In [ ]:

```
#The first cell content of the .ipynb notebook should be as follows:
# A6
# Sujeet kumar
# Amrendra Kumar Singh
# Ritesh Raj Kumar
```

In [77]:

```python
from pandas import read_csv
from pandas import DataFrame
import pandas as pd
import numpy as np
from sklearn.preprocessing import LabelEncoder
from sklearn.preprocessing import StandardScaler  # For scaling dataset
from sklearn.cluster import KMeans
import matplotlib.pyplot as plt
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
from numpy.random import randint
import seaborn as sns
from kmodes import kmodes
from sklearn.decomposition import PCA


# Load the CSV file
dataset = pd.read_csv('data.csv')
modDfObj = dataset
modDfObj.isnull().sum(axis = 0)
#Remove the Recruitment Contact and Post until attributes These attributes are i
nsginificant and most of the values are NAN

modDfObj = dataset.drop(['Recruitment Contact','Post Until'],axis='columns')
modDfObj.columns = [c.replace(' ', '_') for c in modDfObj.columns]
modDfObj.isnull().sum(axis = 0)

# Impute the missing data in five colums with new values
modDfObj[["Full-Time/Part-Time_indicator"]] = modDfObj[["Full-Time/Part-Time_ind
icator"]].fillna(value="Missing-Time")
modDfObj[["Hours/Shift"]] = modDfObj[["Hours/Shift"]].fillna(value="Missing-Hou
r/shift")
modDfObj[["Work_Location_1"]] = modDfObj[["Work_Location_1"]].fillna(value="Miss
ing_Work_Location_1")
modDfObj[["Preferred_Skills"]] = modDfObj[["Preferred_Skills"]].fillna(value="Mi
ssing_Preferred_Skills")
modDfObj[["Additional_Information"]] = modDfObj[["Additional_Information"]].fill
na(value="Missing_Additional_Info..")

modDfObj.isnull().sum(axis = 0)

# drop the rows which has NAN so all records will be not NAN.. Dropping 16 rows
 ( Job Category 2+Mim Qual Requi 14)
modDfObj.dropna(inplace=True)
modDfObj.isnull().sum(axis = 0)

# Labeld the preferred skills .. Create new columnn and map with preferred skill
s
Preferred_Skills = np.unique(modDfObj['Preferred_Skills'])
gle = LabelEncoder()
genre_labels  = gle.fit_transform(modDfObj['Preferred_Skills'])
genre_mappings = {index: label for index, label in
                  enumerate(gle.classes_)}
genre_mappings
modDfObj['Prefskill'] = genre_labels
modDfObj[['Preferred_Skills', 'Prefskill']].iloc[1:7]

# Labeld the preferred skills .. Create new columnn and map with preferred skill
s
```

```python
Job_Category = np.unique(modDfObj['Job_Category'])
gle2 = LabelEncoder()
genre_labels2  = gle2.fit_transform(modDfObj['Job_Category'])
genre_mappings = {index: label for index, label in
                  enumerate(gle2.classes_)}
genre_mappings
modDfObj['jobCategoryCode'] = genre_labels
modDfObj[['Job_Category', 'jobCategoryCode']].iloc[1:7]


# calculated Average salary of each skills..
modDfObj['Average_Salary'] =  modDfObj['Salary_Range_From'] + (modDfObj['Salary_
Range_To'] – modDfObj['Salary_Range_From']) / 2
# Add column salry Normalizatino
modDfObj['Salary_normalization'] = np.where(modDfObj['Salary_Frequency'] == 'Hou
rly' ,2920, np.where(modDfObj['Salary_Frequency'] =="Daily", 365, 1))


# converting Hourly and daily salary into Annual ..
#Assumption – 8 hrs /day and 365 days/annual

modDfObj['Salary_Range_From'] = modDfObj['Salary_Range_From']*modDfObj['Salary_n
ormalization']
modDfObj['Salary_Range_To'] = modDfObj['Salary_Range_To']*modDfObj['Salary_norma
lization']
modDfObj['Average_Salary'] = modDfObj['Average_Salary']*modDfObj['Salary_normali
zation']
modDfObj[['Salary_Range_From','Salary_Range_To','Average_Salary','Salary_Frequen
cy','Salary_normalization']]
```

Out[77]:

	Salary_Range_From	Salary_Range_To	Average_Salary	Salary_Frequency	Salai
2	51907.68	54580.32	53244.0	Annual	1
3	51907.68	54580.32	53244.0	Annual	1
4	102200.00	102200.00	102200.0	Hourly	2920
5	102200.00	102200.00	102200.0	Hourly	2920
6	50598.00	85053.00	67825.5	Annual	1
7	50623.00	75083.00	62853.0	Annual	1
8	90000.00	110000.00	100000.0	Annual	1
9	62942.00	92249.00	77595.5	Annual	1
10	62942.00	92249.00	77595.5	Annual	1
11	30683.00	49707.00	40195.0	Annual	1
12	49492.00	60000.00	54746.0	Annual	1
13	87203.00	131623.00	109413.0	Annual	1
14	87203.00	131623.00	109413.0	Annual	1
15	25550.00	30251.20	27900.6	Hourly	2920
16	25550.00	30251.20	27900.6	Hourly	2920
17	32086.00	51981.00	42033.5	Annual	1
18	43292.00	53000.00	48146.0	Annual	1
19	49492.00	69000.00	59246.0	Annual	1
20	32086.00	51981.00	42033.5	Annual	1
21	81290.00	95896.00	88593.0	Annual	1
22	44735.00	55000.00	49867.5	Annual	1
23	44735.00	55000.00	49867.5	Annual	1
24	45174.00	62370.00	53772.0	Annual	1
25	32086.00	51981.00	42033.5	Annual	1
26	49492.00	100000.00	74746.0	Annual	1
27	38089.00	53300.00	45694.5	Annual	1
28	65458.80	65458.80	65458.8	Annual	1
29	65458.80	65458.80	65458.8	Annual	1
30	72260.00	98163.00	85211.5	Annual	1
31	72260.00	98163.00	85211.5	Annual	1
...	...	...	...	...	...
3198	54382.00	87000.00	70691.0	Annual	1
3199	54382.00	87000.00	70691.0	Annual	1

	Salary_Range_From	Salary_Range_To	Average_Salary	Salary_Frequency	Salaı
3200	73305.00	92001.00	82653.0	Annual	1
3201	73305.00	92001.00	82653.0	Annual	1
3202	45406.00	58750.40	52078.2	Hourly	2920
3203	45406.00	58750.40	52078.2	Hourly	2920
3204	65731.00	88000.00	76865.5	Annual	1
3205	50078.00	57590.00	53834.0	Annual	1
3206	50078.00	57590.00	53834.0	Annual	1
3207	51500.00	51500.00	51500.0	Annual	1
3208	51500.00	51500.00	51500.0	Annual	1
3209	52524.00	60403.00	56463.5	Annual	1
3210	52524.00	60403.00	56463.5	Annual	1
3211	45113.00	50000.00	47556.5	Annual	1
3212	45113.00	50000.00	47556.5	Annual	1
3213	58324.00	67073.00	62698.5	Annual	1
3214	60435.00	112000.00	86217.5	Annual	1
3215	65783.00	70852.00	68317.5	Annual	1
3216	65783.00	70852.00	68317.5	Annual	1
3217	45340.00	66109.00	55724.5	Annual	1
3218	52524.00	60403.00	56463.5	Annual	1
3219	52524.00	60403.00	56463.5	Annual	1
3220	56990.00	120982.00	88986.0	Annual	1
3221	56990.00	120982.00	88986.0	Annual	1
3222	55416.00	80000.00	67708.0	Annual	1
3223	55416.00	80000.00	67708.0	Annual	1
3224	72476.00	85000.00	78738.0	Annual	1
3225	72476.00	85000.00	78738.0	Annual	1
3226	60433.00	73375.00	66904.0	Annual	1
3227	60433.00	73375.00	66904.0	Annual	1

3212 rows × 5 columns

In [78]:

```
# Solution for Question no 1 and Question no 2
# Highest paid skills decided based on the Higest Average salary of skills

# drop duplicates to get unique pref skills
modDfObj = modDfObj.drop_duplicates('Prefskill')

# sort basis on Average salary to get the highest paid skills
modDfObj = modDfObj.sort_values(by=['Average_Salary'],axis=0, ascending=False)

modDfObj[['Prefskill','Salary_Range_From','Salary_Range_To','Average_Salary','Sa
lary_Frequency','Salary_normalization']]
```

Out[78]:

	Prefskill	Salary_Range_From	Salary_Range_To	Average_Salary	Salary_Frequen
2522	1152	239440.000	239440.000	239440.000	Hourly
411	28	214240.400	229482.800	221861.600	Hourly
1960	683	218587.000	218587.000	218587.000	Annual
417	684	209585.000	209585.000	209585.000	Annual
1873	510	200931.000	214848.000	207889.500	Annual
1399	621	180472.000	225217.000	202844.500	Annual
39	460	198518.000	198518.000	198518.000	Annual
1512	930	185000.000	195000.000	190000.000	Annual
2805	1296	183200.800	183200.800	183200.800	Daily
277	639	175000.000	190000.000	182500.000	Annual
1845	934	177652.800	177652.800	177652.800	Daily
602	553	177652.800	177652.800	177652.800	Hourly
812	932	130000.000	224749.000	177374.500	Annual
1094	1319	113113.000	230000.000	171556.500	Annual
2247	1191	91434.544	251615.816	171525.180	Hourly
2256	945	91434.544	251615.816	171525.180	Hourly
3144	1014	103620.000	234402.000	169011.000	Annual
2933	1244	160000.000	175000.000	167500.000	Annual
2199	1274	160000.000	175000.000	167500.000	Annual
1491	928	145000.000	180000.000	162500.000	Annual
1493	917	145000.000	180000.000	162500.000	Annual
752	948	99353.000	224749.000	162051.000	Annual
434	488	99353.000	224749.000	162051.000	Annual
1679	882	94981.000	225217.000	160099.000	Annual
2154	914	94981.000	225217.000	160099.000	Annual
1174	27	94981.000	225217.000	160099.000	Annual
2110	24	157650.800	157650.800	157650.800	Hourly
2472	693	150000.000	160000.000	155000.000	Annual
2065	1156	145000.000	161136.000	153068.000	Annual
1505	586	86346.000	217244.000	151795.000	Annual
...	...	...	...	...	...
1334	175	33036.000	48183.000	40609.500	Annual
1437	13	34543.000	46329.000	40436.000	Annual

	Prefskill	Salary_Range_From	Salary_Range_To	Average_Salary	Salary_Freque
11	447	30683.000	49707.000	40195.000	Annual
3104	268	37217.000	42799.000	40008.000	Annual
3037	1012	37217.000	42799.000	40008.000	Annual
1284	1130	31893.000	47515.000	39704.000	Annual
550	293	36239.000	41675.000	38957.000	Annual
1352	1362	37217.000	40000.000	38608.500	Annual
879	258	35330.000	40629.000	37979.500	Annual
3192	1097	35330.000	40629.000	37979.500	Annual
2037	1246	35330.000	40629.000	37979.500	Annual
1508	963	35330.000	40629.000	37979.500	Annual
911	546	35330.000	40629.000	37979.500	Annual
74	424	35213.000	40495.000	37854.000	Annual
1849	863	0.000	75000.000	37500.000	Annual
1207	935	34096.000	38528.000	36312.000	Annual
3039	261	36309.000	36309.000	36309.000	Annual
2717	594	31573.000	40962.000	36267.500	Annual
2352	131	33704.000	38760.000	36232.000	Annual
2351	116	33704.000	38760.000	36232.000	Annual
1391	698	33604.000	38645.000	36124.500	Annual
46	17	28965.000	43152.000	36058.500	Annual
1800	942	31544.000	39111.000	35327.500	Annual
3110	1253	32680.000	37582.000	35131.000	Annual
2181	203	27794.750	39719.300	33757.025	Daily
421	658	28366.000	32621.000	30493.500	Annual
72	501	26457.000	32665.000	29561.000	Annual
15	74	25550.000	30251.200	27900.600	Hourly
1999	187	0.000	43079.000	21539.500	Annual
981	152	0.000	43079.000	21539.500	Annual

1383 rows × 6 columns

In [64]:

```
# Continuation of Answer of Question no 1 and Question no 2 ..Each niche skills
 and respective
#job category is displayed below in order
pd.set_option('display.max_colwidth', -1)
modDfObj[['Prefskill','Preferred_Skills' ,'Job_Category']]
```

Out[64]:

	Prefskill	Preferred_Skills	Job_Category
2522	1152	â€¢\tProven ability to work collaboratively with high-level officials at City Hall, the Deputy Mayorâ€™s Office, and the Mayorâ€™s Office of Operations. â€¢\tStrong familiarity with previous interagency data-sharing efforts. â€¢\tStrong familiarity with the base data products produced by DoITT and DCP. â€¢\tKnowledge of the foundational spatial data requirements of NYC public safety agencies. â€¢\tStrong understanding of existing mechanisms for sharing data among City agencies. â€¢\tStrong understanding of the variety of data needed for optimal emergency response. â€¢\tUnderstanding of the constraints on optimal data sharing observed during emergency response. â€¢\tStrong understanding of typical deployment of the Esri suite of GIS software at City agencies. â€¢\tStrong background in managing data management staff. â€¢\tProven ability to work with partnering agencies on data / application governance committees. â€¢\tDemonstrated ability to organize and conduct large meetings and synthesize their outcomes. â€¢\tKnowledge of the general development and use of GIS among City agencies.	Technology, Data & Innovation
411	28	--Board Certification in Pediatrics or Adolescent Health - Effective communication and interpersonal skills - Proficiency in internet usage and computer software programs, such as Microsoft Word, Excel, and Outlook - Master's Degree in Public Health (M	Health

	Prefskill	Preferred_Skills	Job_Category
1960	683	The Deputy Commissioner position requires excellent leadership, communication and client service skills as well as a passion for driving innovation, continuous improvement and efficiency, and implementing workforce strategies to recruit, develop and retain the most qualified and diverse talent in a customer service environment. The selected candidate will be expected to work closely with Agency and oversight counterparts and must have excellent management skills focused on staff alignment with the Bureauâ€™s vision, goals and career development. In addition, he/she must be an effective team player, capable of sustaining a culture of excellence in the delivery of customer service to internal partners and possess the ability to establish and maintain effective external partnerships and collaboration. Specifically, the following skills and abilities are required to be successful in this role: â€¢\t7-10 years relevant work experience leading customer focused functions, of which at least 3 years must have been in a senior leadership position â€¢\tBA/BS degree; MBA/advanced degree preferred â€¢\tStrong analytical skills, with ability to interpret data and trends, diagnose problems, and implement action plans to resolve issues â€¢\tOutstanding written and oral communication skills â€¢\tComfort in managing concurrent projects in a fast-paced, results-driven environment with equal enthusiasm for high-level strategic planning and tactical daily execution â€¢\tIn-depth knowledge of Federal, City and State governmental rules and regulations related to the position; NYC experience is a plus. â€¢\tProficiency in Microsoft Office Suite	Administration & Human Resources Finance, Accounting, & Procurement Building Operations & Maintenance

	Prefskill	Preferred_Skills	Job_Category
417	684	The Deputy Commissioner position requires: -\texcellent communication and client service skills to work closely and effectively with Agency, oversight counterparts, and the media; -\tdemonstrated success in leading, overseeing and facilitating innovations and improvements in water distribution and sewer operations as described above; -\texperience in or with public water systems; -\tability to report quickly to emergency situations in all five boroughs around the clock; -\texcellent management and leadership skills that will inspire Bureau staff to sustain a work environment, operations and strategic initiatives that are aligned with DEPâ€™s vision, mission, values and goals; -\tability to be an effective team player and capable of sustaining a culture of excellence in customer service to the residents of NYC; -\tability to facilitate and sustain effective external partnerships with some of the largest and most significant private contractors in NYC who perform some of the more extensive and complex work in maintaining the water distribution and sewer system; and -\ta valid NYS License as a Professional Engineer.	Engineering, Architecture, & Planning Finance, Accounting, & Procurement Building Operations & Maintenance Public Safety, Inspections, & Enforcement

	Prefskill	Preferred_Skills	Job_Category
1873	510	Master Degree or other advanced degree preferred. Dynamic leadership skills and a proven track record of accomplishments in the management of complex social service programs. Excellent critical thinking and strategic planning skills with a proven ability to create, develop and Implement agency policies and procedures. Proven ability to lead and oversee large-scale operations effectively, and bring about whole scale and sustainable improvements. Expertise in services for all homeless populations, including evidenced-based practices of case management and service delivery. Ability to effectively represent the agency at external meetings, conferences, key public events and forums. Experience and knowledge of federal, state and city government transitional housing and homeless programs.	Administration & Human Resources Constituent Services & Community Programs Communications & Intergovernmental Affairs Engineering, Architecture, & Planning Finance, Accounting, & Procurement Health Technology, Data & Innovation Legal Affairs Building Operations & Maintenance Policy, Research & Analysis Public Safety, Inspections, & Enforcement Social Services

	Prefskill	Preferred_Skills	Job_Category
1399	621	QUALIFICATIONS - At least five years of experience managing teams implementing Federal grant programs with demonstrable leadership skills related to Federal grant requirements, financial program analysis, Federal grant compliance, policy innovation and other related Federal grant administration areas of expertise. - Exceptional interpersonal skills and an ability to maintain working relationships with staff, City officials, government agencies, the public and all other internal and external workforces at all levels with utmost professionalism. - Advanced ability to lead and oversee a team of professionals. Ability to work independently as a self-motivator and to motivate others as a leader of a team and to work with minimal supervision. - Exceptional organizational, research, problem solving, and analytical skills. - Outstanding written and spoken communications skills, including public speaking and presentation. - Ability to work calmly and proficiently under pressure and to adhere to strict deadlines. - Must possess strong computer technology skills including a proficiency in Microsoft Office software (Word, Excel, Access, and PowerPoint) and the ability to learn new technology quickly.	Communications & Intergovernmental Affairs Legal Affairs Policy, Research & Analysis
39	460	Extensive experience in wastewater operations is preferred but not required. The ideal candidate will also demonstrate competency in managing technical operations, including large numbers of engineering and other technical staff. A New York State grade 4A Wastewater Treatment Plant Operator Certificate is desirable.	Engineering, Architecture, & Planning Maintenance & Operations
1512	930	â€¢\tA Juris Doctorate preferred or a Masterâ€™s Degree in the fields of business, public administration/policy, engineering, or auditing. â€¢\tA minimum of 10 years of full time satisfactory professional experience in the field of compliance management, with a focus on housing policy related to property management and health and safety.	Policy, Research & Analysis
2805	1296	â€¢ Motor Vehicle Driverâ€™s license valid in the State of New York. â€¢ Basic Knowledge and Computer Skills. â€¢ Good communication skills. â€¢ Familiarity with Microsoft Office, Excel, Word and PowerPoint.	Building Operations & Maintenance

	Prefskill	Preferred_Skills	Job_Category
277	639	Required Skills: â€¢\tIn depth knowledge of project management, capital project delivery, planning, engineering, contracting, procurement, and asset management principles. â€¢\tExperience in leading and directing high-performance teams. â€¢\tHigh level functional technical knowledge and skill in a large organization, public utility, or large wastewater programs. â€¢\tKnowledge of whole systems analysis, process reengineering, process improvement, lean management philosophy, six sigma or other related continuous improvement processes. â€¢\tStrong organization and project management skills. Ability to manage multiple tasks and experience working and managing through complex systems. â€¢\tAdvanced experience with budgeting, capital improvement programs, asset management, and customer service. â€¢\tAdvanced knowledge of general management, personnel management, and supervisory techniques and principles. â€¢\tAbility to establish and maintain effective working relationships with federal, state, regional and local agencies, union leaders, community leaders and the general public. â€¢\tStrong written and verbal communication skills and experience with diverse workforce.	Engineering, Architecture, & Planning Finance, Accounting, & Procurement Building Operations & Maintenance Public Safety, Inspections, & Enforcement
1845	934	â€¢\tA Motor Vehicle Driver License valid in the State of New York. This license must be maintained for the duration of employment. â€¢\tA valid Refrigerating System Operation Engineering Certificate issued by the NYC Fire Department; and â€¢\tA valid Universal Chlorofluorocarbon (CFC) Certificate issued by the United States Environmental Protection Agency.	Engineering, Architecture, & Planning
602	553	PREFERRED â€¢\tMust be computer literate; knowledge of BMS systems, Archibus system, word & spreadsheets is necessary. â€¢\tEmployees work location may be changed based upon operational changes.	Building Operations & Maintenance
812	932	â€¢\tA Masterâ€™s Degree in accounting or related field. Five (5) years of senior level managerial or executive experience in the field of Internal Audit. Technical, Intellectual focus. Demanding and critical follow up.	Administration & Human Resources Finance, Accounting, & Procurement

	Prefskill	Preferred_Skills	Job_Category
1094	1319	â€¢ The Executive Deputy Commissioner will have excellent management skills, vision and ability to work effectively with external agencies and organizations, and experience overseeing large and innovative mental hygiene programs â€¢ Demonstrated knowledge, training and experience in the field of mental hygiene; with broad range of clinical service programs including mental health, early intervention, mental retardation and developmental disabilities, alcoholism and substance abuse prevention services, health promotion, and crisis intervention services â€¢ Ability to administer a complex, large scale service delivery system involving coordination of public and privately funded services; and â€¢ Experience and ability to establish policy, set priorities, and implement objectives, for a large scale mental hygiene service system.	Health
2247	1191	â€¢\tTwo (2) years direct experience in Human Services, particularly working with persons with disabilities/disabled populations. â€¢\tExperience in outreach coordination including client recruitment. â€¢\tExcellent interpersonal, oral and written communication skills. â€¢\tExcellent organizational skills with strong attention to detail. â€¢\tAbility to work independently and collaboratively with multiple internal and external stakeholders. â€¢\tStrong ability to prioritize, take initiative and problem solve. â€¢\tAbility to effectively prepare and present project presentations to a variety of audiences; experience in marketing/recruitment a plus. â€¢\tAbility to scan and assess large volumes of applications.	Engineering, Architecture, & Planning Technology, Data & Innovation Policy, Research & Analysis
2256	945	â€¢\tA minimum of 5 years of experience in project management, planning, and implementation. â€¢\tAt least 3 years of experience in auditing, bookkeeping, and/or accounting. â€¢\t Excellent oral and written communication skills. â€¢\tExcellent organizational skills with strong attention to detail. â€¢\tAbility to work independently and collaboratively with multiple internal and external stakeholders. â€¢\tStrong ability to prioritize, take initiative and problem solve.	Finance, Accounting, & Procurement Policy, Research & Analysis Social Services

	Prefskill	Preferred_Skills	Job_Category
3144	1014	â€¢\tExcellent analytical, legal writing, negotiation, communication and problem-solving skills. â€¢\tAbility to organize, delegate and establish meaningful goals; establish effective working relationships with employees and the public. â€¢\tMust have strong interpersonal, leadership and management skills and experience managing other attorneys and legal staff. â€¢\tIntergovernmental and operational experience â€¢\tCommitment to maintaining strict confidentiality on highly sensitive matters. .	Legal Affairs Public Safety, Inspections, & Enforcement
2933	1244	â€¢ Clearly demonstrated experience trading money market instruments and exposure to foreign exchange markets. â€¢ Experience in short term assets is a must; this experience includes but is not limited to: - Understanding money market curves in relations to interest rate forecast; - Relative value in different money market products; - Valuations compared with long term assets; - New money market measurements to replace Libor; - Central Bank polices and the effect on Money Markets. â€¢ The ability to assess investment guidelines and opportunities and propose alternative strategies. â€¢ Familiarity with investment management risk platforms. â€¢ Experience with foreign exchange hedging programs. â€¢ Excellent writing, accounting, presentation, interpersonal, communication, organizational and process management skills; including strong Excel and PowerPoint skills are a must. NOTE: Position requires extensive hands-on trading experience, cover letter must clearly provide details regarding the candidateâ€™s expertise and experience in managing a trading desk.	Finance, Accounting, & Procurement
2199	1274	â€¢ Expert knowledge of financial principles and concepts and their application to the process of underwriting and evaluating institutional real estate investments; â€¢ 8+ years of experience with a financial services firm, preferably in debt or equity institutional real estate; â€¢ Clearly demonstrated experience in investment manager sourcing and due diligence; portfolio management, structuring and monitoring; producing monthly, quarterly and annual investment materials; and, constructing and producing clear, cohesive investment recommendation documents;\t â€¢ Excellent financial analysis, writing, presentation, interpersonal, communication and organizational skills; â€¢ Strong fluency in Microsoft Office Suite (Word, Excel and PowerPoint).	Finance, Accounting, & Procurement

	Prefskill	Preferred_Skills	Job_Category
1491	928	â€¢\tA Baccalaureate degree from an accredited college, or equivalent; preferably a Masterâ€™s Degree in the fields of public administration, business management, environmental planning, or a related field. â€¢\tA minimum of 10 years of full time satisfactory professional experience in the field of environmental health and safety. â€¢\tExperience overseeing large teams of staff and vendors performing multiple different types of work at a fast pace.	Health Policy, Research & Analysis Public Safety, Inspections, & Enforcement
1493	917	â€¢\t10+ years of experience in property or construction management, and/or quality assurance â€¢\t10+ years of experience in data analysis, strategic planning, and experience in business process improvement or similar experience. â€¢\t10+ years of supervision and direct management of large teams. â€¢\tExcellent data analysis and reporting skills. â€¢\tExcellent verbal and written communications skills. â€¢\tEnergetic, professional and resourceful with ability to enhance traditional quality assurance strategies.	Policy, Research & Analysis
752	948	â€¢\tA minimum of ten years of full-time satisfactory professional experience in the housing finance, affordable housing development, or related field. â€¢\tKnowledge of real estate lending and various Federal, State and local programs for affordable housing. Key Competencies â€¢\tLeadership and Capacity Building: A proven leader with senior level experience in a broad variety of real estate and asset management areas, with the ability to lead a diverse and dynamic team on an individual and corporate level. This includes the ability to cultivate creativity and innovation while enforcing accountability, and maintaining high levels of work ethic. â€¢\tSolutions-Driven and Entrepreneurial: A creative thinker with experience in planning and community development, and structuring and executing complex real estate development transactions to drive towards the NYCHA goals of community benefits and revenue generation. â€¢\tStrategic Communicator: Proven ability to communicate clearly, both written and verbal, while maintaining an acute discernment of audience. Experience engaging with a wide variety of stakeholders, from community residents, to private developers, to small business owners, to advocacy groups, etc.	Policy, Research & Analysis

	Prefskill	Preferred_Skills	Job_Category
434	488	Key Competencies 1.\tLeadership & Capacity Building â€" a proven leader with senior management experience in a broad range of legal areas and the ability to lead a diverse team, on an individual and corporate level. 2.\tLitigation Skills â€" solid experience in legal principles and practices, the interpretation of applicable laws, policies and procedures, and the preparation and presentation of effective written and oral arguments and reports. 3.\tNegotiation Skills â€" the ability to artfully influence and persuade. This requires a diplomatic approach while remaining focused on the agencyâ€™s goals and priorities. 4.\tExcellent Communication Skills â€" demonstrated ability to communicate clearly, both written and verbal. Qualification & Experience Preferred 1.\tAdmission to the New York State Bar, member in good standing; 2.\tA minimum of 10 years of satisfactory professional legal experience, relevant litigation experience, including trial and appellate work in state and federal court is a plus; 3.\tAn understanding of public housing law and US Department of Housing and Urban Development regulations is a bonus.	Legal Affairs
1679	882	Valid holder of the CCISO (Certified Chief Information Security Officer). In addition, the candidate must have any two of the following certifications CISSP, CISM, CGEIT. The candidate should have proven technical background in security architecture, cloud security, endpoint security, and incident response and disaster recovery methodologies. Experience with third party vendor risk management, data security and threat management a plus. Minimum 6 to 10 years of Information and Cyber Security required.	Technology, Data & Innovation

	Prefskill	Preferred_Skills	Job_Category
2154	914	â€¢\t Ten or more years in IT and business/industry experience in a public pension system or public sector a plus. â€¢\tSeven or more years of leadership responsibilities in a Director/Assistant Director or equivalent. â€¢\tCertified Information Systems Auditor (CISA) by Information Systems Audit and Control Association (ISACA). â€¢\tProficiency in transitioning business services to the cloud and related cybersecurity architecture and controls. â€¢\tFive or more years managing multiple, large, cross-functional teams or projects and influencing senior-level management and key stakeholders. â€¢\tExtensive experience managing infrastructure and operations. â€¢\tPrior experience with system conversions including data migration. â€¢\tExtensive Data Center management experience. â€¢\tStrong leadership capability, executing as appropriate in the areas of responsibility. â€¢\tExtensive experience with industry standards such as ITILv3, COBIT5, COSO and/or ISO27000 a plus. â€¢\tExtensive knowledge of infrastructure planning and operations, design and deployment as well as SDLC methodology. â€¢\tExperience with IT budget planning, financial management, vendor management and resource management. â€¢\tBroad knowledge of current and emerging technologies. â€¢\tStrong business acumen and business planning skills. â€¢\tExceptional project management skills, including the ability to effectively deploy resources and manage multiple projects of diverse scopes in a cross-functional environment.	Technology, Data & Innovation
1174	27	--\tMinimum of seven yearsâ€™ experience in public health, including in senior management roles; --\tPossess broad knowledge of public health generally and specific knowledge of population health, healthcare systems, reform and access, quality improve	Health Policy, Research & Analysis
2110	24	- Sr. Stationary Engineer Electric (any level) currently employed in the Department of Environmental Protection. - New York State Department of Environmental Conservation, Grade 4A Wastewater Treatment Plant Operator Certificate required for Plants only.	Engineering, Architecture, & Planning

	Prefskill	Preferred_Skills	Job_Category
2472	693	The candidate should possess proficiency in Microsoft Office with emphasis in Word and Excel; excellent writing and analytical skills; strong organization skills; excellent communication and facilitation skills; ability to quickly adapt to and effectively manage multiple and concurrent high-priority tasks. The candidate must be available to respond to emergency and off-hour situations.	Administration & Human Resources Engineering, Architecture, & Planning Technology, Data & Innovation Building Operations & Maintenance Policy, Research & Analysis
2065	1156	â€¢\tSignificant preference will be given to candidates with transactional real estate experience. â€¢\tFamiliarity with federal, state, and local governmental and quasi-governmental bodies active in affordable housing and economic development. â€¢\tExcellent writing, legal research and analytical skills. â€¢\tExcellent interpersonal and communication skills. â€¢\tAbility to work independently or as part of a team. â€¢\tStrong organizational and management skills.	Legal Affairs

	Prefskill	Preferred_Skills	Job_Category
1505	586	Preferred Education & Experience â€¢\tMinimum of 10 years of satisfactory, full-time, progressively responsible experience in real estate property management, at least 5 of which must have been in a managerial capacity involving the supervision of a large staff of property management staff and/or housing development specialists and requiring independent decision-making concerning program management or planning, allocation of resources and the scheduling and assignment of work. â€¢ \tBachelorâ€™s degree from an accredited college or university. A graduate degree or advanced professional certification in a related field is preferred. â€¢\tProven experience engaging and working with diverse portfolios (example: Low Income Housing Tax Credits, Project Based Vouchers, or Special Housing Program). Key Competencies â€¢\tLeadership and Capacity Building: A proven leader with senior level experience in a broad variety of real estate and asset management areas, with the ability to lead a diverse and dynamic team on an individual and corporate level. This includes the ability to cultivate creativity and innovation while enforcing accountability, and maintaining high levels of work ethic. â€¢\tSolutions-Driven and Entrepreneurial: A creative thinker with experience in property management; leasing, rent collection, recertifications, maintenance and repairs services. . â€¢\tStrategic Communicator: Proven ability to communicate clearly, both written and verbal, while maintaining an acute discernment of audience. Experience engaging with a wide variety of stakeholders, from community residents, to private developers, to small business owners, to advocacy groups, etc. â€¢\tData-driven Manager: Mastery of using data and metrics to drive decisions and measure performance.	Building Operations & Maintenance
...	...	...	...
1334	175	1. Certified in Integrated Pest Management. 2. Experience in providing pest control services using Integrated Pest Management methods. 3. Licensed in 7B category.	Building Operations & Maintenance
1437	13	-\tMust possess strong, organization, and communication skills. -\tDemonstrate ability to work effectively with culturally diverse staff and populations, as well as honor contributions and strengths of all cultures. -\tKnowledge of recovery language and pr	Health

	Prefskill	Preferred_Skills	Job_Category
11	447	Experience with Law Manager and Microsoft Office Applications.	Clerical & Administrative Support
3104	268	Bilingual in English and Spanish	Constituent Services & Community Programs Social Services
3037	1012	â€¢\tExcellent Communication Skills (both orally and in writing) â€¢\tStrong Customer Service Focus â€¢\tComputer Proficiency â€¢\tBilingual a Plus â€¢\tSection 8 or other Rental Subsidy experience a Plus	Constituent Services & Community Programs
1284	1130	â€¢\tOnly open to current City employees who are permanent in the title of Clerical Associate or in a comparable title. â€¢\tBasic knowledge of City systems (FMS, PMS, CityTime, PIP, CHRMS or Remedy) â€¢\tExcellent work ethic and attention to detail â€¢\tExcellent verbal and written communication skills â€¢\tExcellent telephone skills with a professional demeanor â€¢\tAbility to work independently or as part of a team â€¢\tAbility to work well and efficiently in a fast-paced environment â€¢\tAbility to maintain confidentiality	Policy, Research & Analysis
550	293	Candidates must have a Motor Vehicle Driver License valid in the State of New York.	Public Safety, Inspections, & Enforcement
1352	1362	â€¢Must have excellent communications (writing and oral) skills; courteous phone manner â€¢Ability to exhibit professional demeanor in a fast-paced work environment â€¢Experience working with all levels of staff â€¢Ability to prioritize work and manage a wide array of tasks through to completion â€¢Must have strong attention to detail and follow-through â€¢Proficiency in MS Outlook, MS Word and MS PowerPoint required â€" MS Excel and MS Access skills a plus	Constituent Services & Community Programs
879	258	Applicants MUST currently be permanent in the Clerical Associate title.	Legal Affairs
3192	1097	â€¢\tKnowledge of CSMS, UCMS, WMS, ASSETS. â€¢\tAbility to manage a high volume of work quickly and accurately. â€¢\tWorking knowledge of MS Word, Excel, Power Point.	Social Services

	Prefskill	Preferred_Skills	Job_Category
2037	1246	â€¢ Computer literacy â€¢ Working knowledge of Microsoft Office with proficiency in Outlook, Word, Excel, and Access â€¢ Ability to utilize databases â€¢ Excellent organizational and communication skills â€¢ Ability to work independently and as member of a team	Administration & Human Resources Constituent Services & Community Programs Communications & Intergovernmental Affairs
1508	963	â€¢\tAble to lift 50 pounds without restrictions. â€¢ \tStrong oral & written communication skills. â€¢ \tAbility to multi-task & work with minimal supervision. â€¢\tSkilled in Microsoft Office. â€¢\tAble to use a power jack, inline and hand truck.	Administration & Human Resources Building Operations & Maintenance
911	546	PREFERRED SKILLS â€¢\tSuccessful candidates should have experience in data entry. Knowledge of various computer programs such as Microsoft Word and Microsoft Excel; ability to type at least 35 words per minute. Excellent interpersonal communication skills .Strong work ethic and attention to detail. Ability to work independently and meet deadlines. Ability to work well in a fast-paced environment. Ability to maintain confidentiality. SPECIAL NOTE 1.\tSelected candidates will be required to provide a DNA sample by swabbing. 2.\tIn case of an emergency, your position may be designated as essential staff.	Health
74	424	Excellent interpersonal, research and writing skills. Proficiency in LexisNexis, Microsoft Word and Excel a must.	Legal
1849	863	The successful candidate should possess the following: â€¢\tBasic knowledge of Microsoft Excel, Word and PowerPoint. Any experience w/ Microsoft Project; â€¢\tFamiliar with how to export and import data using Microsoft Project tools; â€¢\tBasic understanding of product life-cycle, program planning and process knowledge; â€¢\tExperience using a variety of project reporting tools such as Microsoft Project, Clarity, Financial tools, etc.; â€¢\tAbility to conduct analysis, assessments and report to a managerial level; â€¢\tExperience with contract and sub-contract management basics.	Technology, Data & Innovation

	Prefskill	Preferred_Skills	Job_Category
1207	935	â€¢\tA Qualifying Certificate in Food Protection issued by the New York City Department of Health and Mental Hygiene is required. â€¢\tPrevious work experience in a restaurant, school, or other large scale food operation. â€¢\tMotivated to achieve the highest possible standards for all meals served. â€¢\tEffective communication skills	Public Safety, Inspections, & Enforcement
3039	261	Applicants must possess organizational and interpersonal skills and the ability to speak with victims of crime in a sensitive and non-judgmental way. Have the ability to prioritize and work in a fast-paced environment. BA/BS strongly preferred. Bilingual in Spanish preferred.	Legal Affairs
2717	594	Preferred Skills: 1.\tMust be able to work well in a team environment and with all levels of supervisory staff. 2.\tDemonstrate the ability to communicate complex ideas clearly. 3.\tMust have the ability to analyze significant amounts of information and make correct decisions based on that information. 4.\tStrong organizational, time management and logistical skills 5.\tDemonstrated ability to prioritize and successfully carry out multiple assignments and meet deadlines. 6.\tMust be comfortable traveling across the five NYC Boroughs using DEP vehicles or public transportation multiple times during the month. 7.\tProficient in Microsoft Word, Excel, Access and Outlook.	Administration & Human Resources
2352	131	1. Ability to drive to locations in all five boroughs. 2. Ability to work flexible hours, nights and weekends as needed. 3. Commercial Driver License a plus.	Building Operations & Maintenance
2351	116	1. \tAbility to drive to locations in all five boroughs. 2. \tAbility to work flexible hours, nights and weekends as needed. 3. \tCommercial Driver License a plus.	Building Operations & Maintenance
1391	698	The ideal candidate should have excellent communications and interpersonal skills, and should ensure professional and courteous services are provided at all times.	Social Services
46	17	- Ability to use Microsoft Windows Word, Excel, Visio, Access and PowerPoint; - Experience with data related to mandated health or mental health treatment; - Good written and verbal communication skills, good organization and time management skills;	Clerical & Administrative Support

	Prefskill	Preferred_Skills	Job_Category
1800	942	â€¢\tA four-year high school diploma or its educational equivalent approved by a stateâ€™s department of education or a recognized accrediting organization â€¢\tA valid New York State motor vehicle driver license â€¢\tTwo (2) years of security, law enforcement and/or military experience â€¢\tNew York State Security Guard License	Building Operations & Maintenance Public Safety, Inspections, & Enforcement
3110	1253	â€¢ Detail oriented and ability to work under pressure and in intense environments. â€¢ Prior experience with elevators or mechanical background.	Building Operations & Maintenance
2181	203	1. Supervisory experience 2. Knowledge of Public Health 3. Good computer skills and basic knowledge of Microsoft 4. Strong Inter-personal skills. 5. Board certification in pulmonary or infectious disease with specialty in internal medicine or pediatrics or family practice medicine. 6. English/Chinese (all dialects) and/or English/Spanish or any other second language would be considered. 7. Must be willing to work every other Saturday.	Health
421	658	Strong computer skills including Word and Excel. Must be highly organized and posses excellent oral communication and interpersonal skills. Must have experience in data entry and be familiar with Microsoft Office. Have good organizing skills and ability to follow through on tasks, reliable, and punctual. Adhere to strict data confidentiality	Health
72	501	Knowledge of pest control is a plus.	Public Safety, Inspections, & Enforcement
15	74	1.\tExcellent interpersonal communication skills 2.\tStrong work ethic and attention to detail 3.\tFamiliarity with Microsoft Office Suite	Clerical & Administrative Support
1999	187	1. Knowledge and experience in Supply Chain Management. 2. Experience with Maximo and Oracle. 3. Excellent verbal and written communication skills. 4. Excellent organizational abilities. 5. Proficiency with Microsoft Word, Excel.	Finance, Accounting, & Procurement
981	152	1. Knowledge and experience in Supply Chain Management. 2. Experience with Maximo and Oracle. 3. Excellent verbal and written communication skills. 4. Excellent organizational abilities. 5. Proficiency with Microsoft Word, Excel.	Finance, Accounting, & Procurement

1383 rows × 3 columns

In [79]:

```
# Top job categories ( as per Average salary ) and salary range is displayed bel
ow
pd.set_option('display.max_colwidth', -1)
# Drop duplicates job category
modDfObj = modDfObj.drop_duplicates('Job_Category')
modDfObj[['jobCategoryCode','Job_Category','Salary_Range_From','Salary_Range_To'
]]
```

Out[79]:

	jobCategoryCode	Job_Category	Salary_Range_From	Salary_Range_To
2522	1152	Technology, Data & Innovation	239440.000	239440.000
411	28	Health	214240.400	229482.800
1960	683	Administration & Human Resources Finance, Accounting, & Procurement Building Operations & Maintenance	218587.000	218587.000
417	684	Engineering, Architecture, & Planning Finance, Accounting, & Procurement Building Operations & Maintenance Public Safety, Inspections, & Enforcement	209585.000	209585.000
1873	510	Administration & Human Resources Constituent Services & Community Programs Communications & Intergovernmental Affairs Engineering, Architecture, & Planning Finance, Accounting, & Procurement Health Technology, Data & Innovation Legal Affairs Building Operations & Maintenance Policy, Research & Analysis Public Safety, Inspections, & Enforcement Social Services	200931.000	214848.000

	jobCategoryCode	Job_Category	Salary_Range_From	Salary_Range_To
1399	621	Communications & Intergovernmental Affairs Legal Affairs Policy, Research & Analysis	180472.000	225217.000
39	460	Engineering, Architecture, & Planning Maintenance & Operations	198518.000	198518.000
1512	930	Policy, Research & Analysis	185000.000	195000.000
2805	1296	Building Operations & Maintenance	183200.800	183200.800
1845	934	Engineering, Architecture, & Planning	177652.800	177652.800
812	932	Administration & Human Resources Finance, Accounting, & Procurement	130000.000	224749.000
2247	1191	Engineering, Architecture, & Planning Technology, Data & Innovation Policy, Research & Analysis	91434.544	251615.816
2256	945	Finance, Accounting, & Procurement Policy, Research & Analysis Social Services	91434.544	251615.816
3144	1014	Legal Affairs Public Safety, Inspections, & Enforcement	103620.000	234402.000
2933	1244	Finance, Accounting, & Procurement	160000.000	175000.000
1491	928	Health Policy, Research & Analysis Public Safety, Inspections, & Enforcement	145000.000	180000.000
434	488	Legal Affairs	99353.000	224749.000
1174	27	Health Policy, Research & Analysis	94981.000	225217.000

	jobCategoryCode	Job_Category	Salary_Range_From	Salary_Range_To
2472	693	Administration & Human Resources Engineering, Architecture, & Planning Technology, Data & Innovation Building Operations & Maintenance Policy, Research & Analysis	150000.000	160000.000
1599	1168	Constituent Services & Community Programs Communications & Intergovernmental Affairs Health Social Services	86346.000	217244.000
2341	929	Administration & Human Resources	86346.000	217244.000
2183	184	Public Safety, Inspections, & Enforcement	140000.000	160000.000
2403	624	Finance, Accounting, & Procurement Policy, Research & Analysis	137637.000	137637.000
236	1275	Engineering, Architecture, & Planning Policy, Research & Analysis	75338.000	194395.000
259	1107	Engineering, Architecture, & Planning Technology, Data & Innovation	75338.000	194395.000
2569	1008	Administration & Human Resources Technology, Data & Innovation	130001.000	135000.000
2470	1047	Administration & Human Resources Technology, Data & Innovation Policy, Research & Analysis	120000.000	140000.000

	jobCategoryCode	Job_Category	Salary_Range_From	Salary_Range_To
2407	1084	Constituent Services & Community Programs Policy, Research & Analysis	125000.000	135000.000
1580	453	Engineering, Architecture, & Planning Building Operations & Maintenance	69940.000	186555.000
1424	401	Constituent Services & Community Programs	69940.000	186555.000
...	...	...	...	...
2093	678	Constituent Services & Community Programs Public Safety, Inspections, & Enforcement	52524.000	81535.000
1369	1027	Finance, Accounting, & Procurement Building Operations & Maintenance	58152.000	74479.000
1439	598	Finance, Accounting, & Procurement Health	56981.000	75600.000
2229	1049	Technology, Data & Innovation Building Operations & Maintenance	64663.000	66748.000
2022	1031	Technology, Data & Innovation Policy, Research & Analysis Public Safety, Inspections, & Enforcement	60000.000	70000.000
2370	1007	Constituent Services & Community Programs Finance, Accounting, & Procurement	52524.000	77345.000
1858	465	Constituent Services & Community Programs Health	60184.000	69212.000

|	jobCategoryCode	Job_Category	Salary_Range_From	Salary_Range_To
35	781	Clerical & Administrative Support Community & Business Services	53373.000	72000.000
3068	500	Administration & Human Resources Constituent Services & Community Programs Finance, Accounting, & Procurement Social Services	58152.000	66875.000
84	729	Community & Business Services Social Services	48895.000	75900.000
2203	905	Administration & Human Resources Technology, Data & Innovation Public Safety, Inspections, & Enforcement	54967.000	69595.000
396	1080	Policy, Research & Analysis Public Safety, Inspections, & Enforcement Social Services	57065.000	65625.000
116	913	Finance, Accounting, & Procurement Policy & Analysis	56458.000	64927.000
2100	633	Communications & Intergovernmental Affairs Finance, Accounting, & Procurement Legal Affairs Policy, Research & Analysis	45491.000	68244.000
3078	1015	Administration & Human Resources Communications & Intergovernmental Affairs	52524.000	60403.000
102	616	Clerical & Administrative Support	42856.000	62779.000

	jobCategoryCode	Job_Category	Salary_Range_From	Salary_Range_To
2715	425	Administration & Human Resources Constituent Services & Community Programs Communications & Intergovernmental Affairs Finance, Accounting, & Procurement Legal Affairs Policy, Research & Analysis Public Safety, Inspections, & Enforcement	45260.000	58108.000
2339	216	Constituent Services & Community Programs Legal Affairs Policy, Research & Analysis Public Safety, Inspections, & Enforcement	41061.000	61847.000
32	861	Clerical & Administrative Support Legal	40055.000	60611.000
1465	287	Constituent Services & Community Programs Legal Affairs	41939.000	58688.000
1362	52	Administration & Human Resources Constituent Services & Community Programs Communications & Intergovernmental Affairs Public Safety, Inspections, & Enforcement	37217.000	61936.000
3091	69	Public Safety, Inspections, & Enforcement Social Services	43799.000	55000.000

	jobCategoryCode	Job_Category	Salary_Range_From	Salary_Range_To
1643	50	Finance, Accounting, & Procurement Public Safety, Inspections, & Enforcement	43799.000	55000.000
2464	1173	Communications & Intergovernmental Affairs Technology, Data & Innovation Policy, Research & Analysis	47000.000	50720.000
18	859	Finance, Accounting, & Procurement Information Technology & Telecommunications	43292.000	53000.000
2419	391	Administration & Human Resources Communications & Intergovernmental Affairs Policy, Research & Analysis	43800.000	51100.000
1639	833	Administration & Human Resources Finance, Accounting, & Procurement Technology, Data & Innovation	45260.000	46720.000
372	566	Administration & Human Resources Health Public Safety, Inspections, & Enforcement	33875.000	54879.000
2037	1246	Administration & Human Resources Constituent Services & Community Programs Communications & Intergovernmental Affairs	35330.000	40629.000
74	424	Legal	35213.000	40495.000

121 rows × 4 columns

In [80]:

```python
#plotting "skills vs Category for visualization purpose  "
ax = modDfObj[['Average_Salary','Job_Category']].plot(kind='bar', title ="Skill
 VS Job Cateogory", figsize=(15, 10), legend=True, fontsize=5);
ax.set_xlabel("Job Category", fontsize=5)
ax.set_ylabel("Average_Salary", fontsize=12)
plt.show()
```


Skill VS Job Category
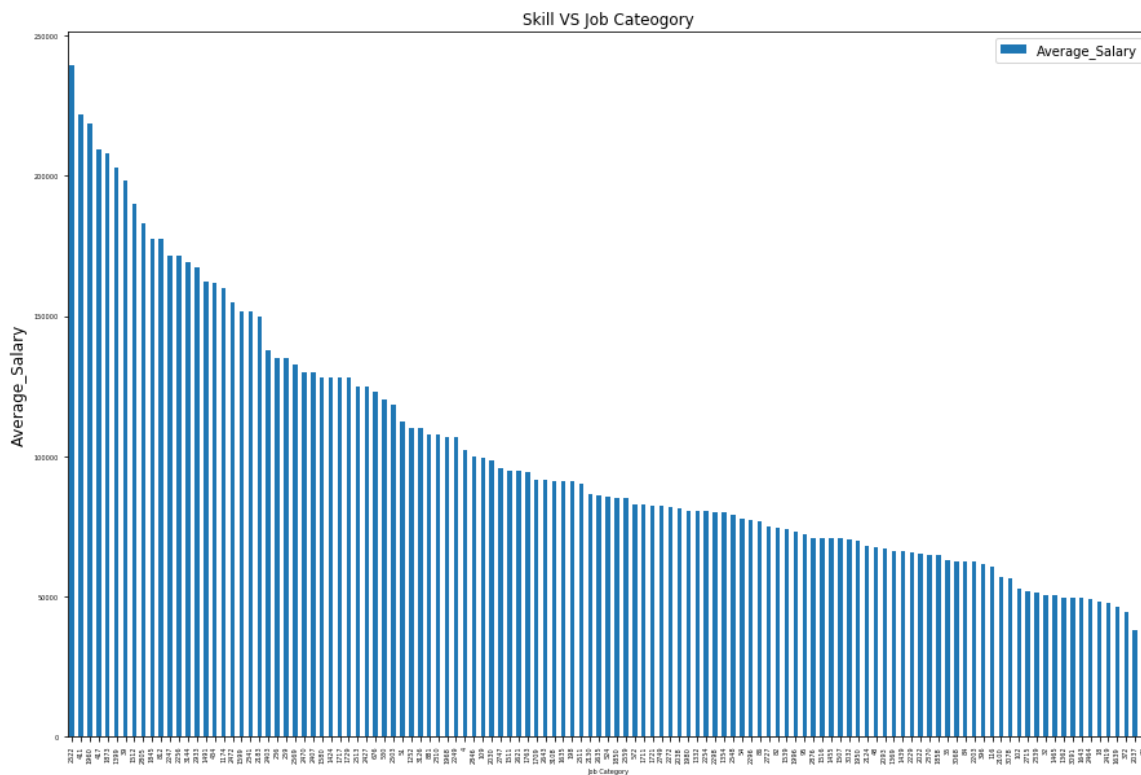
In [81]:

```
#Added the experience column which we have extracted from Minimum Qualification
 in case of mentioned different
#experience in deferent desired filed it's being taken on random basis
# modDfObj3 is created for Problem no 3

modDfObj['Experience'] = [ '3','2','1.5','3','2','0','6','5','10','0','1.5','5',
'5','4','1.5','3','1.8','4','4',
        '5','1.5','4','0','5','6','3','4','4','4','6','5','6','3','5','6','4','8'
,'2','1.5','6','1.5','1.5',
        '5','5','5','4','4','1','2','1','1.5','5','4','4','2','2','4','0','2','2'
,'5','4','1','1','4','4','1',
        '3','5','1','5','2','2','2','1','1','1','3','2','2','2','1','1','2','1',
'1','1','2','2','1','1.5','6',
        '1.5','1','2','1','2','3','1.5','2','6','2','2','2','0','2','3','0','0',
'2.5','1','3','4','4','1','4',
        '0','0','1','1','0']
modDfObj
```

Out[81]:

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
2522	400526	OFFICE OF EMERGENCY MANAGEMENT	1	INTER-AGENCY DATA MANAGER	EMERGENCY PREPAREDNESS MANAGER
411	319959	DEPT OF HEALTH/MENTAL HYGIENE	1	Field Doctor, Bureau of School Health/SH Medical	CITY MEDICAL SPE (PART-
1960	396521	DEPT OF ENVIRONMENT PROTECTION	1	Deputy Commissioner, Bureau of Customer Services	DEPUTY COMMISS (DEP)

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
417	321554	DEPT OF ENVIRONMENT PROTECTION	1	Deputy Commissioner, Water and Sewer Operations	DEPUTY COMMISS (DEP)
1873	395848	DEPT. OF HOMELESS SERVICES	1	DHS FIRST DEPUTY COMMISSIONER	DEPUTY COMMISIONER(HC SE

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
1399	388126	OFFICE OF MANAGEMENT & BUDGET	1	BUDGET ANALYST (OMB)- MANAGERIA	BUDGET ANALYST MANAGERIA
39	197355	DEPT OF ENVIRONMENT PROTECTION	1	Deputy Commissioner, Wastewater Treatment	ADMINISTRATIVE ENGINEER
1512	390769	NYC HOUSING AUTHORITY	1	Chief Compliance Officer	DIRECTOR OF RES & POLICY
2805	403438	DEPT OF ENVIRONMENT PROTECTION	1	Stationary Engineer (Electric)	STATIONARY ENGI (ELECTRIC)
1845	395440	DEPARTMENT OF SANITATION	1	STATIONARY ENGINEER	STATIONARY ENGI

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
812	373748	NYC EMPLOYEES RETIREMENT SYS	1	ADMINISTRATIVE MANAGEMENT AUDITOR	ADMINISTRATIVE MANAGEMENT AU
2247	398702	DEPARTMENT FOR THE AGING	1	Outreach Manager (Per-Diem)	ADMINISTRATIVE PROGRAM OFFICE

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
2256	398761	DEPARTMENT FOR THE AGING	1	Project Manager (Per-Diem)	ADMINISTRATIVE PROGRAM OFFICE
3144	406159	BUSINESS INTEGRITY COMMISSION	1	General Counsel	EXECUTIVE AGENCY COUNSEL

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
2933	404375	OFFICE OF THE COMPTROLLER	1	Head of Short Term Strategic Portfolio and Trading	ADMINISTRATIVE ACCOUNTANT
1491	390413	NYC HOUSING AUTHORITY	1	Environmental Health and Safety Officer	ASSISTANT EXECU DIRECTOR (
434	332695	NYC HOUSING AUTHORITY	1	General Counsel & Executive Vice President for Legal Affairs	EXECUTIVE AGENC COUNSEL

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
1174	384093	DEPT OF HEALTH/MENTAL HYGIENE	1	Deputy Commissioner, Division of Prevention and Primary Care	DEPUTY COMMISS (HEALTH)
2472	400132	DEPT OF CITYWIDE ADMIN SVCS	1	Assistant Commissioner, Fleet Services	ASSISTANT COMMISSIONER (D

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
1599	392180	DEPARTMENT FOR THE AGING	1	Deputy Commissioner, Programs	ADMINISTRATIVE PROGRAM OFFICE
2341	399220	NYC EMPLOYEES RETIREMENT SYS	1	ADMINISTRATIVE MANAGEMENT AUDITOR	ADMINISTRATIVE MANAGEMENT AU

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Ser
2183	398200	DEPARTMENT OF INVESTIGATION	1	Associate Commissioner for Field Operations, Training, and Law Enforcement Administration	INSPECTOR GENE
2403	399598	OFFICE OF MANAGEMENT & BUDGET	1	Assistant Director Central	BUDGET ANALYST MANAGERIA
236	282206	DEPT OF ENVIRONMENT PROTECTION	1	Deputy Director of Field Operations	ADMINISTRATIVE ENGINEER
259	285364	DEPT OF ENVIRONMENT PROTECTION	1	PORTFOLIO MANAGER	ADMINISTRATIVE ENGINEER

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
2569	401484	DEPARTMENT OF FINANCE	1	Senior Project Manager	COMPUTER SYSTE MANAGER
2470	400123	DEPT OF CITYWIDE ADMIN SVCS	1	Fleet Systems Senior Manager	DEPUTY ASSISTAN COMMISSIONER
2407	399627	DEPARTMENT OF CITY PLANNING	1	Director of Population	ADMINISTRATIVE C PLANNER
1580	391552	POLICE DEPARTMENT	1	Executive Director, Services & Capital Planning	ADMINISTRATIVE CONSTRUCTION P

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
1424	389069	NYC HOUSING AUTHORITY	1	SENIOR ADVISOR	SPECIAL ASSISTAN THE DEPUT
...	...	...	...	...	...
2093	397411	DEPARTMENT OF TRANSPORTATION	1	SAFETY EDUCATION OUTREACH COORDINATOR	COMMUNITY COORDINATOR
1369	387737	DEPARTMENT OF TRANSPORTATION	1	Inventory Manager	STAFF ANALYST

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
1439	389347	DEPT OF HEALTH/MENTAL HYGIENE	1	Fiscal Analyst-Accounts Payable Specialist	PROCUREMENT A
2229	398600	OFFICE OF EMERGENCY MANAGEMENT	1	DAFN HUMANITARIAN LOGISTICS SPECIALIST	EMERGENCY PREPAREDNESS S

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
2022	396966	OFFICE OF EMERGENCY MANAGEMENT	1	EMERGENCY OPERATIONS CENTER SPECIALIST	EMERGENCY PREPAREDNESS S
2370	399371	CONSUMER AFFAIRS	1	Senior Operations Manager	COMMUNITY COORDINATOR

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
1858	395512	DEPARTMENT FOR THE AGING	1	Nutrition Consultant	NUTRITION CONSU
35	193109	DEPT OF INFO TECH & TELECOMM	1	311 Call Center Manager	ADM MANAGER-N MGRL FRM M1/M2

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
3068	405455	HRA/DEPT OF SOCIAL SERVICES	1	SYSTEMS ANALYST	STAFF ANALYST
84	239052	ADMIN FOR CHILDREN'S SVCS	1	Child Welfare Trainer	COMMUNITY COORDINATOR

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
2203	398400	DEPARTMENT OF INVESTIGATION	2	Desktop Support	COMPUTER ASSO SUPP)
396	315940	BOARD OF CORRECTION	3	Standards Specialist (Monitor)	CORRECTIONAL STANDARDS REVIE

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
116	246892	DEPT OF ENVIRONMENT PROTECTION	1	Budget Analyst	STAFF ANALYST
2100	397462	OFFICE OF MANAGEMENT & BUDGET	1	Analyst Intergovernmental Relations	BUDGET ANALYST

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
3078	405621	DEPARTMENT OF FINANCE	1	Administrative Coordinator	COMMUNITY COORDINATOR
102	243200	DEPARTMENT OF TRANSPORTATION	1	Principal Administrative Associate I	PRINCIPAL ADMINISTRATIVE A

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
2715	402650	DEPARTMENT OF BUILDINGS	25	College Aide	COLLEGE AIDE (AL DEPTS)
2339	399217	CIVILIAN COMPLAINT REVIEW BD	4	Investigator Level 1	INVESTIGATOR (CC

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
32	192723	DEPT OF INFO TECH & TELECOMM	1	Research Assistant	RESEARCH ASSIST
1465	389713	LAW DEPARTMENT	1	PARALEGAL AIDE - LEVEL 2	PARALEGAL AIDE

|	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
1362	387595	CIVILIAN COMPLAINT REVIEW BD	1	Administrative Coordinator	COMMUNITY ASSC
3091	405778	DEPARTMENT OF INVESTIGATION	1	Confidential Investigator	CONFIDENTIAL INVESTIGATOR
1643	392885	DEPARTMENT OF INVESTIGATION	1	Auditor	CONFIDENTIAL INVESTIGATOR

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
2464	400117	DEPARTMENT OF CITY PLANNING	1	Geographic Analyst	ECONOMIST
18	171944	DEPT OF INFO TECH & TELECOMM	1	Deputy Director, Audits and Accounts	COMPUTER ASSO SUPP)

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
2419	399787	TAXI & LIMOUSINE COMMISSION	1	Client Services Intern	SUMMER COLLEG INTERN
1639	392763	DEPT OF INFO TECH & TELECOMM	11	College Aide	COLLEGE AIDE (AI DEPTS)

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
372	309432	DEPARTMENT OF TRANSPORTATION	1	Equipment Training Coordinator	CLERICAL ASSOCI
2037	397019	DEPARTMENT OF BUILDINGS	4	Senior Operations Associate	CLERICAL ASSOCI

	Job_ID	Agency	#_Of_Positions	Business_Title	Civil_Serv
74	235793	LAW DEPARTMENT	1	Law Student	STUDENT LEGAL SPECIALIST

121 rows × 29 columns
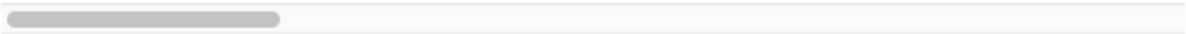
In [82]:

```python
# Below code is for Correlatoin matrix of columns .. some of the Column not taken as it is not required
f, ax = plt.subplots(figsize=(5,5))
# Converted the Experience from Object data type to float
modDfObj[['Experience']] = modDfObj[['Experience']].astype(float)
corr = modDfObj.corr()
sns.heatmap(corr, mask=np.zeros_like(corr, dtype=np.bool), cmap=sns.diverging_palette(500, 10, as_cmap=True),
            square=True, ax=ax)
```

Out[82]:

<matplotlib.axes._subplots.AxesSubplot at 0x1ef7a678400>
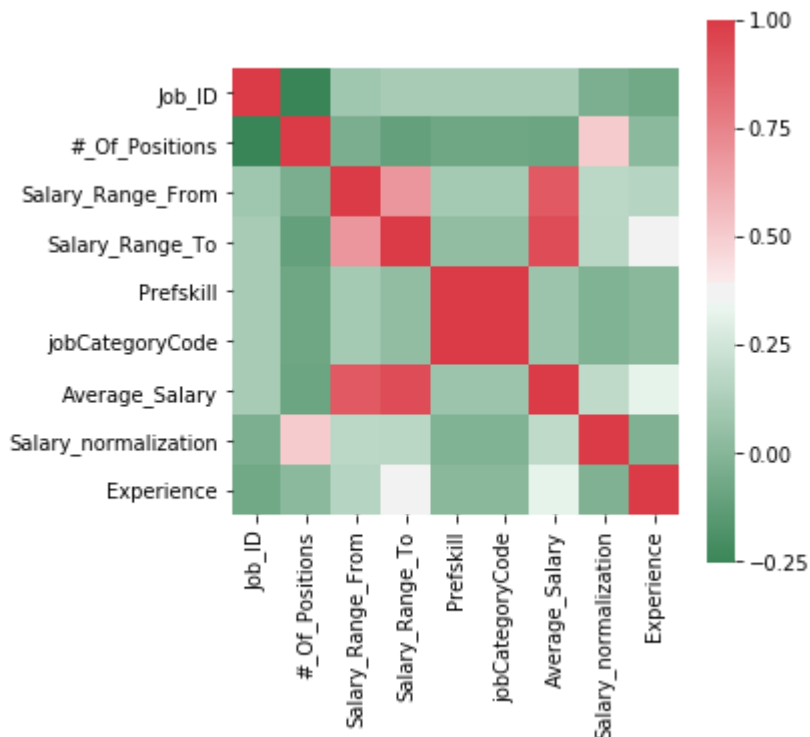
In [84]:

```python
# Cluster Algorithm K mode and PCA technique is used and for Display purpose 3D
 visulization is used

features = ['jobCategoryCode', 'Average_Salary', 'Experience']

# Separating out the features
x = modDfObj.loc[:, features].values

df_dummy = pd.get_dummies(modDfObj3)

#transform into numpy array
i = df_dummy.reset_index().values

# Cluster Algorithm K -Modes
km = kmodes.KModes(n_clusters=3, init='Huang', n_init=5, verbose=0)
clusters = km.fit_predict(i)
df_dummy['clusters'] = clusters

# PCA is used for data visualization
pca = PCA(3)

principalComponents = pca.fit_transform(x)


fig = plt.figure(figsize=(8, 6))
ax = fig.add_subplot(111, projection='3d')

# Setting the axis
ax.set_xlabel('Job Cateogry')
ax.set_ylabel('Average Salary')
ax.set_zlabel('Experience')
plt.scatter(x=plot_columns[:,1], y=plot_columns[:,0], c=df_dummy["clusters"], s=
30)
plt.show()
```
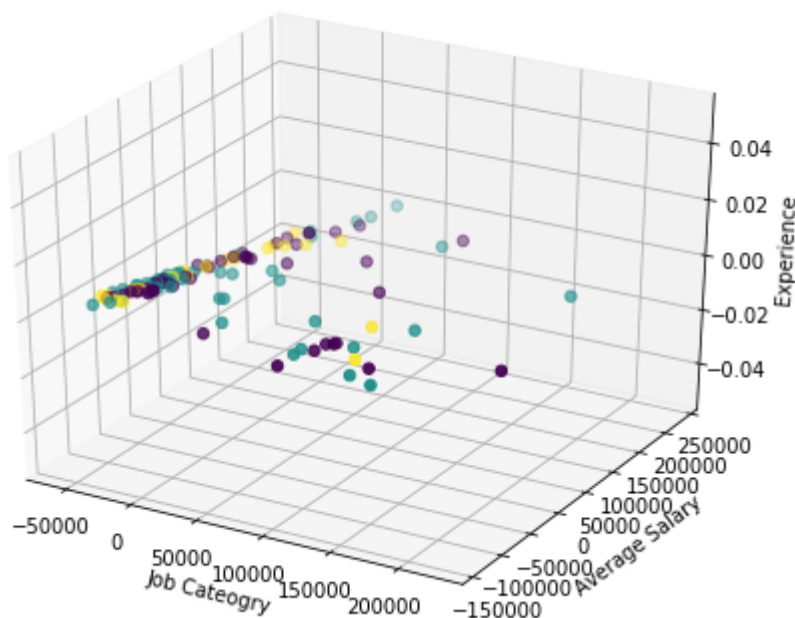
In [ ]:

```
#Documentation -

# Most of the Data Cleaning and dropping the Non Required colums and Reparing th
e missing data activiiy is being done in
#Cell no 1. Few columns has been added also like Job category code and Experienc
e . Experience is extracted from  MInimum
#Qualification , in case of more than one experience is mentioned than its taken
on random basis .

#-------Answer of Question no 1 and Question no 2

# Answer of Question no 1 and Question no 2 ..
# Preferred job skiils in order according to Average salary are (Job code = 115
2,526,28,0,683....so on ) and
# Job Category for these niche skills are ( Technology,Data Innovation, Health,A
dministration and Health ..etc )
#Code for Above is upto cell no 10

#-------Answer of Question no 1 and Question no 3
# For Clustering firstly we calculated and depcited correlation martrix to get t
he relation among the Columns
#Normalizatoin/Scaling of data is  not required as it is done part of cleaning.W
e have usked
# "K-Mode" Clustering algorithm and PCA technique followed by 3D Visualization

# Reason for K mode Techiques is used becasue it's combination of Categorical an
d Numerical data .Also it is used
#distance based technique to measure the closenes of datapoint .

# Worth Mentioning here that some of the fucntion like 'Transform' is taking to
 much time so another
#options are explored and used

# Code and Analysis are documented in Cell itself for easy understanding purpose
.
```