realise par :

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le source donnes :

- les etudiants de l'ensias qui ont un parcours proche de data sience
- 58 profiles scrappe depuis le lien :https://www.linkedin.com/school/ecole-nationale-superieure-d-informatique-et-d-analyse-des-systemes/people/?educationEndYear=2021 (https://www.linkedin.com/school/ecole-nationale-superieure-d-informatique-et-d-analyse-des-systemes/people/?educationEndYear=2021)
- ciblage : les etudiant qui termine leurs etude avant de 2022

Entrée [ ]:

```
from pymongo import MongoClientQ
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

Entrée [24]:

```
# Connect to the MongoDB server
client = MongoClient()
# Select the database and collection you want to work with
db = client.linkden
collection = db.profiles
```

Analyser les compétences d'un Data scientist/Data Science

premier etape quells sont les mot cle qui signifie que un persson est un scientist/Data Science ?

Entrée [155]:

```
results = collection.aggregate([
  {"$unwind": "$work"},
  {"$group": {"_id": "$basics.label", "count": {"$sum": 1}}},
  {"$sort": {"count": -1}}
])
df = pd.DataFrame(results)

# Display the DataFrame
df.head(10)
```

Out[155]:

	_id	count
0	Data Scientist | Business Intelligence / data at MERCURE IT - SGMA | PhD student	12
1	PhD / Ing\u00e9nieur en s\u00e9curit\u00e9 des syst\u00e8mes d'information	9
2	Tech & team lead	8
3	Software engineer at Heliantha	8
4	SQA Analyst & Data Analyst	7
5	Consultante Webmethods chez CREDIT DU MAROC	6
6	Data Scientist | Data Analyst| AI Researcher | Computer Science Trainer	6
7	Consultant BI	6
8	D\u00e9veloppeur Big Data / Cloud Data Engineer	6
9	Consultante Data Scientist chez D-AIM	6

les compétences d'un Data scientist/Data Science

Entrée [303]:

```
# Perform the aggregation pipeline
results = collection.aggregate([

  {"$match": {
    "$or": [
      { "basics.label": { "$regex": "data scientist", "$options": "i" } },
      { "basics.label": { "$regex": "data science", "$options": "i" } },
      { "basics.label": { "$regex": "Analyst", "$options": "i" } },
      { "basics.label": { "$regex": "Intelligence", "$options": "i" } }

    ]
  }},
  {"$unwind": "$skills"},
  {"$group": {"_id": "$skills.name", "count": {"$sum": 1}}},
  {"$sort": {"count": -1}}

                              ])
```

Entrée [304]:

```
data = list(results)
df = pd.DataFrame(data)

# Display the DataFrame
df
```

Out[304]:

	_id	count
0	Python	11
1	MySQL	10
2	PL/SQL	9
3	SQL	9
4	Java	9
5	C	7
6	Machine Learning	7
7	JavaScript	6
8	Microsoft Power BI	6
9	C#	6
10	R	6

Top 20 des compétences de data scientists

Entrée [305]:

```
result2=collection.aggregate([
  {"$match": {
    "$or": [
      { "basics.label": { "$regex": "data scientist", "$options": "i" } },
      { "basics.label": { "$regex": "data science", "$options": "i" } },
      { "basics.label": { "$regex": "Analyst", "$options": "i" } },
      { "basics.label": { "$regex": "Intelligence", "$options": "i" } }

    ]
  }},
  {"$unwind": "$skills"},
  {"$group": {"_id": "$skills.name", "count": {"$sum": 1}}},
  {"$sort": {"count": -1}},
  {"$limit": 20}
])

data = list(result2)
df = pd.DataFrame(data)

# Display the DataFrame
df.head(10)
```

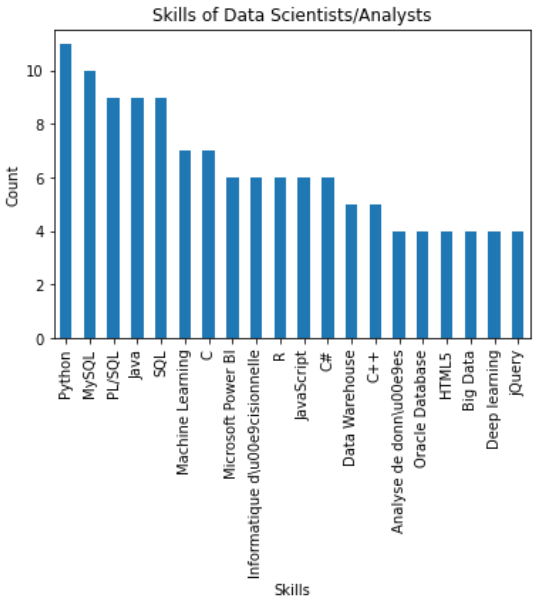
Out[305]:

	_id	count
0	Python	11
1	MySQL	10
2	PL/SQL	9
3	Java	9
4	SQL	9
5	C	7
6	Machine Learning	7
7	Microsoft Power BI	6
8	JavaScript	6
9	Informatique d\u00e9cisionnelle	6

Plot the results as a bar chart

Entrée [153]:

```
df.plot(kind='bar', x='_id', y='count', legend=False)
plt.xlabel("Skills")
plt.ylabel("Count")
plt.title("Skills of Data Scientists/Analysts")
plt.show()
```



3. Catégoriser les emplois / compétence des Data Scientist

les emplois en realtion de data sience avec les compétence

Entrée [150]:

```
result3=collection.aggregate([
  {"$match": {
    "$or": [
      { "basics.label": { "$regex": "data scientist", "$options": "i" } },
      { "basics.label": { "$regex": "data science", "$options": "i" } },
      { "basics.label": { "$regex": "Analyst", "$options": "i" } },
      { "basics.label": { "$regex": "Intelligence", "$options": "i" } }

    ]
  }},
  {"$unwind": "$skills"},
  { "$group": {
    "_id": { "position": "$work.position", "skill": "$skills.name" },
    "skills": { "$push": "$skills.name" }
  }},
  { "$group": {
    "_id": "$_id.position",
    "skills": { "$push": { "skill": "$_id.skill", "count": { "$size": "$skills" } } }
  }},
  { "$sort": { "_id": 1 } }
])
```

Entrée [151]:

```
data = list(result3)
df = pd.DataFrame(data)

# Display the DataFrame
df
```

Out[151]:

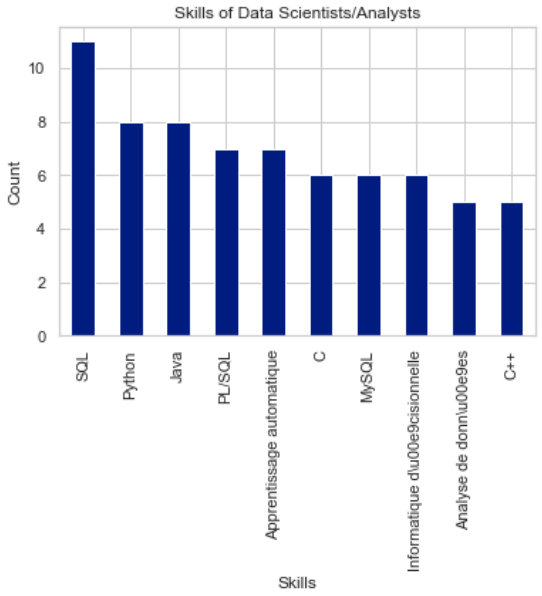
	_id	skills
0	[]	[{'skill': 'C (Programming Language)', 'count': 1}, {'skill': 'Natural Language Processing (NLP)', 'count': 1}, {'skill': 'Python (Programming Language)', 'count': 1}, {'skill': 'RStudio', 'count': 1}, {'skill': 'R', 'count': 1}, {'skill': 'Machine Learning', 'count': 1}, {'skill': 'Data Science', 'count': 1}, {'skill': 'GNU Octave', 'count': 1}, {'skill': 'Deep Learning', 'count': 1}, {'skill': 'Big Data', 'count': 1}, {'skill': 'Big Data Analytics', 'count': 1}, {'skill': 'SPARQL', 'count': 1}, {'skill': 'Sentiment Analysis', 'count': 1}, {'skill': 'Java', 'count': 1}]
1	[Analyste d\u00e9veloppeur en COBOL/MVS, D\u00e9veloppeur et analyste en COBOL/MVS \u2013 Freelance, D\u00e9veloppeur et analyste confirm\u00e9 en COBOL/MVS]	[{'skill': 'Oracle', 'count': 1}, {'skill': 'JAVA', 'count': 1}, {'skill': 'XML', 'count': 1}, {'skill': 'COBOL', 'count': 1}, {'skill': 'C#', 'count': 1}, {'skill': 'MySQL', 'count': 1}, {'skill': 'UML', 'count': 1}, {'skill': 'ASP.NET', 'count': 1}, {'skill': 'J2ME', 'count': 1}]
2	[BI Engineer, Skilling The African Youth, Data Scientist Intern, Research intern, Data Scientist, Business Intelligence Developer, intern, Android Developer, intern]	[{'skill': 'Big Data', 'count': 1}, {'skill': 'Datawarehouse', 'count': 1}, {'skill': 'D\u00e9veloppement d\u2019applications Web', 'count': 1}, {'skill': 'Intelligence artificielle', 'count': 1}, {'skill': 'Tensorflow', 'count': 1}, {'skill': 'Data Collection', 'count': 1}, {'skill': 'Tableau', 'count': 1}, {'skill': 'Data Warehouse', 'count': 1}, {'skill': 'Recherche', 'count': 1}, {'skill': 'Java', 'count': 1}, {'skill': 'D\u00e9veloppement d\u2019applications', 'count': 1}, {'skill': 'Linux', 'count': 1}, {'skill': 'Visualisation de donn\u00e9es', 'count': 1}, {'skill': 'SQL', 'count': 1}, {'skill': 'Machine learning', 'count': 1}, {'skill': 'Apprentissage automatique', 'count': 1}, {'skill': 'Exploration des donn\u00e9es', 'count': 1}, {'skill': 'Deep learning', 'count': 1}, {'skill': 'Data analysis', 'count': 1}, {'skill': 'Microsoft Power BI', 'count': 1}, {'skill': 'Informati

les compétence les plus savant par emplois

cas "Data Scientist"

Entrée [306]:

```
# Specify the position you want to filter by
position = "Data Scientist"

results = collection.aggregate([
    {"$unwind": "$work"},
    {"$unwind": "$skills"},
    {"$match": {"work.position":  { "$regex": position, "$options": "i" }}},
    {"$group": {"_id": "$skills.name", "count": {"$sum": 1}}},
    {"$sort": {"count": -1}}
])

# Convert the results to a pandas DataFrame
df = pd.DataFrame(list(results))

# Rename the columns to match the skills and count
df.rename(columns={'_id':'skills','count':'count'}, inplace=True)

#print the table
df.head(5)
# Plot the results as a bar chart

df.head(10).plot(kind='bar', x='skills', y='count', legend=False)
plt.xlabel("Skills")
plt.ylabel("Count")
plt.title("Skills of Data Scientists/Analysts")

plt.show()
```



4 list des competences de chaque profile

Entrée [210]:

```
results = collection.aggregate([
    {"$unwind": "$work"},
    {"$unwind": "$skills"},
    {"$group": {"_id": {"person":"$basics.name","skill":"$skills.name"}, "count": {"$sum": 1}}},
    {"$sort": {"count": -1}},
    {"$group": {"_id": "$_id.person", "skills": {"$push": {"skill":"$_id.skill","count":"$count"}}}},
    {"$sort": {"_id": 1}},
    {"$match": {"skills.2": {"$exists": True}}}
])


# Convert the results to a pandas DataFrame
df = pd.DataFrame(list(results))

# Rename the columns to match the skills and count

#print the table
df.head(5)
```

Out[210]:

	_id	skills
0	Abla El bekkali	[{'skill': 'Oracle Database', 'count': 9}, {'skill': 'MySQL', 'count': 9}, {'skill': 'Intelligence artificielle (IA)', 'count': 9}, {'skill': 'Programmation web', 'count': 9}, {'skill': 'Project Management', 'count': 9}, {'skill': 'C++', 'count': 9}, {'skill': 'S\u00e9curit\u00e9 r\u00e9seau', 'count': 9}, {'skill': 'Blockchain', 'count': 9}, {'skill': 'Technologies de l\u2019information', 'count': 9}, {'skill': 'Python (langage de programmation)', 'count': 9}, {'skill': 'Networking', 'count': 9}, {'skill': 'Cybers\u00e9curit\u00e9', 'count': 9}, {'skill': 'JavaScript', 'count': 9}, {'skill': 'Test d\u2019intrusion', 'count': 9}, {'skill': 'Gestion d'\u00e9quipe', 'count': 9}, {'skill': 'SQL', 'count': 9}, {'skill': 'C (langage de programmation)', 'count': 9}, {'skill': 'Big data', 'count': 9}, {'skill': 'Gestion de projet', 'count': 9}, {'skill': 'Securit\u00e9 des syst\u00e8mes d\u...
1	Amina Sghiri	[{'skill': 'language c', 'count': 1}, {'skill': 'Analyse de donn\u00e9es', 'count': 1}, {'skill': 'Base de donn\u00e9es', 'count': 1}, {'skill': 'Hive', 'count': 1}, {'skill': 'SAS', 'count': 1}, {'skill': 'Programmation SAS', 'count': 1}, {'skill': 'Analyses Big Data', 'count': 1}, {'skill': 'Big Data', 'count': 1}, {'skill': 'java', 'count': 1}, {'skill': 'Apache Spark', 'count': 1}, {'skill': 'Talend', 'count': 1}, {'skill': 'Python', 'count': 1}, {'skill': 'Extraire, transformer, charger (ETL)', 'count': 1}, {'skill': 'business intelligence', 'count': 1}, {'skill': 'Informatique d\u00e9cisionnelle', 'count': 1}, {'skill': 'Merise', 'count': 1}, {'skill': 'Data Warehouse', 'count': 1}, {'skill': 'Programmation web', 'count': 1}, {'skill': 'Microsoft Office', 'count': 1}, {'skill': 'Science des donn\u00e9es', 'count': 1}, {'skill': 'machine learning', 'count': 1}, {'skill': 'Intell...
2	Amine Hamdouchi	[{'skill': 'Apprentissage supervis\u00e9', 'count': 6}, {'skill': 'Mod\u00e9lisation math\u00e9matique', 'count': 6}, {'skill': 'Apprentissage par renforcement', 'count': 6}, {'skill': 'SQL Server Integration Services (SSIS)', 'count': 6}, {'skill': 'Microsoft Power BI', 'count': 6}, {'skill': 'SPSS', 'count': 6}, {'skill': 'Qlik Sense', 'count': 6}, {'skill': 'Microsoft SQL Server', 'count': 6}]
		[{'skill': 'Python', 'count': 6}, {'skill': 'Time series forecasting', 'count': 6}, {'skill': 'Base de donn\u00e9es', 'count': 6}, {'skill': 'UML', 'count': 6}, {'skill': 'Analyse pr\u00e9dictive', 'count': 6}, {'skill': 'Java', 'count': 6}, {'skill': 'SAS', 'count': 6}, {'skill': 'Merise', 'count': 6}, {'skill': 'Data Analytics'

5 les compétences et l'education des profils qui ont plus experience ,

Entrée [246]:

```
results = collection.aggregate([
  { "$project": {
      "name": "$basics.name",
      "work_count": {"$size": "$work"},
      "skills": "$skills",
      "last_education": { "$arrayElemAt": [ "$education", 1 ] }
    }
  },
  { "$unwind": "$skills" },
  { "$group": {
      "_id": "$name",
      "work_count": {"$first": "$work_count"},
      "skills": {"$push": "$skills.name"},
      "skills_count": {"$sum": 1},
      "last_education": {"$last": "$last_education.studyType"}
    }
  },
  { "$project": {

      "work_count": "$work_count",
      "skills": "$skills",
      "skills_count": "$skills_count",
      "last_education": "$last_education"
    }
  },
  { "$sort": { "work_count": -1 } }
])


# Convert the results to a pandas DataFrame
df = pd.DataFrame(list(results))

# Rename the columns to match the skills and count

#print the table
df.head(5)
```

Out[246]:

	_id	work_count	skills	skills_count	last_education
0	Abla El bekkali	9	[Securit\u00e9 des syst\u00e8mes d\u2019information, Cybers\u00e9curit\u00e9, Blockchain, Iot, Big data, Intelligence artificielle (IA), Python (langage de programmation), S\u00e9curit\u00e9 r\u00e9seau, Cryptographie, Networking, Hacking \u00e9thique, DevOps, Test d\u2019intrusion, Java, JavaScript, SQL, MySQL, Microsoft Office, ITIL, Management services IT, Project Management, C (langage de programmation), Programmation web, Oracle Database, Informatique, Authentification s\u00e9curis\u00e9e, Gestion d'\u00e9quipe, Gestion de projet, Technologies de l\u2019information, C++, Pare-feux, PHP]	32	Master s\u00e9curit\u00e9 des syst\u00e8mes d'information
1	Younes Akhrif	8	[UML, Java Enterprise Edition, Java, SQL, Team Management, Telecommunications, Hibernate, Eclipse, Oracle, Spring, XML, Project Management, Business Intelligence, Web Services, Spring Framework, GSM, Flex, Linux, MySQL, Software Development, NTT DATA Europe & Latam, Talend Open Studio, AngularJS, Oracle SOA Suite, Amazon Web Services (AWS), Spring Boot, Maven, CXF, RESTful WebServices, Magento, Agile Methodologies, Docker, Unified Modeling Language (UML), Spring Batch, Spring Security, Spring MVC, Scrum, Kubernetes]	38	Ma\u00eetrise en G\u00e9nie informatique
			[Object-Oriented Programming (OOP), Machine Learning, Artificial Intelligence (AI), Support Vector Machine (SVM), lora, Secteur de l\u2019\u00e9nergie solaire, G\u00e9nie \u00e9lectrique, Microcontr\u00f4leurs ESP32, Android Studio, C (langage		

6. Compter le nombre de profils qui maitrise python ayant une licence ?

Entrée [143]:

```
result6=collection.aggregate([
    {"$match": {
    "$and": [
      { "education.studyType": { "$regex": "licence", "$options": "i" } },
      { "skills.name": { "$regex": "python", "$options": "i" } },
      { "skills.name": { "$regex": "R", "$options": "i" } }
    ]
  }},
  {"$count": "number of profiles"}
])
data = list(result6)
df = pd.DataFrame(data)

# Display the DataFrame
print(df)
```

```
   number of profiles
0                  16
```

7. Idem que 6 , mais maitrisant aussi R

Entrée [146]:

```
result7=collection.aggregate([
    {"$match": {
    "$and": [
      { "education.studyType": { "$regex": "licence", "$options": "i" } },
      { "skills.name": { "$regex": "python", "$options": "i" } },
      { "skills.name": { "$regex": "R", "$options": "i" } }
    ]
  }},
  {"$count": "number of profiles"}
])
data = list(result7)
df = pd.DataFrame(data)

# Display the DataFrame
print(df)
```

```
   number of profiles
0                  16
```

7. Idem que 6 , mais maitrisant aussi Machine learning

Entrée [214]:

```
result7=collection.aggregate([
    {"$match": {
    "$and": [
      { "education.studyType": { "$regex": "licence", "$options": "i" } },
      { "skills.name": { "$regex": "python", "$options": "i" } },
      { "skills.name": { "$regex": "Machine learning", "$options": "i" } }
    ]
  }},
  {"$count": "number of profiles"}
])
data = list(result7)
df = pd.DataFrame(data)

# Display the DataFrame
print(df)
```

```
   number of profiles
0                   9
```

Compléter le programme (Python) suivant afin d'afficher les postes d'un profil

selon le format suivant :

- poste 1 :
- poste 2 :

Entrée [219]:

```
# Use a cursor to iterate through the documents
cursor = collection.find({"basics.name":"Abla El bekkali"},{"work":1})

for doc in cursor:
    for index, work in enumerate(doc["work"]):
        print("poste " + str(index + 1) + " : " + work["position"] + " at " + work["name"])
```

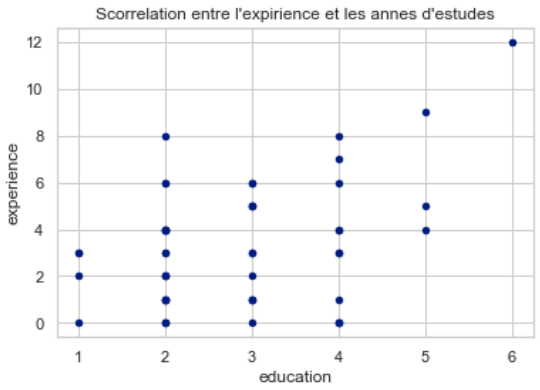
```
poste 1 : Professor at EMCGI
poste 2 : Professor at Ecole Marocaine des Sciences de l'ing\u00e9nieur
poste 3 : Author at Research India Publication
poste 4 : Author at IEEE
poste 5 : Professor at Universit\u00e9 Internationale de Rabat
poste 6 : Ing\u00e9nieur en s\u00e9curit\u00e9 des syst\u00e8mes d'information at Renault Group
poste 7 : Ing\u00e9nieur en s\u00e9curit\u00e9 des syst\u00e8mes d'information at Metragaz tanger
poste 8 : Stage en ing\u00e9nierie at SOCI\u00c9T\u00c9 TANG\u00c9ROISE DE MAINTENANCE
poste 9 : STAGE at Banque Populaire du Maroc (Groupe) Inc
```

9 Analyser Corrélation entre les études et l'employabilité

Entrée [301]:

```
# Perform the aggregation pipeline
pipeline = [
    { "$group": {
        "_id": {"education": "$education"},
        "experience": {"$sum": { "$size": "$work" }},
        "education": {"$sum":  { "$size": "$education" }}
    }},
    { "$sort": {"experience": -1}}
]
results = list(collection.aggregate(pipeline))

# Create a Pandas DataFrame from the results
df = pd.DataFrame(results)
# Calculate the correlation between education and experience
correlation = df['education'].corr(df['experience'])
print("correlation entre l'expirience et les annes d'estudes ->",correlation)
df.plot(kind='scatter', x='education', y='experience', legend=False)
plt.xlabel("education")
plt.ylabel("experience")
plt.title("Scorrelation entre l'expirience et les annes d'estudes")

plt.show()
```

```
correlation entre l'expirience et les annes d'estudes -> 0.40416969898828
```



11. Quelles entreprises qui ont embauché ces data scientists ? On pourra les classer :

- Entreprise de Classe A : > 3
- Enterprise de Classe B : compris entre 2 et 3
- Enterprise de Classe C : <2

Entrée [307]:

```
pipeline = [
    {"$unwind": "$work"},
    {"$group": {"_id": "$work.name", "count": {"$sum": 1}}},
    {"$sort": {"count": -1}}
]

result = collection.aggregate(pipeline)

class_a = []
class_b = []
class_c = []

for company in result:
    if company["count"] > 3:
        class_a.append(company["_id"])
    elif 2 <= company["count"] <= 3:
        class_b.append(company["_id"])
    else:
        class_c.append(company["_id"])

print("Entreprise de Classe A:",class_a, len(class_a))
print(" nombre Entreprise de Classe B:", len(class_b))
print("nombre Entreprise de Classe C:", len(class_c))
```

```
Entreprise de Classe A: ['Heliantha', 'Attijariwafa bank', 'SQLI'] 3
 nombre Entreprise de Classe B: 23
nombre Entreprise de Classe C: 107
```

Entrée [ ]: