roles:['Ishmael Chambers']}]->(SnowFallingonCedars),

  (RickY)-[:ACTED\_IN {roles:['Kazuo Miyamoto']}]->(SnowFallingonCedars),

  (MaxS)-[:ACTED\_IN {roles:['Nels Gudmundsson']}]->(SnowFallingonCedars),

  (JamesC)-[:ACTED\_IN {roles:['Judge Fielding']}]->(SnowFallingonCedars),

  (ScottH)-[:DIRECTED]->(SnowFallingonCedars)

CREATE (YouveGotMail:Movie {title:"You've Got Mail", released:1998, tagline:'At odds in life... in love on-line.'})

CREATE (ParkerP:Person {name:'Parker Posey', born:1968})

CREATE (DaveC:Person {name:'Dave Chappelle', born:1973})

CREATE (SteveZ:Person {name:'Steve Zahn', born:1967})

CREATE (TomH:Person {name:'Tom Hanks', born:1956})

CREATE (NoraE:Person {name:'Nora Ephron', born:1941})

CREATE

  (TomH)-[:ACTED\_IN {roles:['Joe Fox']}]->(YouveGotMail),

  (MegR)-[:ACTED\_IN {roles:['Kathleen Kelly']}]->(YouveGotMail),

  (GregK)-[:ACTED\_IN {roles:['Frank Navasky']}]->(YouveGotMail),

  (ParkerP)-[:ACTED\_IN {roles:['Patricia Eden']}]->(YouveGotMail),

  (DaveC)-[:ACTED\_IN {roles:['Kevin Jackson']}]->(YouveGotMail),

  (SteveZ)-[:ACTED\_IN {roles:['George Pappas']}]->(YouveGotMail),

  (NoraE)-[:DIRECTED]->(YouveGotMail)

CREATE (SleeplessInSeattle:Movie {title:'Sleepless in Seattle', released:1993, tagline:'What if someone you never met, someone you never saw, someone you never knew was the only someone for you?'})

CREATE (RitaW:Person {name:'Rita Wilson', born:1956})

CREATE (BillPull:Person {name:'Bill Pullman', born:1953})

CREATE (VictorG:Person {name:'Victor Garber', born:1949})

CREATE (RosieO:Person {name:"Rosie O'Donnell", born:1962})

CREATE

  (TomH)-[:ACTED\_IN {roles:['Sam Baldwin']}]->(SleeplessInSeattle),

  (MegR)-[:ACTED\_IN {roles:['Annie Reed']}]->(SleeplessInSeattle),

  (RitaW)-[:ACTED\_IN {roles:['Suzy']}]->(SleeplessInSeattle),

  (BillPull)-[:ACTED\_IN {roles:['Walter']}]->(SleeplessInSeattle),

  (VictorG)-[:ACTED\_IN {roles:['Greg']}]->(SleeplessInSeattle),

  (RosieO)-[:ACTED\_IN {roles:['Becky']}]->(SleeplessInSeattle),

  (NoraE)-[:DIRECTED]->(SleeplessInSeattle)

CREATE (JoeVersustheVolcano:Movie {title:'Joe Versus the Volcano', released:1990, tagline:'A story of love, lava and burning desire.'})

CREATE (JohnS:Person {name:'John Patrick Stanley', born:1950})

CREATE (Nathan:Person {name:'Nathan Lane', born:1956})

CREATE

  (TomH)-[:ACTED\_IN {roles:['Joe Banks']}]->(JoeVersustheVolcano),

  (MegR)-[:ACTED\_IN {roles:['DeDe', 'Angelica Graynamore', 'Patricia Graynamore']}]->(JoeVersustheVolcano),

  (Nathan)-[:ACTED\_IN {roles:['Baw']}]->(JoeVersustheVolcano),

  (JohnS)-[:DIRECTED]->(JoeVersustheVolcano)

CREATE (WhenHarryMetSally:Movie {title:'When Harry Met Sally', released:1998, tagline:'At odds in life... in love on-line.'})

CREATE (BillyC:Person {name:'Billy Crystal', born:1948})

CREATE (CarrieF:Person {name:'Carrie Fisher', born:1956})

CREATE (BrunoK:Person {name:'Bruno Kirby', born:1949})

CREATE

  (BillyC)-[:ACTED\_IN {roles:['Harry Burns']}]->(WhenHarryMetSally),

  (MegR)-[:ACTED\_IN {roles:['Sally Albright']}]->(WhenHarryMetSally),

  (CarrieF)-[:ACTED\_IN {roles:['Marie']}]->(WhenHarryMetSally),

  (BrunoK)-[:ACTED\_IN {roles:['Jess']}]->(WhenHarryMetSally),

  (RobR)-[:DIRECTED]->(WhenHarryMetSally),

  (RobR)-[:PRODUCED]->(WhenHarryMetSally),

  (NoraE)-[:PRODUCED]->(WhenHarryMetSally),

  (NoraE)-[:WROTE]->(WhenHarryMetSally)

CREATE (ThatThingYouDo:Movie {title:'That Thing You Do', released:1996, tagline:'In every life there comes a time when that thing you dream becomes that thing you do'})

CREATE (LivT:Person {name:'Liv Tyler', born:1977})

CREATE

  (TomH)-[:ACTED\_IN {roles:['Mr. White']}]->(ThatThingYouDo),

  (LivT)-[:ACTED\_IN {roles:['Faye Dolan']}]->(ThatThingYouDo),

  (Charlize)-[:ACTED\_IN {roles:['Tina']}]->(ThatThingYouDo),

  (TomH)-[:DIRECTED]->(ThatThingYouDo)

CREATE (TheReplacements:Movie {title:'The Replacements', released:2000, tagline:'Pain heals, Chicks dig scars... Glory lasts forever'})

CREATE (Brooke:Person {name:'Brooke Langton', born:1970})

CREATE (Gene:Person {name:'Gene Hackman', born:1930})

CREATE (Orlando:Person {name:'Orlando Jones', born:1968})

CREATE (Howard:Person {name:'Howard Deutch', born:1950})

CREATE

  (Keanu)-[:ACTED\_IN {roles:['Shane Falco']}]->(TheReplacements),

  (Brooke)-[:ACTED\_IN {roles:['Annabelle Farrell']}]->(TheReplacements),

  (Gene)-[:ACTED\_IN {roles:['Jimmy McGinty']}]->(TheReplacements),

  (Orlando)-[:ACTED\_IN {roles:['Clifford Franklin']}]->(TheReplacements),

  (Howard)-[:DIRECTED]->(TheReplacements)

CREATE (RescueDawn:Movie {title:'RescueDawn', released:2006, tagline:"Based on the extraordinary true story of one man's fight for freedom"})

CREATE (ChristianB:Person {name:'Christian Bale', born:1974})

CREATE (ZachG:Person {name:'Zach Grenier', born:1954})

CREATE

  (MarshallB)-[:ACTED\_IN {roles:['Admiral']}]->(RescueDawn),

  (ChristianB)-[:ACTED\_IN {roles:['Dieter Dengler']}]->(RescueDawn),

  (ZachG)-[:ACTED\_IN {roles:['Squad Leader']}]->(RescueDawn),

  (SteveZ)-[:ACTED\_IN {roles:['Duane']}]->(RescueDawn),

  (WernerH)-[:DIRECTED]->(RescueDawn)

CREATE (TheBirdcage:Movie {title:'The Birdcage', released:1996, tagline:'Come as you are'})

CREATE (MikeN:Person {name:'Mike Nichols', born:1931})

CREATE

  (Robin)-[:ACTED\_IN {roles:['Armand Goldman']}]->(TheBirdcage),

  (Nathan)-[:ACTED\_IN {roles:['Albert Goldman']}]->(TheBirdcage),

  (Gene)-[:ACTED\_IN {roles:['Sen. Kevin Keeley']}]->(TheBirdcage),

  (MikeN)-[:DIRECTED]->(TheBirdcage)

CREATE (Unforgiven:Movie {title:'Unforgiven', released:1992, tagline:"It's a hell of a thing, killing a man"})

CREATE (RichardH:Person {name:'Richard Harris', born:1930})

CREATE (ClintE:Person {name:'Clint Eastwood', born:1930})

CREATE

  (RichardH)-[:ACTED\_IN {roles:['English Bob']}]->(Unforgiven),

  (ClintE)-[:ACTED\_IN {roles:['Bill Munny']}]->(Unforgiven),

  (Gene)-[:ACTED\_IN {roles:['Little Bill Daggett']}]->(Unforgiven),

  (ClintE)-[:DIRECTED]->(Unforgiven)

CREATE (JohnnyMnemonic:Movie {title:'Johnny Mnemonic', released:1995, tagline:'The hottest data on earth. In the coolest head in town'})

CREATE (Takeshi:Person {name:'Takeshi Kitano', born:1947})

CREATE (Dina:Person {name:'Dina Meyer', born:1968})

CREATE (IceT:Person {name:'Ice-T', born:1958})

CREATE (RobertL:Person {name:'Robert Longo', born:1953})

CREATE

  (Keanu)-[:ACTED\_IN {roles:['Johnny Mnemonic']}]->(JohnnyMnemonic),

  (Takeshi)-[:ACTED\_IN {roles:['Takahashi']}]->(JohnnyMnemonic),

  (Dina)-[:ACTED\_IN {roles:['Jane']}]->(JohnnyMnemonic),

  (IceT)-[:ACTED\_IN {roles:['J-Bone']}]->(JohnnyMnemonic),

  (RobertL)-[:DIRECTED]->(JohnnyMnemonic)

CREATE (CloudAtlas:Movie {title:'Cloud Atlas', released:2012, tagline:'Everything is connected'})

CREATE (HalleB:Person {name:'Halle Berry', born:1966})

CREATE (JimB:Person {name:'Jim Broadbent', born:1949})

CREATE (TomT:Person {name:'Tom Tykwer', born:1965})

CREATE

  (TomH)-[:ACTED\_IN {roles:['Zachry', 'Dr. Henry Goose', 'Isaac Sachs', 'Dermot Hoggins']}]->(CloudAtlas),

  (Hugo)-[:ACTED\_IN {roles:['Bill Smoke', 'Haskell Moore', 'Tadeusz Kesselring', 'Nurse Noakes', 'Boardman Mephi', 'Old Georgie']}]->(CloudAtlas),

  (HalleB)-[:ACTED\_IN {roles:['Luisa Rey', 'Jocasta Ayrs', 'Ovid', 'Meronym']}]->(CloudAtlas),

  (JimB)-[:ACTED\_IN {roles:['Vyvyan Ayrs', 'Captain Molyneux', 'Timothy Cavendish']}]->(CloudAtlas),

  (TomT)-[:DIRECTED]->(CloudAtlas),

  (AndyW)-[:DIRECTED]->(CloudAtlas),

  (LanaW)-[:DIRECTED]->(CloudAtlas)

CREATE (TheDaVinciCode:Movie {title:'The Da Vinci Code', released:2006, tagline:'Break The Codes'})

CREATE (IanM:Person {name:'Ian McKellen', born:1939})

CREATE (AudreyT:Person {name:'Audrey Tautou', born:1976})

CREATE (PaulB:Person {name:'Paul Bettany', born:1971})

CREATE (RonH:Person {name:'Ron Howard', born:1954})

CREATE

  (TomH)-[:ACTED\_IN {roles:['Dr. Robert Langdon']}]->(TheDaVinciCode),

  (IanM)-[:ACTED\_IN {roles:['Sir Leight Teabing']}]->(TheDaVinciCode),

  (AudreyT)-[:ACTED\_IN {roles:['Sophie Neveu']}]->(TheDaVinciCode),

  (PaulB)-[:ACTED\_IN {roles:['Silas']}]->(TheDaVinciCode),

  (RonH)-[:DIRECTED]->(TheDaVinciCode)

CREATE (VforVendetta:Movie {title:'V for Vendetta', released:2006, tagline:'Freedom! Forever!'})

CREATE (NatalieP:Person {name:'Natalie Portman', born:1981})

CREATE (StephenR:Person {name:'Stephen Rea', born:1946})

CREATE (JohnH:Person {name:'John Hurt', born:1940})

CREATE (BenM:Person {name: 'Ben Miles', born:1967})

CREATE

  (Hugo)-[:ACTED\_IN {roles:['V']}]->(VforVendetta),

  (NatalieP)-[:ACTED\_IN {roles:['Evey Hammond']}]->(VforVendetta),

  (StephenR)-[:ACTED\_IN {roles:['Eric Finch']}]->(VforVendetta),

  (JohnH)-[:ACTED\_IN {roles:['High Chancellor Adam Sutler']}]->(VforVendetta),

  (BenM)-[:ACTED\_IN {roles:['Dascomb']}]->(VforVendetta),

  (JamesM)-[:DIRECTED]->(VforVendetta),

  (AndyW)-[:PRODUCED]->(VforVendetta),

  (LanaW)-[:PRODUCED]->(VforVendetta),

  (JoelS)-[:PRODUCED]->(VforVendetta),

  (AndyW)-[:WROTE]->(VforVendetta),

  (LanaW)-[:WROTE]->(VforVendetta)

CREATE (SpeedRacer:Movie {title:'Speed Racer', released:2008, tagline:'Speed has no limits'})

CREATE (EmileH:Person {name:'Emile Hirsch', born:1985})

CREATE (JohnG:Person {name:'John Goodman', born:1960})

CREATE (SusanS:Person {name:'Susan Sarandon', born:1946})

CREATE (MatthewF:Person {name:'Matthew Fox', born:1966})

CREATE (ChristinaR:Person {name:'Christina Ricci', born:1980})

CREATE (Rain:Person {name:'Rain', born:1982})

CREATE

  (EmileH)-[:ACTED\_IN {roles:['Speed Racer']}]->(SpeedRacer),

  (JohnG)-[:ACTED\_IN {roles:['Pops']}]->(SpeedRacer),

  (SusanS)-[:ACTED\_IN {roles:['Mom']}]->(SpeedRacer),

  (MatthewF)-[:ACTED\_IN {roles:['Racer X']}]->(SpeedRacer),

  (ChristinaR)-[:ACTED\_IN {roles:['Trixie']}]->(SpeedRacer),

  (Rain)-[:ACTED\_IN {roles:['Taejo Togokahn']}]->(SpeedRacer),

  (BenM)-[:ACTED\_IN {roles:['Cass Jones']}]->(SpeedRacer),

  (AndyW)-[:DIRECTED]->(SpeedRacer),

  (LanaW)-[:DIRECTED]->(SpeedRacer),

  (AndyW)-[:WROTE]->(SpeedRacer),

  (LanaW)-[:WROTE]->(SpeedRacer),

  (JoelS)-[:PRODUCED]->(SpeedRacer)

CREATE (NinjaAssassin:Movie {title:'Ninja Assassin', released:2009, tagline:'Prepare to enter a secret world of assassins'})

CREATE (NaomieH:Person {name:'Naomie Harris'})

CREATE

  (Rain)-[:ACTED\_IN {roles:['Raizo']}]->(NinjaAssassin),

  (NaomieH)-[:ACTED\_IN {roles:['Mika Coretti']}]->(NinjaAssassin),

  (RickY)-[:ACTED\_IN {roles:['Takeshi']}]->(NinjaAssassin),

  (BenM)-[:ACTED\_IN {roles:['Ryan Maslow']}]->(NinjaAssassin),

  (JamesM)-[:DIRECTED]->(NinjaAssassin),

  (AndyW)-[:PRODUCED]->(NinjaAssassin),

  (LanaW)-[:PRODUCED]->(NinjaAssassin),

  (JoelS)-[:PRODUCED]->(NinjaAssassin)

CREATE (TheGreenMile:Movie {title:'The Green Mile', released:1999, tagline:"Walk a mile you'll never forget."})

CREATE (MichaelD:Person {name:'Michael Clarke Duncan', born:1957})

CREATE (DavidM:Person {name:'David Morse', born:1953})

CREATE (SamR:Person {name:'Sam Rockwell', born:1968})

CREATE (GaryS:Person {name:'Gary Sinise', born:1955})

CREATE (PatriciaC:Person {name:'Patricia Clarkson', born:1959})

CREATE (FrankD:Person {name:'Frank Darabont', born:1959})

CREATE

  (TomH)-[:ACTED\_IN {roles:['Paul Edgecomb']}]->(TheGreenMile),

  (MichaelD)-[:ACTED\_IN {roles:['John Coffey']}]->(TheGreenMile),

  (DavidM)-[:ACTED\_IN {roles:['Brutus "Brutal" Howell']}]->(TheGreenMile),

  (BonnieH)-[:ACTED\_IN {roles:['Jan Edgecomb']}]->(TheGreenMile),

  (JamesC)-[:ACTED\_IN {roles:['Warden Hal Moores']}]->(TheGreenMile),

  (SamR)-[:ACTED\_IN {roles:['"Wild Bill" Wharton']}]->(TheGreenMile),

  (GaryS)-[:ACTED\_IN {roles:['Burt Hammersmith']}]->(TheGreenMile),

  (PatriciaC)-[:ACTED\_IN {roles:['Melinda Moores']}]->(TheGreenMile),

  (FrankD)-[:DIRECTED]->(TheGreenMile)

CREATE (FrostNixon:Movie {title:'Frost/Nixon', released:2008, tagline:'400 million people were waiting for the truth.'})

CREATE (FrankL:Person {name:'Frank Langella', born:1938})

CREATE (MichaelS:Person {name:'Michael Sheen', born:1969})

CREATE (OliverP:Person {name:'Oliver Platt', born:1960})

CREATE

  (FrankL)-[:ACTED\_IN {roles:['Richard Nixon']}]->(FrostNixon),

  (MichaelS)-[:ACTED\_IN {roles:['David Frost']}]->(FrostNixon),

  (KevinB)-[:ACTED\_IN {roles:['Jack Brennan']}]->(FrostNixon),

  (OliverP)-[:ACTED\_IN {roles:['Bob Zelnick']}]->(FrostNixon),

  (SamR)-[:ACTED\_IN {roles:['James Reston, Jr.']}]->(FrostNixon),

  (RonH)-[:DIRECTED]->(FrostNixon)

CREATE (Hoffa:Movie {title:'Hoffa', released:1992, tagline:"He didn't want law. He wanted justice."})

CREATE (DannyD:Person {name:'Danny DeVito', born:1944})

CREATE (JohnR:Person {name:'John C. Reilly', born:1965})

CREATE

  (JackN)-[:ACTED\_IN {roles:['Hoffa']}]->(Hoffa),

  (DannyD)-[:ACTED\_IN {roles:['Robert "Bobby" Ciaro']}]->(Hoffa),

  (JTW)-[:ACTED\_IN {roles:['Frank Fitzsimmons']}]->(Hoffa),

  (JohnR)-[:ACTED\_IN {roles:['Peter "Pete" Connelly']}]->(Hoffa),

  (DannyD)-[:DIRECTED]->(Hoffa)

CREATE (Apollo13:Movie {title:'Apollo 13', released:1995, tagline:'Houston, we have a problem.'})

CREATE (EdH:Person {name:'Ed Harris', born:1950})

CREATE (BillPax:Person {name:'Bill Paxton', born:1955})

CREATE

  (TomH)-[:ACTED\_IN {roles:['Jim Lovell']}]->(Apollo13),

  (KevinB)-[:ACTED\_IN {roles:['Jack Swigert']}]->(Apollo13),

  (EdH)-[:ACTED\_IN {roles:['Gene Kranz']}]->(Apollo13),

  (BillPax)-[:ACTED\_IN {roles:['Fred Haise']}]->(Apollo13),

  (GaryS)-[:ACTED\_IN {roles:['Ken Mattingly']}]->(Apollo13),

  (RonH)-[:DIRECTED]->(Apollo13)

CREATE (Twister:Movie {title:'Twister', released:1996, tagline:"Don't Breathe. Don't Look Back."})

CREATE (PhilipH:Person {name:'Philip Seymour Hoffman', born:1967})

CREATE (JanB:Person {name:'Jan de Bont', born:1943})

CREATE

  (BillPax)-[:ACTED\_IN {roles:['Bill Harding']}]->(Twister),

  (HelenH)-[:ACTED\_IN {roles:['Dr. Jo Harding']}]->(Twister),

  (ZachG)-[:ACTED\_IN {roles:['Eddie']}]->(Twister),

  (PhilipH)-[:ACTED\_IN {roles:['Dustin "Dusty" Davis']}]->(Twister),

  (JanB)-[:DIRECTED]->(Twister)

CREATE (CastAway:Movie {title:'Cast Away', released:2000, tagline:'At the edge of the world, his journey begins.'})

CREATE (RobertZ:Person {name:'Robert Zemeckis', born:1951})

CREATE

  (TomH)-[:ACTED\_IN {roles:['Chuck Noland']}]->(CastAway),

  (HelenH)-[:ACTED\_IN {roles:['Kelly Frears']}]->(CastAway),

  (RobertZ)-[:DIRECTED]->(CastAway)

CREATE (OneFlewOvertheCuckoosNest:Movie {title:"One Flew Over the Cuckoo's Nest", released:1975, tagline:"If he's crazy, what does that make you?"})

CREATE (MilosF:Person {name:'Milos Forman', born:1932})

CREATE

  (JackN)-[:ACTED\_IN {roles:['Randle McMurphy']}]->(OneFlewOvertheCuckoosNest),

  (DannyD)-[:ACTED\_IN {roles:['Martini']}]->(OneFlewOvertheCuckoosNest),

  (MilosF)-[:DIRECTED]->(OneFlewOvertheCuckoosNest)

CREATE (SomethingsGottaGive:Movie {title:"Something's Gotta Give", released:2003})

CREATE (DianeK:Person {name:'Diane Keaton', born:1946})

CREATE (NancyM:Person {name:'Nancy Meyers', born:1949})

CREATE

  (JackN)-[:ACTED\_IN {roles:['Harry Sanborn']}]->(SomethingsGottaGive),

  (DianeK)-[:ACTED\_IN {roles:['Erica Barry']}]->(SomethingsGottaGive),

  (Keanu)-[:ACTED\_IN {roles:['Julian Mercer']}]->(SomethingsGottaGive),

  (NancyM)-[:DIRECTED]->(SomethingsGottaGive),

  (NancyM)-[:PRODUCED]->(SomethingsGottaGive),

  (NancyM)-[:WROTE]->(SomethingsGottaGive)

CREATE (BicentennialMan:Movie {title:'Bicentennial Man', released:1999, tagline:"One robot's 200 year journey to become an ordinary man."})

CREATE (ChrisC:Person {name:'Chris Columbus', born:1958})

CREATE

  (Robin)-[:ACTED\_IN {roles:['Andrew Marin']}]->(BicentennialMan),

  (OliverP)-[:ACTED\_IN {roles:['Rupert Burns']}]->(BicentennialMan),

  (ChrisC)-[:DIRECTED]->(BicentennialMan)

CREATE (CharlieWilsonsWar:Movie {title:"Charlie Wilson's War", released:2007, tagline:"A stiff drink. A little mascara. A lot of nerve. Who said they couldn't bring down the Soviet empire."})

CREATE (JuliaR:Person {name:'Julia Roberts', born:1967})

CREATE

  (TomH)-[:ACTED\_IN {roles:['Rep. Charlie Wilson']}]->(CharlieWilsonsWar),

  (JuliaR)-[:ACTED\_IN {roles:['Joanne Herring']}]->(CharlieWilsonsWar),

  (PhilipH)-[:ACTED\_IN {roles:['Gust Avrakotos']}]->(CharlieWilsonsWar),

  (MikeN)-[:DIRECTED]->(CharlieWilsonsWar)

CREATE (ThePolarExpress:Movie {title:'The Polar Express', released:2004, tagline:'This Holiday Season… Believe'})

CREATE

  (TomH)-[:ACTED\_IN {roles:['Hero Boy', 'Father', 'Conductor', 'Hobo', 'Scrooge', 'Santa Claus']}]->(ThePolarExpress),

  (RobertZ)-[:DIRECTED]->(ThePolarExpress)

CREATE (ALeagueofTheirOwn:Movie {title:'A League of Their Own', released:1992, tagline:'Once in a lifetime you get a chance to do something different.'})

CREATE (Madonna:Person {name:'Madonna', born:1954})

CREATE (GeenaD:Person {name:'Geena Davis', born:1956})

CREATE (LoriP:Person {name:'Lori Petty', born:1963})

CREATE (PennyM:Person {name:'Penny Marshall', born:1943})

CREATE

  (TomH)-[:ACTED\_IN {roles:['Jimmy Dugan']}]->(ALeagueofTheirOwn),

  (GeenaD)-[:ACTED\_IN {roles:['Dottie Hinson']}]->(ALeagueofTheirOwn),

  (LoriP)-[:ACTED\_IN {roles:['Kit Keller']}]->(ALeagueofTheirOwn),

  (RosieO)-[:ACTED\_IN {roles:['Doris Murphy']}]->(ALeagueofTheirOwn),

  (Madonna)-[:ACTED\_IN {roles:['"All the Way" Mae Mordabito']}]->(ALeagueofTheirOwn),

  (BillPax)-[:ACTED\_IN {roles:['Bob Hinson']}]->(ALeagueofTheirOwn),

  (PennyM)-[:DIRECTED]->(ALeagueofTheirOwn)

CREATE (PaulBlythe:Person {name:'Paul Blythe'})

CREATE (AngelaScope:Person {name:'Angela Scope'})

CREATE (JessicaThompson:Person {name:'Jessica Thompson'})

CREATE (JamesThompson:Person {name:'James Thompson'})

CREATE

  (JamesThompson)-[:FOLLOWS]->(JessicaThompson),

  (AngelaScope)-[:FOLLOWS]->(JessicaThompson),

  (PaulBlythe)-[:FOLLOWS]->(AngelaScope)

CREATE

  (JessicaThompson)-[:REVIEWED {summary:'An amazing journey', rating:95}]->(CloudAtlas),

  (JessicaThompson)-[:REVIEWED {summary:'Silly, but fun', rating:65}]->(TheReplacements),

  (JamesThompson)-[:REVIEWED {summary:'The coolest football movie ever', rating:100}]->(TheReplacements),

  (AngelaScope)-[:REVIEWED {summary:'Pretty funny at times', rating:62}]->(TheReplacements),

  (JessicaThompson)-[:REVIEWED {summary:'Dark, but compelling', rating:85}]->(Unforgiven),

  (JessicaThompson)-[:REVIEWED {summary:"Slapstick redeemed only by the Robin Williams and Gene Hackman's stellar performances", rating:45}]->(TheBirdcage),

  (JessicaThompson)-[:REVIEWED {summary:'A solid romp', rating:68}]->(TheDaVinciCode),

  (JamesThompson)-[:REVIEWED {summary:'Fun, but a little far fetched', rating:65}]->(TheDaVinciCode)

// Parasite movie and cast

CREATE (Parasite:Movie {title:'Parasite', released:2019, tagline:'Act like you own the place'})

CREATE (KangHoSong:Person {name:'Kang-ho Song'})

CREATE (SunKyunLee:Person {name:'Sun-kyun Lee'})

CREATE (YeoJeongJo:Person {name:'Yeo-jeong Jo'})

CREATE (WooSikChoi:Person {name:'Woo-sik Choi'})

CREATE (SoDamPark:Person  {name:'So-dam Park'})

CREATE

  (KangHoSong)-[:ACTED\_IN {roles:['Ki Taek']}]->(Parasite),

  (SunKyunLee)-[:ACTED\_IN {roles:['Dong Ik']}]->(Parasite),

  (YeoJeongJo)-[:ACTED\_IN {roles:['Yeon Kyo']}]->(Parasite),

  (WooSikChoi)-[:ACTED\_IN {roles:['Ki Woo']}]->(Parasite),

  (SoDamPark)-[:ACTED\_IN {roles:['Ki Jung']}]->(Parasite)

// Joker movie and cast

CREATE (Joker:Movie {title:'Joker', released:2019, tagline:'Put on a happy face'})

CREATE (JoaquinPhoenix:Person {name:'Joaquin Phoenix'})

CREATE (RobertDeNiro:Person {name:'Robert De Niro'})

CREATE (ZazieBeetz:Person {name:'Zazie Beetz'})

CREATE

  (JoaquinPhoenix)-[:ACTED\_IN {roles:['Arthur Fleck']}]->(Joker),

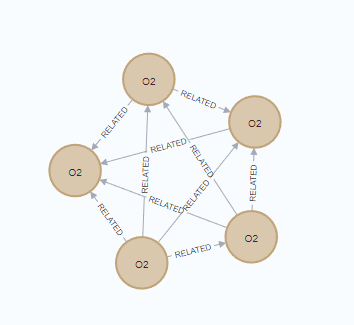
  (RobertDeNiro)-[:ACTED\_IN {roles:['Murray Franklin']}]->(Joker),

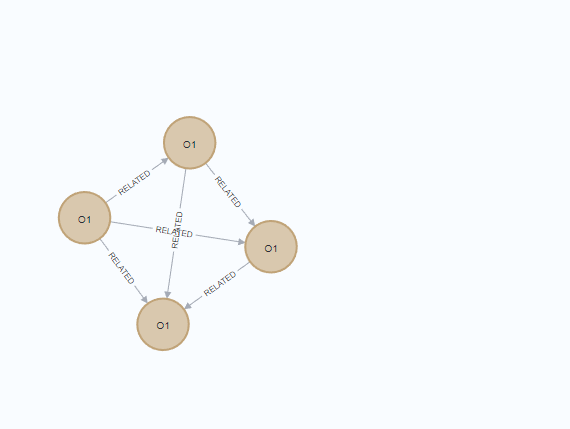
  (ZazieBeetz)-[:ACTED\_IN {roles:['Sophie Dumond']}]->(Joker)

;

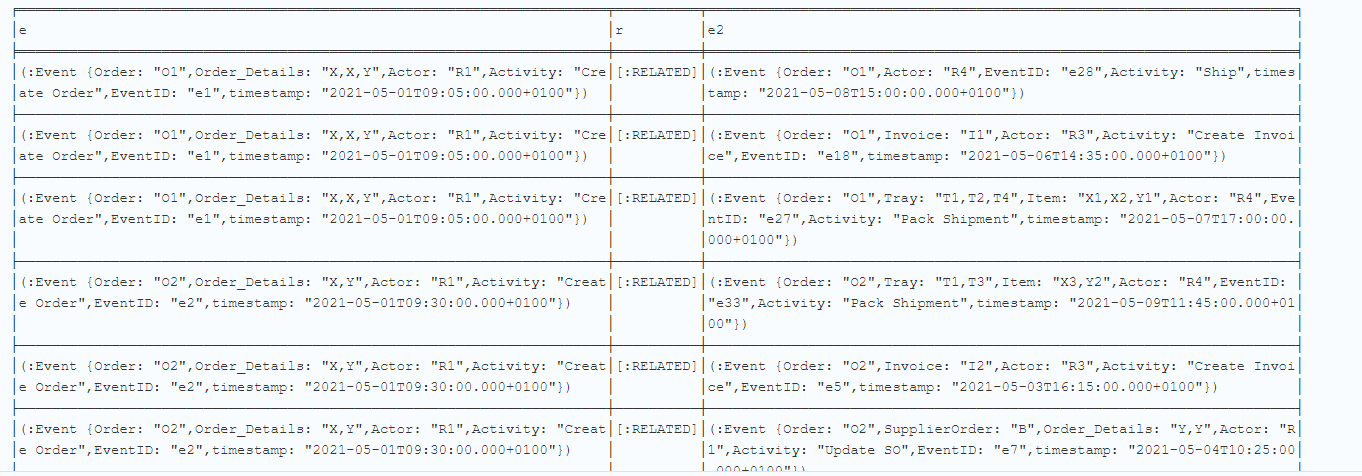
The Python scripts for automating the construction of an event knowledge graph (1\_import\_events.py and 2\_build\_event\_knowledge\_graph.py) do not scale to larger real-life datasets as the queries executed in Neo4j are stored on the heap and importing or executing queries over too many nodes exceeds the available heap (or the available memory of your computer).

* Modify the scripts to process data import and queries for event knowledge graph construction in batched transactions.
* Run an experiment that analyzes the scalability of your implementation (by synthesizing or upsampling the data from the tutorial or using other comparable data).









Cypher code (orderGraph.cql):

MATCH (n)

DETACH DELETE n

LOAD CSV WITH HEADERS FROM 'file:///order\_process\_event\_table\_orderhandling\_prepared.csv' AS row

CREATE (e:Event)

SET e = row,

    e.Order = row.Order,

    e.SupplierOrder = row.SupplierOrder,

    e.Item = row.Item,

    e.Tray = row.Tray,

    e.Payment = row.Payment,

    e.Invoice = row.Invoice,

    e.Order\_Details = row.Order\_Details,

    e.Actor = row.Actor,

    e.EventID = row.EventID,

    e.Activity = row.Activity,

    e.timestamp = row.timestamp

MATCH (e:Event)

RETURN e

LIMIT 10

MATCH (e:Event)

OPTIONAL MATCH (e)-[r:RELATED]->(e2:Event)

RETURN e, r, e2

Python code (testProject.py; 1\_import\_events.py -> modification mytestproject.py, 2\_build\_event\_knowledge\_graph.py -> modification mytestGraph.py):

# -\*- coding: utf-8 -\*-

"""

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"""

import os

import csv

import time

import psutil

from neo4j import GraphDatabase

#from contextlib import contextmanager # Ensure this import is at the top

#@contextmanager

#def monitor\_performance():

# process = psutil.Process(os.getpid())

# initial\_mem = process.memory\_info().rss / (1024 \*\* 2)

start\_time = time.perf\_counter()

# try:

# yield

#finally:

# end\_time = time.perf\_counter()

#final\_mem = process.memory\_info().rss / (1024 \*\* 2)

# peak\_mem = process.memory\_info().peak\_wset / (1024 \*\* 2) # Windows peak memory usage, for UNIX peak\_rss

#duration = end\_time - start\_time

#memory\_used = final\_mem - initial\_mem

#print(f"Execution Time: {duration:.4f} seconds")

#print(f"Memory Used: {memory\_used:.4f} MB (Final - Initial)")

#print(f"Peak Memory Used: {peak\_mem:.4f} MB")

#with open('performance\_log.txt', 'w') as file:

# file.write(f"Execution Time: {duration:.4f} seconds\n")

#file.write(f"Memory Used: {memory\_used:.4f} MB\n")

#file.write(f"Peak Memory Used: {peak\_mem:.4f} MB\n")

def read\_csv(file\_path):

"""Reads CSV file and returns headers and data as a list."""

with open(file\_path, newline='', encoding='utf-8') as csvfile:

reader = csv.reader(csvfile)

headers = next(reader) # Read the first line as headers

print("Headers found:", headers) # Debugging line to check headers

data = [row for row in reader] # Read the rest as data

return headers, data

def run\_query(driver, query, parameters=None):

with driver.session() as session:

session.run(query, parameters)

def clear\_database(driver):

"""Clears all data from the database."""

run\_query(driver, "MATCH (n) DETACH DELETE n")

def process\_in\_batches(driver, data, headers, batch\_size=500):

"""Process data in batches to manage memory usage and ensure data integrity."""

total = len(data)

with driver.session() as session:

for start in range(0, total, batch\_size):

end = start + batch\_size

batch = data[start:end]

# Using EventID as an identifier

filtered\_batch = [

{headers[i]: value for i, value in enumerate(row) if value} # Filtering empty values

for row in batch

if row[headers.index('EventID')] is not None # Make sure EventID is not null

]

if not filtered\_batch:

continue # We skip the package if all entries are invalid

query = """

UNWIND $batch AS row

MERGE (e:Event {EventID: row.EventID})

SET e += row

"""

session.run(query, {'batch': filtered\_batch})

def create\_relationships(driver):

""" Creates connections based on node properties."""

query = """

MATCH (e1:Event), (e2:Event)

WHERE e1.Order = e2.Order AND e1.EventID < e2.EventID

CREATE (e1)-[:RELATED]->(e2)

"""

run\_query(driver, query)

if \_\_name\_\_ == "\_\_main\_\_":

uri = "bolt://localhost:7689"

username = "neo4j"

password = "12345678"

driver = GraphDatabase.driver(uri, auth=(username, password))

file\_path = './prepared\_logs/order\_process\_event\_table\_orderhandling\_prepared.csv'

if os.path.exists(file\_path):

headers, data = read\_csv(file\_path)

if 'EventID' not in headers:

print("Error: 'EventID' column is missing from the CSV file.")

else:

#with monitor\_performance(): # We start monitoring

clear\_database(driver)

process\_in\_batches(driver, data, headers)

create\_relationships(driver)

driver.close()

else:

print("Error: File does not exist.")