

# S\_NITHISHKUMAR\_Clustering

January 27, 2025

```
[1]: # Import required libraries
import pandas as pd
import numpy as np
from sklearn.preprocessing import StandardScaler
from sklearn.cluster import KMeans
from sklearn.metrics import davies_bouldin_score
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.decomposition import PCA

# Load datasets
customers = pd.read_csv("/content/drive/My Drive/Zeotap/Customers.csv")
transactions = pd.read_csv("/content/drive/My Drive/Zeotap/Transactions.csv")

# Convert date columns to datetime
customers['SignupDate'] = pd.to_datetime(customers['SignupDate'],
    ↪format='%d-%m-%Y', errors='coerce')
transactions['TransactionDate'] = pd.
    ↪to_datetime(transactions['TransactionDate'], format='%d-%m-%Y %H:%M',
    ↪errors='coerce')

# Merge datasets
data = transactions.merge(customers, on='CustomerID', how='left')

# Feature engineering: Transaction-level aggregation
agg_data = data.groupby('CustomerID').agg({
    'TotalValue': 'sum',          # Total spending
    'Quantity': 'sum',           # Total items bought
    'TransactionID': 'count',    # Number of transactions
}).rename(columns={
    'TotalValue': 'TotalSpending',
    'Quantity': 'TotalItems',
    'TransactionID': 'TransactionCount'
}).reset_index()

# Add customer profile information
```

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customer_segmentation_data = agg_data.merge(customers[['CustomerID',
↳ 'Region']], on='CustomerID', how='left')

# Encode categorical variables (e.g., Region)
customer_segmentation_data = pd.get_dummies(customer_segmentation_data,
↳ columns=['Region'], drop_first=True)

# Ensure only numeric columns are used for clustering
numeric_columns = customer_segmentation_data.drop(['CustomerID'], axis=1)

# Standardize the data
scaler = StandardScaler()
scaled_data = scaler.fit_transform(numeric_columns)

# Perform KMeans clustering
k = 5 # Number of clusters (adjust as needed)
kmeans = KMeans(n_clusters=k, random_state=42)
cluster_labels = kmeans.fit_predict(scaled_data)

# Assign cluster labels to the original data
customer_segmentation_data['Cluster'] = cluster_labels

# Calculate Davies-Bouldin Index
db_index = davies_bouldin_score(scaled_data, cluster_labels)
print(f"Davies-Bouldin Index: {db_index}")

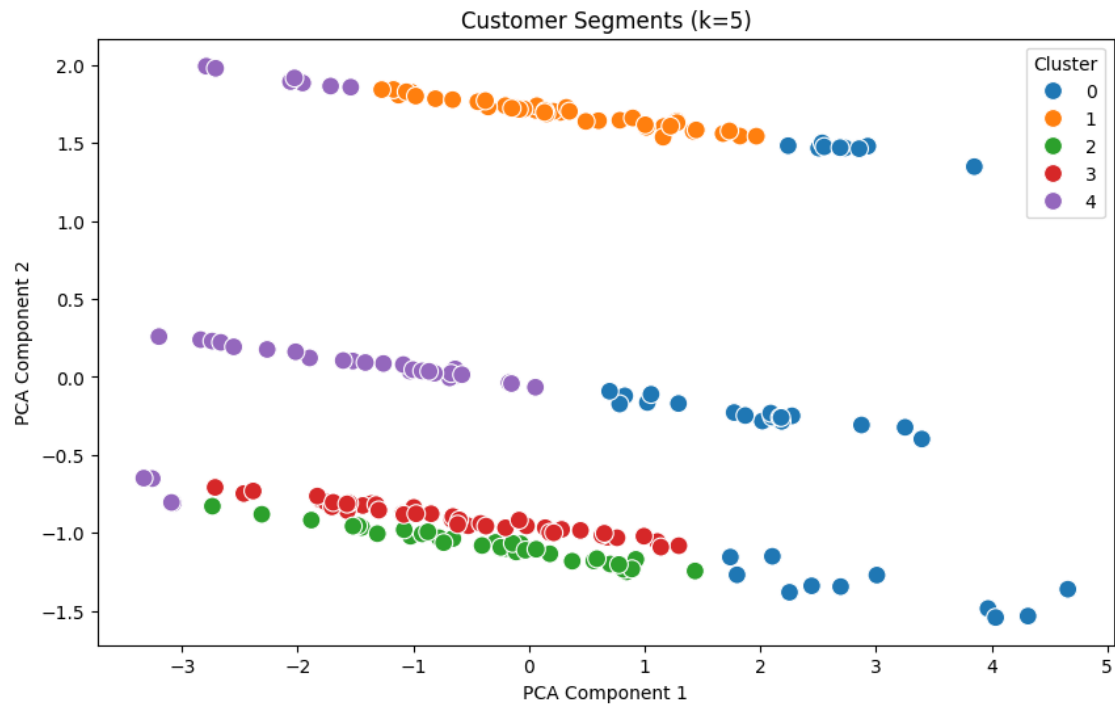
# Visualize clusters using PCA for dimensionality reduction
pca = PCA(n_components=2)
pca_data = pca.fit_transform(scaled_data)
pca_df = pd.DataFrame(pca_data, columns=['PCA1', 'PCA2'])
pca_df['Cluster'] = cluster_labels

# Plot the clusters
plt.figure(figsize=(10, 6))
sns.scatterplot(data=pca_df, x='PCA1', y='PCA2', hue='Cluster',
↳ palette='tab10', s=100)
plt.title(f'Customer Segments (k={k})')
plt.xlabel('PCA Component 1')
plt.ylabel('PCA Component 2')
plt.legend(title='Cluster')
plt.show()

# Analyze cluster characteristics (numeric columns only)
cluster_analysis = customer_segmentation_data.drop('CustomerID', axis=1).
↳ groupby('Cluster').mean()
print("\nCluster Characteristics:")
print(cluster_analysis)

```

Davies-Bouldin Index: 0.9384521529981805



Cluster Characteristics:

	TotalSpending	TotalItems	TransactionCount	Region_Europe \
Cluster				
0	5935.633421	21.710526	8.026316	0.105263
1	3702.809048	13.071429	5.142857	0.000000
2	2920.969730	11.378378	4.783784	0.000000
3	3146.072045	11.181818	4.500000	1.000000
4	1642.643684	6.578947	2.736842	0.052632

	Region_North America	Region_South America
Cluster		
0	0.184211	0.236842
1	0.000000	1.000000
2	1.000000	0.000000
3	0.000000	0.000000
4	0.052632	0.210526

```
[ ]: !apt-get install -y texlive-xetex
```

```
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
```

The following additional packages will be installed:

```
dvisvgm fonts-droid-fallback fonts-lato fonts-lmodern fonts-noto-mono fonts-
texgyre
  fonts-urw-base35 libapache-pom-java libcommons-logging-java libcommons-parent-
java
  libfontbox-java libfontenc1 libgs9 libgs9-common libidn12 libijs-0.35
libjbig2dec0 libkpathsea6
  libpdfbox-java libptexenc1 libruby3.0 libsynchronet2 libteckit0 libtexlua53
libtexluajit2 libwoff1
  libzip-0-13 lmodern poppler-data preview-latex-style rake ruby ruby-net-
telnet ruby-rubygems
  ruby-webrick ruby-xmlrpc ruby3.0 rubygems-integration t1utils teckit tex-
common tex-gyre
  texlive-base texlive-binaries texlive-fonts-recommended texlive-latex-base
texlive-latex-extra
  texlive-latex-recommended texlive-pictures texlive-plain-generic tipa xfonts-
encodings
  xfonts-utils
```

Suggested packages:

```
fonts-noto fonts-freefont-otf | fonts-freefont-ttf libavalon-framework-java
libcommons-logging-java-doc libexcalibur-logkit-java liblog4j1.2-java poppler-
utils ghostscript
  fonts-japanese-mincho | fonts-ipafont-mincho fonts-japanese-gothic | fonts-
ipafont-gothic
  fonts-arphic-ukai fonts-arphic-uming fonts-nanum ri ruby-dev bundler debhelper
gv
  | postscript-viewer perl-tk xpdf | pdf-viewer xzdec texlive-fonts-recommended-
doc
  texlive-latex-base-doc python3-pygments icc-profiles libfile-which-perl
  libspreadsheet-parseexcel-perl texlive-latex-extra-doc texlive-latex-
recommended-doc
  texlive-luatex texlive-pstricks dot2tex prerex texlive-pictures-doc vprerex
default-jre-headless
  tipa-doc
```

The following NEW packages will be installed:

```
dvisvgm fonts-droid-fallback fonts-lato fonts-lmodern fonts-noto-mono fonts-
texgyre
  fonts-urw-base35 libapache-pom-java libcommons-logging-java libcommons-parent-
java
  libfontbox-java libfontenc1 libgs9 libgs9-common libidn12 libijs-0.35
libjbig2dec0 libkpathsea6
  libpdfbox-java libptexenc1 libruby3.0 libsynchronet2 libteckit0 libtexlua53
libtexluajit2 libwoff1
  libzip-0-13 lmodern poppler-data preview-latex-style rake ruby ruby-net-
telnet ruby-rubygems
  ruby-webrick ruby-xmlrpc ruby3.0 rubygems-integration t1utils teckit tex-
common tex-gyre
  texlive-base texlive-binaries texlive-fonts-recommended texlive-latex-base
```

```

texlive-latex-extra
  texlive-latex-recommended texlive-pictures texlive-plain-generic texlive-xetex
tipa
  xfonts-encodings xfonts-utils
0 upgraded, 54 newly installed, 0 to remove and 49 not upgraded.
Need to get 182 MB of archives.
After this operation, 571 MB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu jammy/main amd64 fonts-droid-fallback all
1:6.0.1r16-1.1build1 [1,805 kB]
Get:2 http://archive.ubuntu.com/ubuntu jammy/main amd64 fonts-lato all 2.0-2.1
[2,696 kB]
Get:3 http://archive.ubuntu.com/ubuntu jammy/main amd64 poppler-data all
0.4.11-1 [2,171 kB]
Get:4 http://archive.ubuntu.com/ubuntu jammy/universe amd64 tex-common all 6.17
[33.7 kB]
Get:5 http://archive.ubuntu.com/ubuntu jammy/main amd64 fonts-urw-base35 all
20200910-1 [6,367 kB]
Get:6 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libgs9-common
all 9.55.0~dfsg1-0ubuntu5.10 [752 kB]
Get:7 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libidn12 amd64
1.38-4ubuntu1 [60.0 kB]
Get:8 http://archive.ubuntu.com/ubuntu jammy/main amd64 libijs-0.35 amd64
0.35-15build2 [16.5 kB]
Get:9 http://archive.ubuntu.com/ubuntu jammy/main amd64 libjbig2dec0 amd64
0.19-3build2 [64.7 kB]
Get:10 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libgs9 amd64
9.55.0~dfsg1-0ubuntu5.10 [5,031 kB]
Get:11 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libkpathsea6
amd64 2021.20210626.59705-1ubuntu0.2 [60.4 kB]
Get:12 http://archive.ubuntu.com/ubuntu jammy/main amd64 libwoff1 amd64
1.0.2-1build4 [45.2 kB]
Get:13 http://archive.ubuntu.com/ubuntu jammy/universe amd64 dvisvgm amd64
2.13.1-1 [1,221 kB]
Get:14 http://archive.ubuntu.com/ubuntu jammy/universe amd64 fonts-lmodern all
2.004.5-6.1 [4,532 kB]
Get:15 http://archive.ubuntu.com/ubuntu jammy/main amd64 fonts-noto-mono all
20201225-1build1 [397 kB]
Get:16 http://archive.ubuntu.com/ubuntu jammy/universe amd64 fonts-texgyre all
20180621-3.1 [10.2 MB]
Get:17 http://archive.ubuntu.com/ubuntu jammy/universe amd64 libapache-pom-java
all 18-1 [4,720 B]
Get:18 http://archive.ubuntu.com/ubuntu jammy/universe amd64 libcommons-parent-
java all 43-1 [10.8 kB]
Get:19 http://archive.ubuntu.com/ubuntu jammy/universe amd64 libcommons-logging-
java all 1.2-2 [60.3 kB]
Get:20 http://archive.ubuntu.com/ubuntu jammy/main amd64 libfontenc1 amd64
1:1.1.4-1build3 [14.7 kB]
Get:21 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 libptexenc1

```

amd64 2021.20210626.59705-1ubuntu0.2 [39.1 kB]  
 Get:22 <http://archive.ubuntu.com/ubuntu> jammy/main amd64 rubygems-integration  
 all 1.18 [5,336 B]  
 Get:23 <http://archive.ubuntu.com/ubuntu> jammy-updates/main amd64 ruby3.0 amd64  
 3.0.2-7ubuntu2.8 [50.1 kB]  
 Get:24 <http://archive.ubuntu.com/ubuntu> jammy/main amd64 ruby-rubygems all  
 3.3.5-2 [228 kB]  
 Get:25 <http://archive.ubuntu.com/ubuntu> jammy/main amd64 ruby amd64 1:3.0~exp1  
 [5,100 B]  
 Get:26 <http://archive.ubuntu.com/ubuntu> jammy/main amd64 rake all 13.0.6-2 [61.7  
 kB]  
 Get:27 <http://archive.ubuntu.com/ubuntu> jammy/main amd64 ruby-net-telnet all  
 0.1.1-2 [12.6 kB]  
 Get:28 <http://archive.ubuntu.com/ubuntu> jammy-updates/main amd64 ruby-webrick  
 all 1.7.0-3ubuntu0.1 [52.1 kB]  
 Get:29 <http://archive.ubuntu.com/ubuntu> jammy-updates/main amd64 ruby-xmlrpc all  
 0.3.2-1ubuntu0.1 [24.9 kB]  
 Get:30 <http://archive.ubuntu.com/ubuntu> jammy-updates/main amd64 libruby3.0  
 amd64 3.0.2-7ubuntu2.8 [5,113 kB]  
 Get:31 <http://archive.ubuntu.com/ubuntu> jammy-updates/main amd64 libsynchronet2  
 amd64 2021.20210626.59705-1ubuntu0.2 [55.6 kB]  
 Get:32 <http://archive.ubuntu.com/ubuntu> jammy/universe amd64 libteckit0 amd64  
 2.5.11+ds1-1 [421 kB]  
 Get:33 <http://archive.ubuntu.com/ubuntu> jammy-updates/main amd64 libtexlua53  
 amd64 2021.20210626.59705-1ubuntu0.2 [120 kB]  
 Get:34 <http://archive.ubuntu.com/ubuntu> jammy-updates/main amd64 libtexluajit2  
 amd64 2021.20210626.59705-1ubuntu0.2 [267 kB]  
 Get:35 <http://archive.ubuntu.com/ubuntu> jammy/universe amd64 libzip-0-13 amd64  
 0.13.72+dfsg.1-1.1 [27.0 kB]  
 Get:36 <http://archive.ubuntu.com/ubuntu> jammy/main amd64 xfonts-encodings all  
 1:1.0.5-0ubuntu2 [578 kB]  
 Get:37 <http://archive.ubuntu.com/ubuntu> jammy/main amd64 xfonts-utils amd64  
 1:7.7+6build2 [94.6 kB]  
 Get:38 <http://archive.ubuntu.com/ubuntu> jammy/universe amd64 lmodern all  
 2.004.5-6.1 [9,471 kB]  
 Get:39 <http://archive.ubuntu.com/ubuntu> jammy/universe amd64 preview-latex-style  
 all 12.2-1ubuntu1 [185 kB]  
 Get:40 <http://archive.ubuntu.com/ubuntu> jammy/main amd64 t1utils amd64  
 1.41-4build2 [61.3 kB]  
 Get:41 <http://archive.ubuntu.com/ubuntu> jammy/universe amd64 teckit amd64  
 2.5.11+ds1-1 [699 kB]  
 Get:42 <http://archive.ubuntu.com/ubuntu> jammy/universe amd64 tex-gyre all  
 20180621-3.1 [6,209 kB]  
 Get:43 <http://archive.ubuntu.com/ubuntu> jammy-updates/universe amd64 texlive-  
 binaries amd64 2021.20210626.59705-1ubuntu0.2 [9,860 kB]  
 Get:44 <http://archive.ubuntu.com/ubuntu> jammy/universe amd64 texlive-base all  
 2021.20220204-1 [21.0 MB]  
 Get:45 <http://archive.ubuntu.com/ubuntu> jammy/universe amd64 texlive-fonts-

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recommended all 2021.20220204-1 [4,972 kB]
Get:46 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-latex-base
all 2021.20220204-1 [1,128 kB]
Get:47 http://archive.ubuntu.com/ubuntu jammy/universe amd64 libfontbox-java all
1:1.8.16-2 [207 kB]
Get:48 http://archive.ubuntu.com/ubuntu jammy/universe amd64 libpdfbox-java all
1:1.8.16-2 [5,199 kB]
Get:49 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-latex-
recommended all 2021.20220204-1 [14.4 MB]
Get:50 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-pictures
all 2021.20220204-1 [8,720 kB]
Get:51 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-latex-extra
all 2021.20220204-1 [13.9 MB]
Get:52 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-plain-
generic all 2021.20220204-1 [27.5 MB]
Get:53 http://archive.ubuntu.com/ubuntu jammy/universe amd64 tipa all 2:1.3-21
[2,967 kB]
Get:54 http://archive.ubuntu.com/ubuntu jammy/universe amd64 texlive-xetex all
2021.20220204-1 [12.4 MB]
Fetched 182 MB in 4s (41.6 MB/s)
Extracting templates from packages: 100%
Preconfiguring packages ...
Selecting previously unselected package fonts-droid-fallback.
(Reading database ... 124574 files and directories currently installed.)
Preparing to unpack .../00-fonts-droid-fallback_1%3a6.0.1r16-1.1build1_all.deb
...
Unpacking fonts-droid-fallback (1:6.0.1r16-1.1build1) ...
Selecting previously unselected package fonts-lato.
Preparing to unpack .../01-fonts-lato_2.0-2.1_all.deb ...
Unpacking fonts-lato (2.0-2.1) ...
Selecting previously unselected package poppler-data.
Preparing to unpack .../02-poppler-data_0.4.11-1_all.deb ...
Unpacking poppler-data (0.4.11-1) ...
Selecting previously unselected package tex-common.
Preparing to unpack .../03-tex-common_6.17_all.deb ...
Unpacking tex-common (6.17) ...
Selecting previously unselected package fonts-urw-base35.
Preparing to unpack .../04-fonts-urw-base35_20200910-1_all.deb ...
Unpacking fonts-urw-base35 (20200910-1) ...
Selecting previously unselected package libgs9-common.
Preparing to unpack .../05-libgs9-common_9.55.0~dfsg1-0ubuntu5.10_all.deb ...
Unpacking libgs9-common (9.55.0~dfsg1-0ubuntu5.10) ...
Selecting previously unselected package libidn12:amd64.
Preparing to unpack .../06-libidn12_1.38-4ubuntu1_amd64.deb ...
Unpacking libidn12:amd64 (1.38-4ubuntu1) ...
Selecting previously unselected package libijs-0.35:amd64.
Preparing to unpack .../07-libijs-0.35_0.35-15build2_amd64.deb ...
Unpacking libijs-0.35:amd64 (0.35-15build2) ...

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Selecting previously unselected package libjbig2dec0:amd64.
Preparing to unpack .../08-libjbig2dec0_0.19-3build2_amd64.deb ...
Unpacking libjbig2dec0:amd64 (0.19-3build2) ...
Selecting previously unselected package libgs9:amd64.
Preparing to unpack .../09-libgs9_9.55.0~dfsg1-0ubuntu5.10_amd64.deb ...
Unpacking libgs9:amd64 (9.55.0~dfsg1-0ubuntu5.10) ...
Selecting previously unselected package libkpathsea6:amd64.
Preparing to unpack .../10-libkpathsea6_2021.20210626.59705-1ubuntu0.2_amd64.deb
...
Unpacking libkpathsea6:amd64 (2021.20210626.59705-1ubuntu0.2) ...
Selecting previously unselected package libwoff1:amd64.
Preparing to unpack .../11-libwoff1_1.0.2-1build4_amd64.deb ...
Unpacking libwoff1:amd64 (1.0.2-1build4) ...
Selecting previously unselected package dvisvgm.
Preparing to unpack .../12-dvisvgm_2.13.1-1_amd64.deb ...
Unpacking dvisvgm (2.13.1-1) ...
Selecting previously unselected package fonts-lmodern.
Preparing to unpack .../13-fonts-lmodern_2.004.5-6.1_all.deb ...
Unpacking fonts-lmodern (2.004.5-6.1) ...
Selecting previously unselected package fonts-noto-mono.
Preparing to unpack .../14-fonts-noto-mono_20201225-1build1_all.deb ...
Unpacking fonts-noto-mono (20201225-1build1) ...
Selecting previously unselected package fonts-texgyre.
Preparing to unpack .../15-fonts-texgyre_20180621-3.1_all.deb ...
Unpacking fonts-texgyre (20180621-3.1) ...
Selecting previously unselected package libapache-pom-java.
Preparing to unpack .../16-libapache-pom-java_18-1_all.deb ...
Unpacking libapache-pom-java (18-1) ...
Selecting previously unselected package libcommons-parent-java.
Preparing to unpack .../17-libcommons-parent-java_43-1_all.deb ...
Unpacking libcommons-parent-java (43-1) ...
Selecting previously unselected package libcommons-logging-java.
Preparing to unpack .../18-libcommons-logging-java_1.2-2_all.deb ...
Unpacking libcommons-logging-java (1.2-2) ...
Selecting previously unselected package libfontenc1:amd64.
Preparing to unpack .../19-libfontenc1_1%3a1.1.4-1build3_amd64.deb ...
Unpacking libfontenc1:amd64 (1:1.1.4-1build3) ...
Selecting previously unselected package libptexenc1:amd64.
Preparing to unpack .../20-libptexenc1_2021.20210626.59705-1ubuntu0.2_amd64.deb
...
Unpacking libptexenc1:amd64 (2021.20210626.59705-1ubuntu0.2) ...
Selecting previously unselected package rubygems-integration.
Preparing to unpack .../21-rubygems-integration_1.18_all.deb ...
Unpacking rubygems-integration (1.18) ...
Selecting previously unselected package ruby3.0.
Preparing to unpack .../22-ruby3.0_3.0.2-7ubuntu2.8_amd64.deb ...
Unpacking ruby3.0 (3.0.2-7ubuntu2.8) ...
Selecting previously unselected package ruby-rubygems.

```



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Preparing to unpack .../23-ruby-rubygems_3.3.5-2_all.deb ...
Unpacking ruby-rubygems (3.3.5-2) ...
Selecting previously unselected package ruby.
Preparing to unpack .../24-ruby_1%3a3.0~exp1_amd64.deb ...
Unpacking ruby (1:3.0~exp1) ...
Selecting previously unselected package rake.
Preparing to unpack .../25-rake_13.0.6-2_all.deb ...
Unpacking rake (13.0.6-2) ...
Selecting previously unselected package ruby-net-telnet.
Preparing to unpack .../26-ruby-net-telnet_0.1.1-2_all.deb ...
Unpacking ruby-net-telnet (0.1.1-2) ...
Selecting previously unselected package ruby-webrick.
Preparing to unpack .../27-ruby-webrick_1.7.0-3ubuntu0.1_all.deb ...
Unpacking ruby-webrick (1.7.0-3ubuntu0.1) ...
Selecting previously unselected package ruby-xmlrpc.
Preparing to unpack .../28-ruby-xmlrpc_0.3.2-1ubuntu0.1_all.deb ...
Unpacking ruby-xmlrpc (0.3.2-1ubuntu0.1) ...
Selecting previously unselected package libruby3.0:amd64.
Preparing to unpack .../29-libruby3.0_3.0.2-7ubuntu2.8_amd64.deb ...
Unpacking libruby3.0:amd64 (3.0.2-7ubuntu2.8) ...
Selecting previously unselected package libsyntax2:amd64.
Preparing to unpack .../30-libsyntax2_2021.20210626.59705-1ubuntu0.2_amd64.deb
...
Unpacking libsyntax2:amd64 (2021.20210626.59705-1ubuntu0.2) ...
Selecting previously unselected package libteckit0:amd64.
Preparing to unpack .../31-libteckit0_2.5.11+ds1-1_amd64.deb ...
Unpacking libteckit0:amd64 (2.5.11+ds1-1) ...
Selecting previously unselected package libtexlua53:amd64.
Preparing to unpack .../32-libtexlua53_2021.20210626.59705-1ubuntu0.2_amd64.deb
...
Unpacking libtexlua53:amd64 (2021.20210626.59705-1ubuntu0.2) ...
Selecting previously unselected package libtexluajit2:amd64.
Preparing to unpack
.../33-libtexluajit2_2021.20210626.59705-1ubuntu0.2_amd64.deb ...
Unpacking libtexluajit2:amd64 (2021.20210626.59705-1ubuntu0.2) ...
Selecting previously unselected package libzip-0-13:amd64.
Preparing to unpack .../34-libzip-0-13_0.13.72+dfsg.1-1.1_amd64.deb ...
Unpacking libzip-0-13:amd64 (0.13.72+dfsg.1-1.1) ...
Selecting previously unselected package xfonts-encodings.
Preparing to unpack .../35-xfonts-encodings_1%3a1.0.5-0ubuntu2_all.deb ...
Unpacking xfonts-encodings (1:1.0.5-0ubuntu2) ...
Selecting previously unselected package xfonts-utils.
Preparing to unpack .../36-xfonts-utils_1%3a7.7+6build2_amd64.deb ...
Unpacking xfonts-utils (1:7.7+6build2) ...
Selecting previously unselected package lmodern.
Preparing to unpack .../37-lmodern_2.004.5-6.1_all.deb ...
Unpacking lmodern (2.004.5-6.1) ...
Selecting previously unselected package preview-latex-style.

```

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Preparing to unpack .../38-preview-latex-style_12.2-1ubuntu1_all.deb ...
Unpacking preview-latex-style (12.2-1ubuntu1) ...
Selecting previously unselected package t1utils.
Preparing to unpack .../39-t1utils_1.41-4build2_amd64.deb ...
Unpacking t1utils (1.41-4build2) ...
Selecting previously unselected package teckit.
Preparing to unpack .../40-teckit_2.5.11+ds1-1_amd64.deb ...
Unpacking teckit (2.5.11+ds1-1) ...
Selecting previously unselected package tex-gyre.
Preparing to unpack .../41-tex-gyre_20180621-3.1_all.deb ...
Unpacking tex-gyre (20180621-3.1) ...
Selecting previously unselected package texlive-binaries.
Preparing to unpack .../42-texlive-
binaries_2021.20210626.59705-1ubuntu0.2_amd64.deb ...
Unpacking texlive-binaries (2021.20210626.59705-1ubuntu0.2) ...
Selecting previously unselected package texlive-base.
Preparing to unpack .../43-texlive-base_2021.20220204-1_all.deb ...
Unpacking texlive-base (2021.20220204-1) ...
Selecting previously unselected package texlive-fonts-recommended.
Preparing to unpack .../44-texlive-fonts-recommended_2021.20220204-1_all.deb ...
Unpacking texlive-fonts-recommended (2021.20220204-1) ...
```

```
[ ]: !jupyter nbconvert "/content/drive/My Drive/Zeotap/S_NITHISHKUMAR_Clustering.
↪ipynb" --to pdf
```