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import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import confusion_matrix, precision_score,
recall_score, f1_score
from google.colab import drive

# Mount Google Drive
drive.mount('/content/drive')

# Load dataset
df = pd.read_csv("/content/drive/MyDrive/fake_and_real_news.csv.zip")

# Convert labels to binary
labels = df['label'].map({'Fake': 0, 'Real': 1})

# Convert text data to numerical features using TF-IDF
vectorizer = TfidfVectorizer(max_features=500)
X = vectorizer.fit_transform(df['Text']).toarray()
y = labels.values

# Ensure correct indexing for class selection
class_0 = X[y == 0]
class_1 = X[y == 1]
if len(class_0) == 0 or len(class_1) == 0:
    raise ValueError("Dataset must contain at least one instance of
each class.")

# Compute class centroids (mean vectors)
centroid_0 = np.mean(class_0, axis=0)
centroid_1 = np.mean(class_1, axis=0)

print("\nCentroid (Mean) of Fake News Class (0):\n", centroid_0)
print("\nCentroid (Mean) of Real News Class (1):\n", centroid_1)

# Compute standard deviation (spread) for each class
spread_0 = np.std(class_0, axis=0)
spread_1 = np.std(class_1, axis=0)

print("\nSpread (Standard Deviation) of Fake News Class (0):\n",
spread_0)
print("\nSpread (Standard Deviation) of Real News Class (1):\n",
spread_1)

# Compute interclass distance
distance = np.linalg.norm(centroid_0 - centroid_1)
print("\nInterclass Distance between Fake and Real News:", distance)

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# Histogram of a feature
plt.hist(X[:, 0], bins=20, alpha=0.7, label='Feature 1')
plt.xlabel("Feature Value")
plt.ylabel("Frequency")
plt.legend()
plt.show()

# Minkowski Distance for two feature vectors
if len(X) > 1:
    vector_1 = X[0]
    vector_2 = X[1]
    distances = [np.linalg.norm(vector_1 - vector_2, ord=r) for r in
range(1, 11)]

    plt.plot(range(1, 11), distances, marker='o')
    plt.xlabel("r (Minkowski Parameter)")
    plt.ylabel("Distance")
    plt.title("Minkowski Distance for Varying r")
    plt.show()
else:
    print("Not enough data points for Minkowski distance
calculation.")

# Split dataset into train and test sets
X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size=0.3, random_state=42, stratify=y)

# Train kNN classifier (k=3)
neigh = KNeighborsClassifier(n_neighbors=3)
neigh.fit(X_train, y_train)

# Evaluate accuracy
accuracy = neigh.score(X_test, y_test)
print("\nkNN Accuracy:", accuracy)

# Predict classes
predictions = neigh.predict(X_test)
print("\nSample Predictions:", predictions[:10])

# Evaluate confusion matrix
conf_matrix = confusion_matrix(y_test, predictions)
precision = precision_score(y_test, predictions)
recall = recall_score(y_test, predictions)
f1 = f1_score(y_test, predictions)

print("\nConfusion Matrix:\n", conf_matrix)
print("\nPrecision:", precision)
print("Recall:", recall)
print("F1-Score:", f1)

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# Vary k from 1 to 11 and plot accuracy
accuracies = []
k_values = range(1, 12)
for k in k_values:
    knn = KNeighborsClassifier(n_neighbors=k)
    knn.fit(X_train, y_train)
    accuracies.append(knn.score(X_test, y_test))

plt.plot(k_values, accuracies, marker='o')
plt.xlabel("k (Number of Neighbors)")
plt.ylabel("Accuracy")
plt.title("kNN Accuracy for Different k")
plt.show()

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Centroid (Mean) of Fake News Class (0):

```

[0.00706868 0.00656768 0.00595439 0.01102009 0.01862607 0.04217121
 0.0124644  0.00757181 0.00390612 0.01558267 0.00451905 0.01238665
 0.00365732 0.02205252 0.01364257 0.01613398 0.0034079  0.00268574
 0.00196222 0.03651739 0.00986221 0.01852548 0.01875805 0.01678337
 0.01502972 0.00463133 0.03038803 0.15603908 0.01103255 0.00849302
 0.01695607 0.01090644 0.00627038 0.04779856 0.01002668 0.04751407
 0.01035033 0.03637816 0.0101408  0.00575444 0.00996445 0.01533778
 0.01014811 0.00792494 0.00385206 0.00389598 0.04868588 0.02878097
 0.02739919 0.01361164 0.02040273 0.00932259 0.00882417 0.00689881
 0.00827459 0.0130307  0.00276128 0.01467131 0.00781822 0.00284257
 0.00784303 0.03841546 0.03706571 0.00915753 0.0116925  0.00750774
 0.02116129 0.02942156 0.00783962 0.01298668 0.00711885 0.00225317
 0.00697974 0.00522944 0.0081125  0.00430047 0.00618908 0.00887804
 0.00520717 0.02704299 0.01241291 0.01276534 0.02066058 0.0101129
 0.01288792 0.00251103 0.00571473 0.00347359 0.00537473 0.00785685
 0.00288008 0.00617267 0.00536189 0.00506811 0.01558464 0.00376474
 0.01788375 0.01330349 0.00841144 0.00332709 0.01392534 0.00833835
 0.00617635 0.00982892 0.00522247 0.00439789 0.00322414 0.00670564
 0.01015823 0.00638952 0.00742403 0.01695534 0.01518366 0.00646269
 0.02547089 0.01235059 0.01634188 0.0122107  0.02020358 0.03182875
 0.00998214 0.01407392 0.01687625 0.00399363 0.0024539  0.00462091
 0.0028458  0.02119455 0.00672186 0.00877749 0.02815437 0.01302066
 0.01350128 0.00749175 0.00537533 0.00180605 0.00722139 0.01796449
 0.01084894 0.00941579 0.01049947 0.01001722 0.02631515 0.01053878
 0.00617156 0.00281549 0.01555973 0.00926654 0.07224696 0.00654304
 0.01243901 0.00538999 0.01588593 0.00621359 0.00464453 0.0342816
 0.00715821 0.00277333 0.00707042 0.0209903  0.00908088 0.02232314
 0.00840633 0.01456569 0.02127774 0.01281232 0.01690536 0.01296512
 0.00975938 0.00381087 0.00965894 0.00589288 0.00303576 0.02330768
 0.0074234  0.04488995 0.04337734 0.00866364 0.10072556 0.00994773
 0.00676579 0.00879611 0.03788305 0.02028636 0.00535924 0.02395358
 0.03806928 0.01576694 0.07774572 0.02036301 0.02215136 0.01040126

```

0.01280649	0.03281831	0.02832214	0.02264226	0.00433406	0.10560688
0.00612156	0.0094597	0.00952377	0.00525081	0.00978405	0.00902775
0.01721456	0.01112476	0.10340251	0.01168103	0.00486771	0.00427593
0.08117103	0.00804056	0.01312254	0.0098027	0.0069135	0.00791015
0.00490541	0.00723799	0.00886773	0.03935837	0.00630783	0.00852024
0.02228495	0.00587243	0.00372149	0.01108916	0.00447765	0.00920345
0.00174513	0.00661841	0.00417572	0.00840494	0.00716952	0.00461872
0.00238219	0.01161472	0.00597664	0.03067486	0.00775374	0.0087093
0.00984682	0.00894403	0.01125775	0.00988771	0.01507915	0.00557668
0.00410381	0.01654553	0.00846073	0.01674475	0.01544064	0.00969466
0.00796537	0.01414534	0.01453189	0.01710403	0.0071931	0.00617589
0.00513976	0.0095047	0.00588156	0.00967241	0.00494459	0.00944739
0.00414035	0.00564611	0.02524466	0.0011051	0.01761583	0.00489982
0.01507944	0.00502188	0.00720509	0.01582443	0.00946052	0.01049017
0.01053112	0.01477437	0.01787378	0.02258578	0.00682135	0.01049676
0.02579145	0.00601683	0.04410178	0.01182859	0.0105544	0.02655631
0.00394569	0.00544	0.02798041	0.00666498	0.00944042	0.14654293
0.01317131	0.0128022	0.00513881	0.00612911	0.0082514	0.05911894
0.00922809	0.03190877	0.02234292	0.02648508	0.00889085	0.01623693
0.02727927	0.03340364	0.0196034	0.01472955	0.00865906	0.01288017
0.00291911	0.00592933	0.00826826	0.00914159	0.03889002	0.0095059
0.01068952	0.01996252	0.00787028	0.00662848	0.00318681	0.01043788
0.00914501	0.0056778	0.00901825	0.00506153	0.00907949	0.00745987
0.00872516	0.03126011	0.01041241	0.01530537	0.00435277	0.00362586
0.01001214	0.0100787	0.01069389	0.00718694	0.01373839	0.02296965
0.00992461	0.02510577	0.01589752	0.00134013	0.00376593	0.0076548
0.00447967	0.00363517	0.00699765	0.00118024	0.00105751	0.0142934
0.02059901	0.0076664	0.00036718	0.02321158	0.00819763	0.00249512
0.02023336	0.01284045	0.00813735	0.02733286	0.01051702	0.00217513
0.01694573	0.01077346	0.01356697	0.00718856	0.00861789	0.01267968
0.00678089	0.00782011	0.00679177	0.00296081	0.00837956	0.00474222
0.00562724	0.03726326	0.0207686	0.01416233	0.01218948	0.03320048
0.01569732	0.0103691	0.01433177	0.00696234	0.00466764	0.00905174
0.00218297	0.01190206	0.00569051	0.01315413	0.00784955	0.01467537
0.01303269	0.00953799	0.00909997	0.00869817	0.00908354	0.0123636
0.00414581	0.01022835	0.0130545	0.00747225	0.00787394	0.00425351
0.00961866	0.00387244	0.02091357	0.13171355	0.32020832	0.0319634
0.02325408	0.01906886	0.02808015	0.01771507	0.05236242	0.01324568
0.01407316	0.0173601	0.0586925	0.01507737	0.01185756	0.00657566
0.00841912	0.00403178	0.00193829	0.02217446	0.01091359	0.20601663
0.0092972	0.01114706	0.01246238	0.00927626	0.00494613	0.00157817
0.14614383	0.01075432	0.00397396	0.01148656	0.00976917	0.03287069
0.01103233	0.00953339	0.01199731	0.00634264	0.02666753	0.01818236
0.00775708	0.00775516	0.01233761	0.01823495	0.02952083	0.0250718
0.01394284	0.01039879	0.0045961	0.00880499	0.01465667	0.00901163
0.00904293	0.05566069	0.00483071	0.0178463	0.01748299	0.043298
0.0033163	0.00691225	0.01732617	0.01184918	0.02163331	0.03522899
0.0295537	0.01166483	0.00595782	0.02003059	0.01812685	0.02735167
0.04076164	0.01536378	0.02955341	0.00980502	0.05290497	0.00809639

0.02107589 0.01220982 0.00985269 0.0087507 0.00743907 0.01512464
0.02651574 0.00608799 0.01126461 0.0139129 0.00952699 0.00836046
0.06353766 0.01870647]

Centroid (Mean) of Real News Class (1):

[1.06217059e-02 7.01591639e-03 7.00044676e-03 1.45179002e-02
3.56837595e-03 2.13754940e-02 1.02243533e-02 9.17435783e-03
8.20937556e-03 1.31834239e-03 8.57320948e-03 2.54895313e-02
9.42725275e-03 2.29636361e-02 3.75133921e-03 1.67065013e-02
7.93285335e-03 1.55159055e-02 1.18429549e-02 1.04910223e-02
5.90109594e-03 2.02914348e-02 5.27598138e-03 1.10856825e-02
7.25298911e-03 6.99505791e-03 3.08740611e-02 1.29431933e-01
6.44046707e-03 4.43757566e-03 1.54744706e-02 2.05591772e-03
6.08173536e-03 2.57160074e-02 4.08889803e-03 4.27734407e-02
1.20742475e-02 3.35205584e-02 6.26138485e-03 1.13123954e-02
3.46178423e-03 9.06149991e-03 2.04825861e-03 1.15258406e-02
8.44346360e-03 7.19124384e-03 3.21817922e-02 8.10334797e-03
1.93781683e-02 1.44401833e-02 7.28178830e-03 4.05116435e-03
4.02675304e-03 1.53719181e-02 5.31554080e-03 3.65236281e-02
1.46122327e-02 1.73241381e-03 1.12889951e-02 1.80293806e-02
1.06929991e-02 2.35006996e-02 4.20929396e-02 5.88358336e-03
1.12550908e-02 5.46805880e-03 1.99337758e-02 1.10622013e-02
5.52561008e-03 5.47280706e-03 7.88673333e-03 1.25706226e-02
8.85600691e-03 1.19121405e-02 5.08652950e-03 2.01264881e-02
7.89699642e-03 6.09675365e-03 9.78304163e-03 7.07728343e-03
4.00994137e-03 4.53314524e-03 4.59867622e-04 5.91777261e-03
1.41156901e-02 1.20774968e-02 2.80838741e-02 1.24243118e-02
7.20184083e-03 2.29707834e-02 1.32842107e-02 8.39557732e-03
7.22783629e-03 6.91306705e-03 2.05333259e-02 1.04242352e-02
9.34683739e-03 1.69059014e-03 2.32173753e-02 9.30526410e-03
9.22036703e-03 6.45724421e-03 1.60150699e-02 3.31321994e-03
1.28688509e-02 1.18795568e-02 1.29184299e-02 2.05434859e-02
1.79450284e-02 2.25771156e-02 4.73370033e-03 1.37005915e-02
1.29445916e-03 1.40471021e-02 1.15166087e-02 6.11224287e-03
1.94976576e-03 3.51167320e-03 5.58521809e-03 2.20850230e-02
4.30904313e-03 8.67935218e-03 1.28059945e-02 1.03023098e-02
1.09722750e-02 6.75556593e-03 9.17928913e-03 1.94054920e-02
9.41046701e-03 4.57571681e-03 5.40271317e-03 2.39778433e-03
3.29663642e-03 4.42944258e-03 9.54139321e-03 1.19898746e-02
5.29274716e-03 1.69252207e-03 2.59998847e-03 3.85297549e-03
5.11338985e-03 1.27270182e-02 5.91501325e-05 3.50738837e-03
2.27532908e-02 1.17003248e-02 1.40039369e-02 9.57048077e-03
6.74356108e-02 1.75731977e-02 2.15893998e-02 5.87958028e-03
3.60453852e-03 5.59828726e-03 1.99474400e-02 3.66937434e-02
5.36968971e-03 1.11103007e-02 1.41198851e-02 8.51433016e-03
3.09658078e-03 0.00000000e+00 5.14698013e-03 5.89680531e-03
8.56464466e-03 5.47234699e-03 2.73823667e-04 2.38869880e-03
2.35670009e-02 1.15945532e-02 6.30328411e-03 1.34106322e-02
9.54311770e-03 2.87473151e-02 3.71312588e-03 3.73410453e-02

3.16613210e-02	3.59286035e-03	5.14054081e-02	1.21305429e-02
2.02089695e-02	1.00853118e-02	9.49867250e-03	3.02689535e-03
6.60774310e-03	3.58401641e-03	1.07608491e-02	2.98568752e-03
3.73760451e-02	5.54624913e-02	8.25002144e-03	4.01399143e-03
0.00000000e+00	1.55305934e-02	2.15726313e-04	2.36639955e-04
1.07702688e-02	1.22815369e-01	1.47542011e-02	1.00638394e-02
3.11475258e-03	1.14658705e-02	1.60856201e-02	7.95607911e-03
1.58109587e-02	1.41724192e-02	4.29618322e-02	6.35016806e-04
8.94782070e-03	8.51998174e-03	4.13636370e-02	2.65675212e-02
6.45703208e-03	6.09445783e-03	5.33577656e-03	8.19788638e-03
9.48682977e-03	6.12600225e-03	5.83379486e-03	5.53989587e-03
1.16658008e-02	5.43037626e-03	4.15382489e-03	6.39794043e-03
2.12741637e-02	1.87553813e-02	7.63583835e-03	2.06424539e-02
1.65630640e-02	1.16569811e-02	1.41234589e-02	4.92290303e-03
4.84945971e-03	9.00530177e-03	2.03485985e-02	2.80495973e-03
9.95440113e-03	6.56239352e-03	6.55798042e-03	3.93165874e-03
3.82593537e-03	8.13368433e-03	3.80673678e-03	3.34847929e-03
1.10887576e-02	8.96177566e-03	9.63164278e-03	1.04677110e-02
5.89965662e-03	2.14792954e-03	9.71311552e-03	6.22080065e-03
4.94034516e-03	1.41293464e-02	4.23217746e-03	8.10352055e-03
1.84466477e-02	1.06061385e-02	9.82873654e-03	5.12853214e-03
1.48484096e-02	1.18013365e-02	1.75131314e-02	6.89513299e-03
1.19029784e-02	7.51548215e-03	1.97006412e-02	1.40689670e-02
8.13816296e-03	8.84326475e-03	5.96816539e-03	1.02322989e-02
7.53265405e-03	6.30859592e-03	4.22814374e-03	1.49963663e-02
8.49108832e-03	4.30034931e-03	2.55817825e-02	1.28421949e-02
1.25110521e-02	2.55654912e-03	1.54361923e-02	2.27403910e-02
3.80085996e-02	2.71139280e-03	4.13308228e-03	8.30093251e-03
1.31962671e-02	5.78250274e-03	1.45260504e-02	1.70528443e-02
2.64094467e-03	1.38089456e-01	5.73382685e-03	1.45264705e-02
1.68655828e-02	1.84569027e-02	4.47886283e-03	9.76253955e-02
2.90459468e-03	1.38858475e-02	7.53841393e-03	1.99459123e-02
1.10720740e-02	1.63527246e-02	1.32833165e-02	1.19610092e-02
1.78543571e-02	6.70052361e-03	9.18753575e-03	9.30725935e-03
1.07608693e-02	8.68248926e-03	6.14518406e-03	6.40448361e-03
1.47292530e-02	1.97458767e-02	3.20766802e-03	0.00000000e+00
5.51203985e-03	1.58367329e-02	9.93137167e-03	3.51749931e-03
4.80680232e-03	1.43168079e-02	1.09776589e-02	9.47644184e-03
7.63809336e-03	6.30054875e-03	2.88205669e-03	4.57278033e-02
1.16933311e-02	4.15653558e-03	7.66823091e-03	1.36223914e-02
1.14709820e-02	5.67505493e-03	7.34249488e-03	4.01423185e-03
2.53489733e-04	9.64340973e-03	3.32039045e-03	4.71629458e-03
2.85989321e-03	1.52928898e-02	1.06334376e-02	8.26546433e-03
1.12581555e-02	1.56475671e-02	5.91860071e-03	1.20220614e-02
1.55414393e-02	3.95543649e-02	2.25753417e-02	5.17705926e-03
4.74243142e-02	5.28706076e-03	6.95153880e-03	1.15683266e-02
2.96258970e-02	2.23233481e-02	1.06576314e-02	9.41974260e-02
4.63228943e-03	1.60119743e-02	9.54285111e-03	1.13345120e-02
1.48196573e-02	1.76431765e-02	1.86489087e-02	6.83649056e-03

5.37470667e-03 4.54124589e-02 2.13375714e-02 1.10353379e-02
8.58017870e-03 7.05102544e-03 8.06350585e-03 1.39227415e-02
1.12850812e-02 3.88319486e-03 9.92568094e-03 9.21727265e-03
1.62320743e-02 1.28209174e-03 3.01469408e-03 8.40869779e-03
1.11111324e-02 4.87980438e-03 1.12816486e-02 4.43939109e-03
7.73942545e-03 3.17025154e-02 2.07846134e-02 2.80299337e-02
7.81982009e-03 4.32722683e-03 3.12370554e-03 1.15738679e-02
1.39509809e-02 2.64982494e-03 7.91616659e-03 2.27803284e-03
9.08721080e-03 5.34620229e-03 5.14786950e-02 7.69818917e-03
6.01654540e-03 8.28938444e-03 1.33990793e-02 7.55046284e-02
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4.04630259e-02 7.44796877e-04 6.44831991e-03 2.78517030e-02
2.16571920e-02 1.88913221e-02 6.77996907e-03 1.76858083e-03
2.02604489e-02 9.99482842e-03 1.28679575e-02 8.04545578e-03
1.49507244e-02 2.20863199e-02 1.00056711e-02 3.31063196e-02
2.59970029e-02 2.68686149e-03 3.29915068e-02 5.06761656e-03
5.00093975e-02 8.38971014e-03 4.74676153e-03 3.77778076e-03
1.52712294e-03 1.19759072e-02 8.24290642e-03 6.65007252e-03
4.14338304e-02 6.46068298e-03 2.24349251e-02 1.08577287e-02
5.28498197e-03 1.18868247e-02 8.37025180e-03 3.07685571e-03]

Spread (Standard Deviation) of Fake News Class (0):

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0.01753362 0.03791082 0.0244532 0.02571414 0.03890379 0.03395531
0.03556781 0.0180397 0.03000909 0.06555211 0.02496422 0.03359529
0.02736341 0.02648626 0.04296958 0.04525189 0.02532046 0.03927083
0.02662592 0.0357721 0.03481039 0.02472889 0.02737955 0.0292568
0.02878727 0.04256154 0.01676403 0.01812346 0.03905965 0.03575683
0.03191744 0.02515611 0.03198582 0.02458221 0.02605977 0.019584
0.0239127 0.04538984 0.02031225 0.06184486 0.02028439 0.02131075
0.02971509 0.03154935 0.03176942 0.02927475 0.0244231 0.02177293
0.04648941 0.035421 0.02704094 0.04327255 0.02299627 0.01380668
0.02852504 0.01994175 0.03625249 0.03620662 0.03277009 0.02201365
0.03946547 0.06861743 0.04819799 0.03570394 0.04828119 0.02412282
0.06844513 0.01416316 0.02562325 0.02183298 0.02837762 0.02590679]

0.0154186	0.02341843	0.01849637	0.02184305	0.02694827	0.02025399
0.03281064	0.03029512	0.03980519	0.01708805	0.03158243	0.0263096
0.02643563	0.05993951	0.02183222	0.02136969	0.01711949	0.02203196
0.03663356	0.0276185	0.02112201	0.02862794	0.03119743	0.02327208
0.03290678	0.02637024	0.03159589	0.02804109	0.03506545	0.03024057
0.02625723	0.0279353	0.02966467	0.01480705	0.01863621	0.01726811
0.01498863	0.04688284	0.01966588	0.02379897	0.03389541	0.02912153
0.0291972	0.03079894	0.02471626	0.0106571	0.02440688	0.03180929
0.0442754	0.03585822	0.02584786	0.04495439	0.01431337	0.06083325
0.02400343	0.01818794	0.03036542	0.06452964	0.04510708	0.02657074
0.02805884	0.01897672	0.06536044	0.02489257	0.01701829	0.03393925
0.02096154	0.01891599	0.02509884	0.032215	0.02334946	0.01947721
0.02405686	0.02918356	0.03581649	0.02809293	0.04607046	0.02871162
0.02736519	0.02493202	0.02745327	0.02440148	0.0204294	0.03095063
0.02219365	0.03899194	0.03637718	0.02405956	0.08412279	0.03995406
0.0342049	0.02416272	0.0849559	0.03148626	0.02136066	0.06001066
0.04677742	0.03320393	0.06279657	0.0387207	0.03230194	0.02451251
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0.01668754	0.03393643	0.02463225	0.03325518	0.04100597	0.03008538
0.02726571	0.04039661	0.05696631	0.02635213	0.0185898	0.01807745
0.05120766	0.02085978	0.06349319	0.0303943	0.03686376	0.03189715
0.0314046	0.04818627	0.05576221	0.03900586	0.02706426	0.02266756
0.03587902	0.01936433	0.03214284	0.02191428	0.01644575	0.02843836
0.01190832	0.02339211	0.01961705	0.02271372	0.02292076	0.02145513
0.01577255	0.02747164	0.0336336	0.03805425	0.02236068	0.02393895
0.02630261	0.02172826	0.02773019	0.02655999	0.02728276	0.01913492
0.01763851	0.0276341	0.02182189	0.0394866	0.02849716	0.05008313
0.02501008	0.03658727	0.03549612	0.048453	0.03404358	0.02107829
0.03951558	0.02481073	0.03282576	0.03209757	0.01788151	0.03514414
0.01699845	0.01999177	0.03170121	0.01062501	0.02940492	0.01838097
0.02746706	0.04084813	0.02188132	0.03796251	0.0269359	0.02877283
0.0251116	0.03286516	0.03264486	0.05148362	0.01934126	0.03277228
0.03266202	0.03396704	0.03485172	0.02790203	0.05099021	0.03342028
0.02897778	0.02156118	0.07279881	0.03655967	0.05189717	0.06372941
0.02906565	0.0298273	0.02083646	0.02324705	0.03063742	0.03627738
0.02303672	0.03537952	0.03044142	0.03412517	0.03183319	0.02459113
0.04540635	0.03591155	0.02850101	0.03010133	0.02169495	0.03839528
0.01593212	0.02756748	0.03397662	0.06026748	0.04835262	0.04739622
0.02924895	0.04776162	0.02261619	0.02839552	0.01650649	0.0260664
0.04653427	0.02242238	0.02529577	0.01805023	0.02968276	0.02552574
0.02685812	0.04194796	0.0266331	0.04865268	0.01920448	0.02537282
0.02848024	0.02357572	0.05270157	0.02489903	0.04903789	0.0392282
0.02687104	0.08328345	0.03104482	0.01154985	0.02412242	0.02907303
0.01736726	0.01811673	0.02332723	0.01003424	0.00841915	0.03094176
0.04900665	0.02560356	0.00471798	0.03812025	0.03458665	0.01760382
0.05983865	0.04443051	0.05305858	0.03257951	0.0257972	0.02256309
0.03044594	0.02446305	0.02815386	0.025251	0.03098661	0.02681297
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0.01864196	0.08267372	0.03414068	0.03973562	0.02365239	0.03529685

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0.02707967 0.02620775 0.02653001 0.02151829 0.04250524 0.03267915
0.03391709 0.01890715 0.02963121 0.06113457 0.10059731 0.04117445
0.03394537 0.03152486 0.03666284 0.03408709 0.05653711 0.02794768
0.0298328 0.03399892 0.04503529 0.0284238 0.02548592 0.02121048
0.02282059 0.01510274 0.02331584 0.0344629 0.0301762 0.07148814
0.02627527 0.02254345 0.0273296 0.02231841 0.01731737 0.01362625
0.09468408 0.02589739 0.01457456 0.03748225 0.03144326 0.05836394
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0.02370846 0.02265849 0.02865659 0.03204261 0.0193457 0.04813788
0.04570546 0.04159481 0.02400239 0.04843652 0.03044761 0.02541277
0.03866408 0.05205636 0.01550062 0.03254362 0.02860909 0.05115789
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0.03864436 0.0304727 0.03959741 0.02707494 0.03914176 0.02256328
0.07383899 0.03105633 0.02669594 0.02468656 0.02447868 0.03743685
0.0340699 0.02250402 0.02830778 0.03016803 0.02316248 0.02741046
0.07751356 0.04231459]

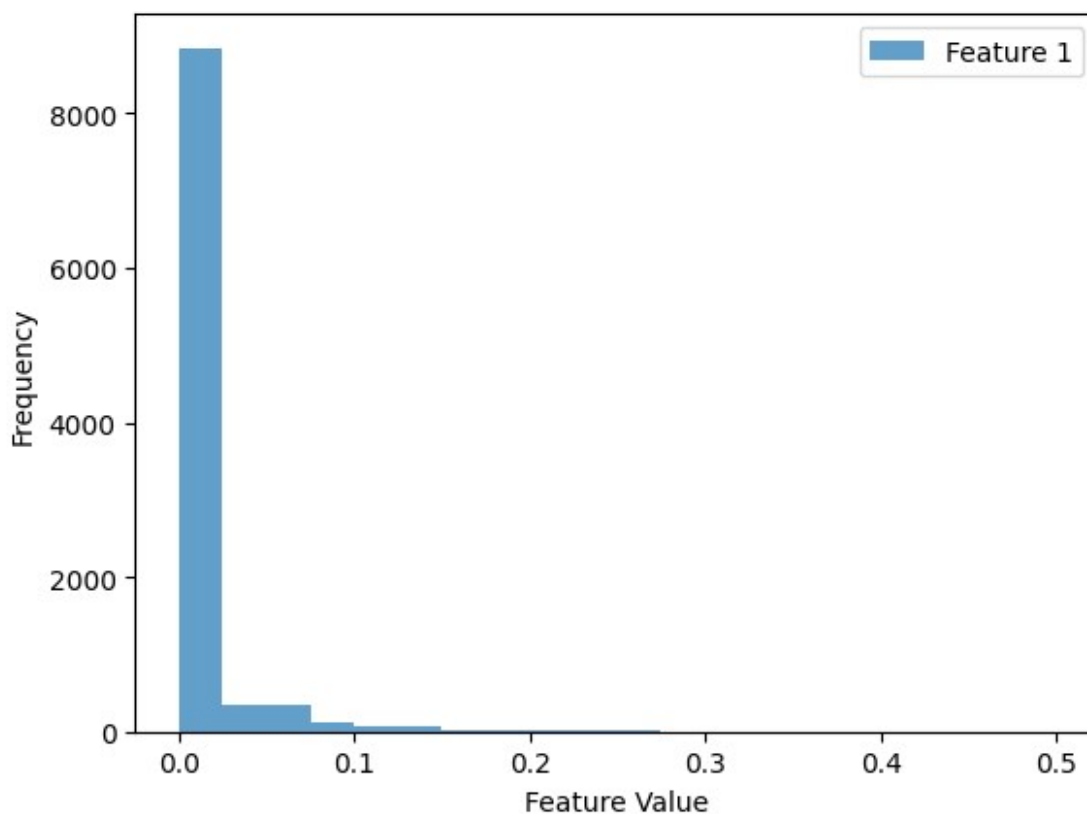
Spread (Standard Deviation) of Real News Class (1):

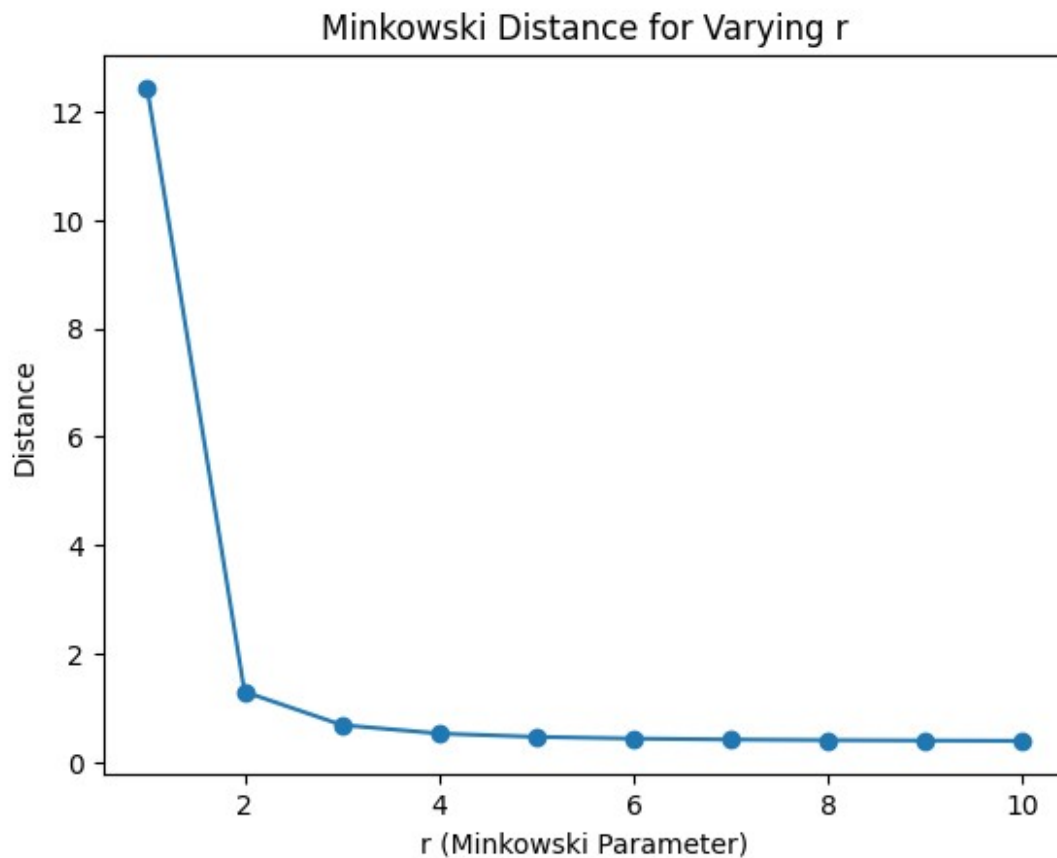
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0.03496872 0.02784168 0.03850213 0.02432739 0.02468544 0.01959248
0.0468808 0.02301674 0.02382644 0.02233528 0.03064389 0.03947871
0.03280798 0.03588142 0.02635515 0.08984823 0.04091643 0.02043266
0.05702909 0.03370187 0.02868001 0.02118162 0.00534129 0.02138617
0.07280324 0.03296827 0.06482624 0.04292383 0.03384763 0.04767088
0.03447842 0.03311395 0.02822448 0.0277777 0.03431226 0.03711362
0.02602565 0.0122118 0.0788119 0.03247685 0.02591486 0.02163694
0.05371736 0.01785881 0.04142651 0.05075533 0.03837265 0.04304967
0.04576113 0.05918056 0.01920786 0.0276329 0.01011724 0.04462898
0.024977 0.02070469 0.01217493 0.01554618 0.0197126 0.02216567
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0.01526086 0.02193267 0.03143936 0.0335165 0.02072011 0.01040624
0.02166547 0.02074792 0.01814059 0.05436358 0.00130824 0.01762296
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0.04197275 0.02311704 0.02457377 0.02587845 0.04491 0.03864283
0.02447499 0.04592612 0.039797 0.02373473 0.0167546 0.]

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0.06686968	0.02774949	0.03918569	0.01401452	0.02222513	0.01588272
0.02655879	0.01509405	0.04795393	0.07562849	0.02103963	0.0147039
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0.04037097	0.04420489	0.02129534	0.02566052	0.02499051	0.0278777
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0.02599633	0.02017454	0.0458005	0.0353551	0.03547563	0.01518327
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0.01860833	0.0338122	0.05303599	0.04414057	0.01920036	0.04876496
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0.02002836	0.08355692	0.05463884	0.03228686	0.05687115	0.0243636
0.02250174	0.04476852	0.03088405	0.01824358	0.02164214	0.02033127
0.02795048	0.00990447	0.0141055	0.03986327	0.03977836	0.02774712
0.04701099	0.03518052	0.031464	0.06575708	0.04703578	0.04698711
0.02270837	0.0201795	0.02066573	0.02452671	0.03474406	0.01475821
0.03730286	0.01376994	0.02352584	0.01911853	0.1444044	0.03593721
0.02899678	0.03170319	0.02548995	0.05060652	0.1242465	0.03096736
0.02264271	0.01539748	0.02732478	0.01967495	0.03241391	0.01114854
0.01669487	0.02552898	0.02792289	0.02205139	0.01307658	0.02763664
0.02747309	0.04584652	0.08010537	0.02387601	0.02736788	0.08351637
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0.07542366	0.01618451	0.04548734	0.02176449	0.01954836	0.03638408
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0.02300011 0.02207198 0.03320727 0.02944579 0.02032991 0.06247154
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0.02629051 0.01727737]
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Interclass Distance between Fake and Real News: 0.2943173073538051





kNN Accuracy: 0.9141414141414141

Sample Predictions: [1 1 1 0 0 1 0 1 0 1]

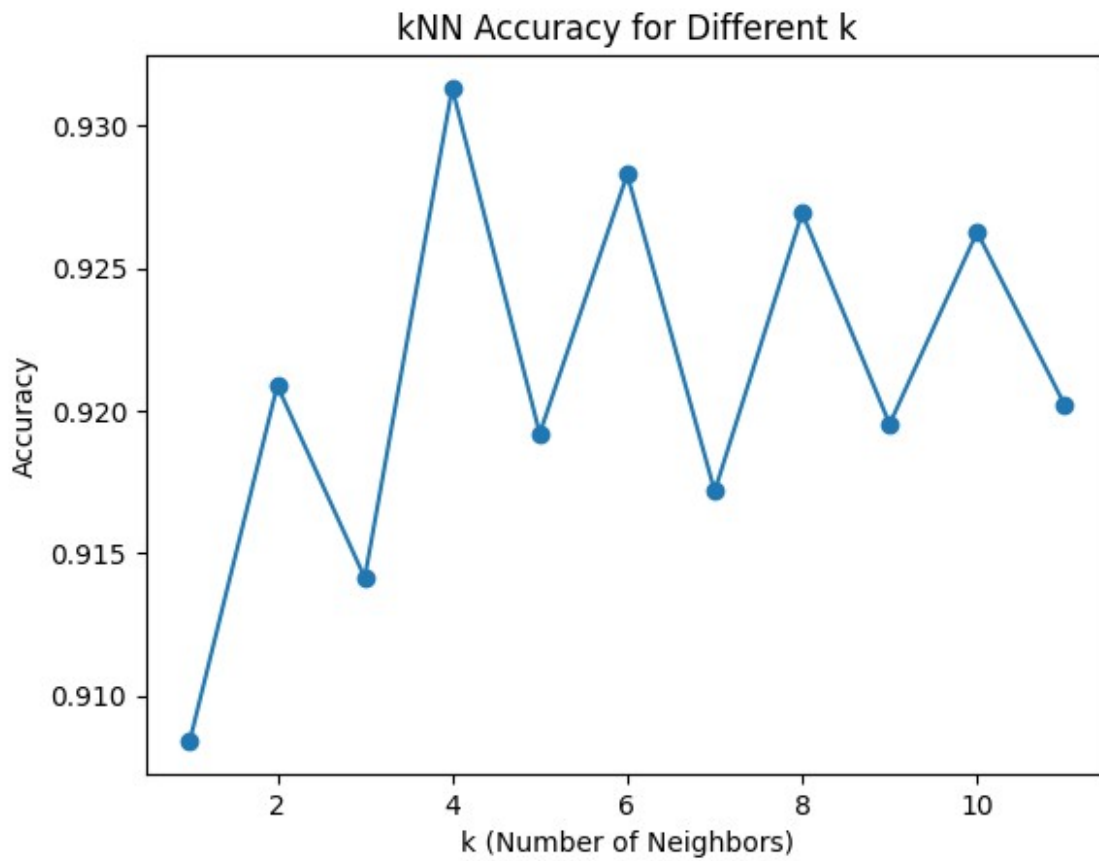
Confusion Matrix:

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[[1296  204]
 [  51 1419]]
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Precision: 0.8743068391866913

Recall: 0.9653061224489796

F1-Score: 0.9175557710960233



```
from google.colab import drive  
drive.mount('/content/drive')
```

Mounted at /content/drive