

Information Retrieval CS6322.001 Assignment 2 (Indexing) Report

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Some **important Information** regarding **tokenization** are:

- The program Removes all the SGML Tags from the cranfield documents.
- All the words are converted into lower-case.
- The program removes all the dashes between the words and splits into two different words.
- The program removes punctuation marks, Removes comma and hyphen, replaces with space.
- The Possessives (') are also removed using the preprocess() function created in the program.
- Acronyms containing . are also removed and converted into a single token.

Lemmatization:

I have used open source WordNet Lemmatizer (Python library) of NLTK for the Lemmatization of the tokens from the Cranfield documents. The stopwords are removed from the token before performing Lemmatization

Stemming:

I have used open source Porter Stemmer (Python library) of NLTK for the Stemming of the tokens from the Cranfield documents. The stopwords are removed from the token before performing Stemming

Index Building:

I have Built each index using the algorithm: **Blocked sort-based Indexing (BSBI)**

Part 1:

Index Version 1 Uncompressed:

In this We have used Word Net Lemmatizer for the creation of the dictionary of the lemmas. The format, I have used for index building as follows:

Term: DF [DOCID, TF, Max_TF, DocLen]

The postings contain **[DOCID, TF, Max_TF, DocLen]**

Where,

Term is the lemma of the tokens

DF is the Document frequency for that lemma in how many documents that lemma is occurring

DOCID is the document ID in which that lemma is occurring

TF is the term frequency of lemma in that document

Max_TF is the maximum term frequency in that document

DocLen is the total number of lemmas in that document

Index Version 2 Uncompressed

In this We have used Porter Stemmer for the creation of the dictionary of the Stems.

The format, I have used for index building as follows:

Term: DF [DOCID, TF, Max_TF, DocLen]

The postings contain **[DOCID, TF, Max_TF, DocLen]**

Where,

Term is the Stem of the tokens

DF is the Document frequency for that stems in how many documents that Stem is occurring.

DOCID is the document ID in which that Stem is occurring

TF is the term frequency of stem in that document

Max_TF is the maximum term frequency in that document

DocLen is the total number of stems in that document

Part 2:

Index Version 1 Compressed:

In this Version I have used for dictionary compression a **blocked compression** with **k=4** (in this version of the index, the dictionary contains terms) and the posting file contains the appended **gamma encoding** for the gaps between the document IDs.

In this Index A **term string** has also been added which is denoted by its length and the corresponding term and so on.

The first line is **Term String** in the text file and the Compressed Indexes are in the form of:

term: Doc frequency----> Appended Gamma codes for their Gap list: index (Index After every 4th Term)

Index Version 2 Compressed:

In this Version I have used use compression of the dictionary with **front-coding** with the block size **k=8** and the posting files contains the appended **delta codes** to encode the gaps between document-ids.

The first line is front coding (with block size 8) in the text file and the Compressed indexes are in the form of:

term: Doc frequency----> Appended delta codes for their Gap list: index (Index After every 8th Term)

The following statistics and the Results are as follows:

Size (in Bytes) of uncompressed index Version 1 is: 2165932 Bytes

Size (in Bytes) of uncompressed index2 Version is: 2082958 Bytes

Size (in Bytes) of compressed index Version 1 is: 1138352 Bytes

Size (in Bytes) of compressed index Version 2 is: 951340 Bytes

Time (in sec) to build uncompressed index Version 1 is: 01.896655 seconds

Time (in sec) to build uncompressed index Version 2 is: 02.840602 seconds

Time (in sec) to build compressed index Version 1 is: 00.389670 seconds

Time (in sec) to build compressed index Version 2 is: 00.354815 seconds

Console Output on Anaconda Prompt:

The number of postings in Version 1 of the index is: 10209

The number of postings in Version 2 of the index is: 8299

-----Index Version 1 Results for the term list: ['reynolds', 'nasa', 'prandtl', 'flow', 'pressure', 'boundary', 'shock'] -----

Term: boundary

Document Frequency: 467

Term Frequency: 1185

Individual Frequencies in their Respective Documents are:

{1: 1, 2: 5, 3: 2, 4: 4, 7: 4, 8: 2, 9: 5, 12: 1, 16: 3, 17: 3, 18: 1, 21: 2, 22: 2, 23: 3, 24: 9, 25: 1, 34: 4, 36: 1, 37: 3, 40: 2, 43: 2, 45: 3, 47: 5, 49: 1, 50: 3, 53: 4, 54: 4, 55: 3, 59: 2, 60: 1, 61: 1, 62: 5, 63: 2, 71: 3, 72: 10, 73: 3, 74: 1, 76: 4, 78: 2, 79: 2, 80: 4, 84: 1, 89: 7, 94: 4, 96: 2, 97: 1, 101: 2, 104: 1, 105: 3, 107: 4, 111: 3, 112: 1, 117: 2, 121: 3, 123: 1, 124: 1, 125: 3, 126: 1, 127: 2, 128: 2, 131: 2, 133: 3, 134: 6,

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Inverted List size(in Bytes): 4272 Bytes

Term: flow

Document Frequency: 728

Term Frequency: 2073

Individual Frequencies in their Respective Documents are:

{1: 1, 2: 6, 3: 2, 4: 3, 6: 1, 7: 3, 9: 3, 16: 1, 17: 4, 18: 6, 19: 2, 21: 1, 22: 2, 23: 5, 24: 1, 25: 6, 26: 2, 27: 3, 28: 4, 33: 6, 34: 6, 35: 2, 36: 1, 37: 4, 38: 2, 39: 5, 44: 1, 45: 6, 48: 4, 49: 3, 50: 2, 51: 1, 52: 1, 53: 2, 54: 1, 55: 1, 56: 1, 57: 2, 58: 2, 59: 5, 60: 1, 61: 2, 62: 1, 63: 3, 64: 1, 69: 1, 70: 2, 72: 1, 73: 3, 74: 2, 81: 2, 84: 7, 85: 3, 86: 3, 87: 2, 88: 4, 89: 7, 91: 2, 93: 1, 94: 7, 96: 2, 97: 13, 98: 2, 102: 1, 103: 3, 105: 3, 106: 2, 109: 5, 110: 2, 112: 2, 115: 2, 116: 3, 117: 3, 118: 8, 119: 1, 120: 1, 121: 5, 122: 2, 123: 3, 124: 4, 125: 2, 126: 1, 128: 3, 131: 4, 132: 2, 133: 6, 134: 5, 135: 4, 138: 2, 144: 2, 145: 1, 146: 3, 147: 1, 148: 6, 149: 2, 150: 1, 152: 1, 155: 1, 157: 1, 159: 1, 160: 10, 161: 1, 165: 2, 166: 3, 167: 5, 169: 1, 170: 1, 171: 1, 173: 3, 174: 1, 175: 1, 176: 1, 177: 1, 179: 7, 180: 2, 182: 1, 183: 4, 184: 1, 186: 3, 187: 6, 188: 8, 189: 7, 190: 2, 191: 5, 192: 2, 193: 12, 196: 3, 197: 2, 198: 2, 199: 1, 201: 2, 203: 1, 204: 1, 205: 3, 206: 6, 207: 1, 208: 2, 211: 4, 212: 3, 213: 4, 214: 1, 216: 8, 217: 4, 221: 2, 222: 8, 224: 1, 225: 2, 227: 3, 228: 2, 229: 1, 230: 1, 231: 2, 232: 1, 234: 1, 236: 5, 237: 2, 240: 6, 241: 1, 242: 4, 243: 1, 244: 4, 247: 1, 248: 2, 252: 1, 257: 7, 258: 2, 259: 1, 261: 2, 265: 2, 266: 7, 267: 1, 268: 3, 269: 3, 270: 8, 273: 3, 274: 1, 277: 6, 278: 5, 280: 2, 283: 2, 287: 1, 288: 1, 289: 1, 292: 3, 294: 2, 295: 1, 296: 1, 297: 3, 298: 2, 299: 3, 300: 5, 303: 1, 304: 4, 305: 5, 306: 6, 307: 1, 308: 3, 309: 5, 310: 9, 311: 2, 312: 1, 313: 2, 314: 1, 315: 4, 316: 1, 317: 5, 318: 4, 319: 2, 322: 1, 323: 1, 324: 2, 325: 2, 326: 2, 327: 1, 328: 3, 329: 4, 332: 9, 333: 2, 334: 1, 335: 3, 340: 2, 341: 6, 342: 2, 344: 2, 346: 1, 347: 1, 348: 1, 349: 2, 351: 2, 352: 5, 356: 2, 358: 1, 360: 3, 361: 1, 363: 7, 364: 2, 365: 2, 366: 2, 370: 3, 371: 5, 372: 3, 373: 7, 375: 8, 376: 2, 377: 4, 378: 1, 379: 8, 380: 1, 381: 2, 382: 1, 383: 3, 385: 2, 386: 4, 387: 2, 388: 5, 389: 2, 391: 1, 393: 3, 394: 3, 395: 6, 398: 2, 401: 6, 402: 1, 404: 10, 406: 1, 407: 2, 410: 3, 413: 1, 415: 1, 417: 4, 418: 2, 420: 4, 421: 1, 423: 3, 426: 2, 427: 8, 428: 3, 430: 2, 433: 2, 435: 2, 439: 8, 440: 5, 442: 1, 443: 2, 444: 1, 445: 2, 450: 2, 452: 7, 453: 1, 455: 4, 456: 6, 457: 1, 458: 4, 459: 4, 460: 1, 461: 1, 464: 3, 465: 2, 466: 5, 467: 4, 468: 4, 469: 2, 470: 1, 472: 5, 475: 1, 477: 1, 481: 2, 483: 1, 484: 1, 485: 1, 486: 1, 487: 6, 488: 1, 489: 1, 490: 3, 491: 5, 494: 6, 495: 2, 496: 1, 498: 6, 500: 3, 501: 1, 503: 2, 504: 2, 507: 1, 508: 1, 511: 2, 514: 2, 521: 3, 522: 2, 523: 2, 525: 3, 526: 6, 527: 3, 528: 1, 529: 3, 530: 3, 531: 3, 533: 1, 534: 3, 535: 4, 536: 5, 537: 3, 538: 1, 539: 2, 540: 5, 541: 6, 544: 2, 545: 2, 547: 1, 549: 2, 550: 5, 552: 1, 556: 3, 557: 3, 560: 2, 561: 2, 562: 4, 563: 4, 564: 1, 565: 2, 567: 2, 569: 5, 570: 1, 571: 2, 572: 4, 574: 7, 575: 4, 576: 8, 577: 3, 578: 1, 579: 6, 583: 4, 587: 1, 588: 4, 589: 3, 590: 2, 591: 1, 592: 2, 593: 1, 597: 1, 600: 3, 601: 4, 602: 4, 603: 1, 604: 3, 606: 1, 607: 2, 608: 1, 610: 3, 612: 2, 623: 2, 624: 4, 625: 7, 626: 5, 627: 1, 629: 5, 630: 1, 632: 1, 633: 4, 634: 1, 635: 1, 637: 3, 646: 2, 651: 8, 652: 2, 653: 4, 655: 1, 656: 4, 657: 6, 658: 1, 659: 3, 660: 14, 661: 3, 662: 5, 663: 2, 665: 4, 666: 4, 667: 4, 668: 1, 669: 4, 672: 1, 675: 5, 680: 2, 682: 3, 683: 4, 686: 1, 687: 1, 688: 2, 689: 1, 690: 2, 691: 2, 692: 1, 693: 1, 696: 3, 697: 1, 699: 1, 700: 1, 701: 3, 702: 1, 704: 1, 705: 3, 706: 4, 710: 4, 714: 1, 719: 2, 748: 1, 749: 1, 750: 1, 751: 2, 754: 1, 757: 8, 767: 1, 770: 2, 771: 3, 772: 2, 773: 4, 774: 3, 775: 8, 779: 6, 781: 1, 784: 2, 785: 2, 789: 1, 792: 3, 793: 4, 794: 4, 795: 1, 797: 6, 798: 5, 799: 3, 800: 1, 801: 2, 802: 2, 803: 5, 814: 3, 817: 1, 818: 2, 820: 5, 825: 1, 856: 1, 857: 1, 869: 1, 872: 5, 873: 3, 892: 3, 894: 1, 895: 2, 899: 1, 900: 4, 901: 3, 902: 4, 903: 3, 906: 1, 907: 1, 915: 1, 916: 2, 917: 3, 918: 2, 919: 2, 920: 1, 921: 5, 922: 2, 927: 11, 933: 2, 939: 1, 940: 1, 941: 6, 942: 2, 943: 1, 944: 1, 945: 2, 947: 1, 949: 4, 959: 3, 960: 1, 964: 1, 965: 3, 966: 5, 967: 4, 970: 2, 974: 1, 975: 4, 977: 2, 979: 5, 980: 2, 981: 1, 983: 1, 984: 7, 985: 1, 986: 4, 987: 7, 988: 2, 989: 8, 990: 3, 991: 2, 992: 4, 993: 2, 994: 2, 996: 2, 998: 7, 1002: 1, 1003: 2, 1006: 3, 1007: 5, 1009: 3, 1010: 7, 1014: 1, 1024: 1, 1040: 4, 1061: 1, 1064: 1, 1072: 5, 1073: 1, 1074: 2, 1076: 1, 1078: 2, 1080: 4, 1081: 6, 1082: 4, 1083: 4, 1084: 3, 1085: 1, 1086: 1, 1093: 1, 1104: 1, 1105: 2, 1106: 5, 1107: 4, 1108: 5, 1110: 3, 1112: 2, 1119: 2, 1124: 1, 1128: 1, 1139: 4, 1141: 1, 1142: 2, 1143: 4, 1144: 6, 1148: 2, 1149: 2, 1151: 2, 1153: 3, 1154: 4, 1156: 1, 1157: 1, 1158: 1, 1159: 2, 1164: 1, 1165: 2, 1166: 1, 1179: 3, 1180: 4, 1181: 6, 1182: 8, 1184:

7, 1186: 2, 1187: 4, 1189: 3, 1190: 2, 1193: 3, 1194: 5, 1195: 12, 1198: 6, 1200: 2, 1201: 1, 1202: 3, 1203: 5, 1204: 3, 1205: 3, 1207: 1, 1209: 4, 1210: 3, 1212: 1, 1213: 1, 1216: 4, 1220: 4, 1221: 2, 1222: 7, 1223: 2, 1224: 4, 1225: 3, 1227: 1, 1228: 4, 1229: 1, 1230: 2, 1231: 2, 1232: 4, 1233: 2, 1234: 2, 1235: 5, 1236: 2, 1238: 3, 1239: 6, 1241: 1, 1242: 4, 1244: 2, 1245: 9, 1246: 1, 1247: 1, 1248: 3, 1249: 3, 1250: 2, 1251: 1, 1252: 1, 1253: 3, 1254: 2, 1255: 3, 1256: 2, 1259: 3, 1260: 1, 1261: 1, 1262: 2, 1263: 1, 1264: 2, 1265: 1, 1266: 1, 1267: 2, 1268: 1, 1269: 1, 1270: 2, 1272: 2, 1273: 5, 1274: 4, 1275: 6, 1277: 1, 1278: 1, 1280: 2, 1281: 3, 1282: 4, 1283: 2, 1284: 1, 1287: 2, 1288: 1, 1289: 2, 1295: 5, 1296: 3, 1297: 3, 1301: 4, 1302: 6, 1303: 1, 1304: 3, 1306: 1, 1307: 2, 1309: 5, 1310: 5, 1313: 6, 1315: 2, 1318: 1, 1319: 4, 1321: 5, 1322: 1, 1323: 3, 1324: 4, 1325: 4, 1326: 1, 1328: 2, 1330: 3, 1332: 1, 1334: 1, 1336: 1, 1339: 2, 1341: 1, 1343: 1, 1349: 2, 1351: 3, 1353: 3, 1354: 5, 1356: 5, 1365: 1, 1367: 2, 1368: 1, 1370: 2, 1371: 4, 1373: 2, 1374: 2, 1375: 5, 1377: 3, 1379: 1, 1382: 1, 1383: 1, 1385: 1, 1386: 3, 1390: 4, 1391: 8, 1393: 3, 1394: 4}

Inverted List size(in Bytes): 6232 Bytes

Term: nasa

Document Frequency: 145

Term Frequency: 148

Individual Frequencies in their Respective Documents are:

{53: 1, 58: 1, 68: 1, 69: 1, 76: 1, 78: 1, 80: 1, 82: 1, 83: 1, 160: 1, 161: 1, 162: 1, 163: 1, 164: 1, 211: 1, 272: 1, 275: 1, 302: 1, 312: 1, 413: 1, 421: 1, 449: 1, 492: 1, 564: 1, 634: 1, 638: 1, 639: 1, 685: 1, 686: 1, 688: 1, 690: 1, 691: 1, 696: 1, 704: 1, 708: 1, 709: 1, 711: 1, 712: 1, 713: 1, 716: 1, 717: 1, 718: 1, 727: 1, 758: 1, 759: 1, 766: 1, 769: 1, 781: 1, 805: 1, 806: 2, 807: 1, 808: 1, 809: 1, 810: 1, 815: 1, 816: 1, 838: 1, 840: 1, 857: 1, 858: 1, 859: 1, 862: 1, 863: 1, 888: 1, 897: 1, 898: 1, 930: 1, 944: 1, 945: 1, 946: 1, 947: 1, 948: 1, 949: 2, 955: 1, 956: 1, 957: 1, 966: 1, 967: 1, 970: 1, 971: 1, 972: 1, 973: 1, 988: 1, 989: 1, 994: 1, 996: 1, 997: 1, 999: 1, 1000: 1, 1001: 1, 1064: 1, 1065: 1, 1066: 1, 1068: 1, 1069: 1, 1070: 1, 1071: 1, 1077: 1, 1089: 1, 1091: 1, 1093: 1, 1098: 1, 1099: 1, 1100: 1, 1101: 1, 1102: 1, 1105: 1, 1106: 1, 1107: 1, 1112: 1, 1114: 1, 1143: 1, 1146: 1, 1153: 1, 1156: 1, 1162: 1, 1163: 1, 1165: 1, 1166: 1, 1167: 1, 1168: 1, 1169: 1, 1170: 1, 1178: 1, 1270: 1, 1289: 1, 1290: 1, 1291: 1, 1292: 1, 1293: 1, 1294: 1, 1307: 1, 1311: 1, 1331: 1, 1344: 1, 1346: 1, 1347: 1, 1348: 1, 1349: 1, 1350: 2, 1351: 1, 1355: 1, 1356: 1, 1359: 1, 1380: 1}

Inverted List size(in Bytes): 1248 Bytes

Term: prandtl

Document Frequency: 59

Term Frequency: 75

Individual Frequencies in their Respective Documents are:

{23: 1, 37: 1, 49: 1, 50: 2, 54: 1, 55: 1, 62: 1, 70: 1, 98: 1, 101: 2, 115: 1, 185: 1, 240: 3, 268: 1, 269: 1, 297: 1, 300: 1, 302: 2, 306: 1, 307: 1, 310: 2, 325: 1, 328: 2, 351: 1, 352: 1, 370: 1, 375: 2, 383: 1, 389: 1, 398: 1, 460: 1, 467: 1, 474: 1, 534: 2, 538: 1, 559: 1, 560: 1, 562: 1, 565: 2, 570: 1, 574: 1, 611: 1, 661: 2, 662: 1, 701: 1, 784: 1, 818: 1, 962: 1, 998: 1, 1007: 1, 1040: 1, 1072: 1, 1149: 1, 1226: 5, 1241: 1, 1372: 1, 1374: 1, 1384: 1, 1386: 2}

Inverted List size(in Bytes): 640 Bytes

Term: pressure

Document Frequency: 541

Term Frequency: 1354

Individual Frequencies in their Respective Documents are:

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Inverted List size(in Bytes): 4848 Bytes

Term: reynolds

Document Frequency: 200

Term Frequency: 384

Individual Frequencies in their Respective Documents are:

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Inverted List size(in Bytes): 1672 Bytes

Term: shock

Document Frequency: 238

Term Frequency: 736

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Inverted List size(in Bytes): 2216 Bytes

----- Index Version 2 Results for the term list: ['reynolds', 'nasa', 'prandtl', 'flow', 'pressure', 'boundary', 'shock'] -----

Term: boundari

Document Frequency: 467

Term Frequency: 1185

Individual Frequencies in their Respective Documents are:

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Inverted List size(in Bytes): 4272 Bytes

Term: flow

Document Frequency: 730

Term Frequency: 2079

Individual Frequencies in their Respective Documents are:

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Inverted List size(in Bytes): 6232 Bytes

Term: nasa

Document Frequency: 145

Term Frequency: 148

Individual Frequencies in their Respective Documents are:

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Inverted List size(in Bytes): 1248 Bytes

Term: prandtl

Document Frequency: 63

Term Frequency: 80

Individual Frequencies in their Respective Documents are:

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Inverted List size(in Bytes): 640 Bytes

Term: pressur

Document Frequency: 551

Term Frequency: 1382

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Inverted List size(in Bytes): 4848 Bytes

Term: reynold

Document Frequency: 200

Term Frequency: 384

Individual Frequencies in their Respective Documents are:

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Inverted List size(in Bytes): 1672 Bytes

Term: shock

Document Frequency: 239

Term Frequency: 737

Individual Frequencies in their Respective Documents are:

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Inverted List size(in Bytes): 2216 Bytes

-----Index Version 1 Results for the term 'NASA' -----

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Document Frequency nasa is: 145

Nasa Posting List no.: 1

Term Frequency: 1

DocLength: 159

Max TF: 11

Nasa Posting List no.: 2

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Term Frequency: 1

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Max TF: 5

----- Index Version 2 Results for the term 'NASA' -----

Term: nasa

Document Frequency nasa is: 145

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Term Frequency: 1

DocLength: 159

Max TF: 11

Nasa Posting List no.: 2

Term Frequency: 1

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Terms from Index Version 1 with Largest df:

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Terms from Index Version 1 with Smallest df:

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'formulating', 'formulism', 'forray', 'forst', 'fort', 'forty', 'forwardacceleration', 'forwardflight', 'foughner', 'foundation', 'fourcomponent', 'fourthorder', 'fourwave', 'fox', 'fpre', 'fraiser', 'framed', 'france', 'francis', 'frank', 'frankel', 'fredholm', 'freedman', 'freeing', 'freudenthal', 'frictionless', 'friedman', 'friedrich', 'frontal', 'frozenflow', 'fruit', 'frustration', 'ft18', 'fujihiko', 'fund', 'fur', 'furnace', 'furnishes', 'furnishing', 'fused', 'fuselagesection', 'fx', 'fz', 'gallagher', 'garabedians', 'gardless', 'garner', 'gascous', 'gasdynamical', 'gathered', 'gauged', 'gaydon', 'geckelers', 'gee', 'gehring', 'genuine', 'geoffrey', 'geometrics', 'geophys', 'geophysical', 'georgia', 'germany', 'gerrard', 'gersten', 'getting', 'gibbs', 'gilbert', 'gill', 'ginzel', 'giraud', 'gj', 'gk', 'gkbatchelor', 'glancing', 'glassy', 'glauerts', 'glenny', 'glick', 'globule', 'glycerin', 'goal', 'goddard', 'goebel', 'goetz', 'golian', 'gollnick', 'goodier', 'goodwin', 'gorcum', 'gorcums', 'goree', 'gothic', 'gottenberg', 'gouse', 'graduate', 'gramsc', 'grand', 'grant', 'granular', 'granville', 'grape', 'grashof', 'grasshofs', 'gravitz', 'gray', 'grazing', 'greensite', 'gregg', 'gridwork', 'grifith', 'grober', 'groove', 'grossman', 'grouped', 'growing', 'grunow', 'gt', 'guggenheim', 'guy', 'gvr', 'gyration', 'gyroscope', 'gyroscopic', 'gz', 'h2', 'h2o', 'haag', 'haberman', 'hadamards', 'haggenmacher', 'hains', 'hale', 'haley', 'halfangle', 'halfway', 'halstead', 'halved', 'hama', 'hamel', 'hamilton', 'hammerhead', 'hammerling', 'hammond', 'hampered', 'hanawalt', 'hancock', 'handbook', 'handicap', 'handle', 'handley', 'hanging', 'hankelman', 'hansen', 'hansens', 'hantzsche', 'happen', 'happened', 'hardware', 'harold', 'hartnett', 'hartunian', 'hash', 'haskell', 'haslet', 'hasse', 'hastening', 'hastings', 'hauser', 'haveg', 'hay', 'hayday', 'hayer', 'hayman', 'hazard', 'headed', 'heaslet', 'heaslett', 'heavier', 'heaving', 'heighth', 'heightto', 'heimel', 'heimenz', 'heisler', 'heldenfels', 'helger', 'helical', 'heliocentric', 'hemi', 'hemispheroidal', 'hencky', 'hennessy', 'herberle', 'hero', 'herring', 'herriot', 'herrnstein', 'heuman', 'heywood', 'hickman', 'hicks2', 'highenergy', 'higherorder', 'highfrequency', 'highvelocity', 'hilsenrath', 'himself', 'hindered', 'hingeaxis', 'hinson', 'hirschfelders', 'hirshfelder', 'hislop', 'historically', 'historics', 'hit', 'hitherto', 'hitting', 'hja', 'hodge', 'hodographic', 'hoffs', 'hoge', 'hogging', 'holding', 'holer', 'holl', 'holland', 'holloway', 'hollowcylinder', 'homann', 'home', 'homing', 'homogenous', 'hope', 'hopelessly', 'hopf', 'hopkins', 'hopper', 'hosokawa', 'hosokawas', 'hosowaka', 'hotter', 'houbolt', 'housefly', 'housing', 'hover', 'howard', 'howell', 'howorth', 'hpyersonic', 'huber', 'hubka', 'huckell', 'huff', 'hufton', 'huggett', 'hugh', 'hughes', 'humphreys', 'hundred', 'hunter', 'hunton', 'hunziker', 'hurd', 'hurler', 'huston', 'hybrid', 'hydraulic', 'hydraulically', 'hydroballistic', 'hydrocarbon', 'hyett', 'hyp', 'hypass', 'hyperliptic', 'hypersoule', 'hysol', 'hysteretic', 'idealizing', 'identically', 'identifiable', 'identifying', 'identity', 'iee', 'iferation', 'igc', 'ignite', 'ignited', 'ignorable', 'ignores', 'igy', 'illinois', 'illustrious', 'imaginary', 'imai', 'immobile', 'immovable', 'impair', 'imparted', 'imperial', 'implement', 'implied', 'imply', 'impression', 'imprimerie', 'improper', 'inaccessible', 'inadmissable', 'inadvertently', 'inafinite', 'inapplicable', 'inappropriate', 'inasmuch', 'inboard', 'incidental', 'inclusive', 'incoming', 'inconclusive', 'inconel', 'inconsistency', 'inconsistent', 'incorporating', 'incrementalnormal', 'incurring', 'indefinitely', 'indetermining', 'indirectly', 'indium', 'inducedpressure', 'inductance', 'inefficient', 'inertial', 'inevitably', 'inexpensive', 'inferred', 'infiniteaspect', 'infite', 'influencing', 'influential', 'ing', 'inhomogeneous', 'inject', 'injectioncooled', 'injector', 'ink', 'inletmass', 'inoperative', 'inouye', 'inplane', 'inquire', 'inquired', 'insect', 'inserted', 'inserting', 'insertion', 'inspire', 'instant', 'instigated', 'instruct', 'instruction', 'instrumented', 'insulates', 'insure', 'insuring', 'integrable', 'integrands', 'integrate', 'integrity', 'integrodifferential', 'intensification', 'intensified', 'intention', 'intentionally', 'interacted', 'interanl', 'interchangeable', 'intercrystalline', 'interdependence', 'interferograms', 'intergranular', 'interim', 'internat', 'interposed', 'interpretive', 'intersects', 'interstellar', 'intimately', 'intractable', 'intrieri', 'intrinsically', 'introduring', 'intuition',

'invalidate', 'invalidated', 'invariably', 'inverts', 'investigaion', 'inviscidflow', 'invoked', 'inwards', 'inyokern', 'iodine', 'iowa', 'ir', 'irbm', 'ire', 'iron', 'irritant', 'isaac', 'isakson', 'isochronousstress', 'isofoam', 'isolation', 'isotope', 'isovel', 'itechnical', 'item', 'iw', 'jackson', 'jacob', 'jacobian', 'jaerscs', 'jaesc', 'jaescs1960', 'jaescs26', 'jaescs29', 'jahsman', 'james', 'jamrs', 'janzen', 'jappmech28', 'jaszlics', 'jay', 'jbritinters', 'jeffery', 'jeffrey', 'jeg', 'jenson', 'jetboundary', 'jetexit', 'jetlike', 'jetstream', 'jhb', 'ji', 'jinstmetals', 'jmathmech', 'jmin', 'mjn', 'jnb', 'jnr', 'jo', 'jogarao', 'johannesen', 'johansen', 'join', 'jointly', 'jouguet', 'joule', 'joyce', 'jphyssocjapan', 'jplprog', 'jra', 'jroyaes58', 'jroyaes63', 'jroyaesoc', 'judiciously', 'jugoslavia', 'jukoff', 'justifiable', 'justify', 'jzescs', 'k05', 'k1th', 'k20', 'ka', 'kallmann', 'kalman', 'kana', 'kanwal', 'karchmar', 'kawaguti', 'keating', 'keck', 'keenan', 'keener', 'keeping', 'keith', 'kelleys', 'kempf', 'kempners', 'kendrick', 'kenny', 'kernal', 'kernelfunction', 'kerrebrock', 'kester', 'keulegan1', 'keune1', 'kfa', 'kh', 'kidalgo', 'kilakowski', 'kilometre', 'kinematically', 'kingdom', 'kinked', 'kinking', 'kippenhan', 'kirby', 'kivel', 'kj', 'klebanoff', 'kleeman', 'knee', 'knowing', 'knox', 'ko', 'kochendorfer', 'kogan', 'komoda', 'kopalfor', 'kopals', 'korkegi', 'kosson', 'kramp', 'krasilshchikova', 'krieger', 'krqus', 'krumm', 'krypton', 'kth', 'kubota', 'kuehn', 'kuethe', 'l40', 'l51e09', 'l52119a', 'l53e27', 'l53h04', 'l54e05a', 'l54i16', 'l55k30', 'l56106', 'l56e07', 'l58', 'l58a16', 'l58e22', 'l5d20', 'l9g06', 'labour', 'lacking', 'lackman', 'lacquer', 'lagranges', 'laguerre', 'laid', 'laidlaw', 'lakshmikantham', 'lambert', 'laminarboundary', 'laminarturbulent', 'laminary', 'laminare', 'lance', 'landahls', 'landau', 'landrum', 'langer', 'langhaar', 'lap', 'laplacian', 'lardner', 'largeangled', 'largeaspect', 'largechord', 'largescale', 'late', 'latent', 'lateraldirectional', 'launching', 'laurence', 'lavender', 'lawes', 'layered', 'leaf', 'lees', 'legitimate', 'lehnert', 'lengthened', 'lennard', 'leonard', 'letko', 'letter', 'letting', 'letude', 'lever', 'levin', 'levinsky', 'liable', 'liapunov', 'liapunovs', 'libove', 'libration', 'libroves', 'license', 'lieberstein', 'liebersten', 'liepmann', 'liftingsurface', 'lighthill1957for', 'lightly', 'liila', 'lina', 'linder', 'lindholm', 'lineal', 'linearisation', 'linearizedtheory', 'linearizing', 'lingitudinal', 'linjection', 'liouville', 'lip', 'liquidinjection', 'listing', 'literal', 'livesley', 'livingood', 'lm', 'lmethod', 'ln', 'lo', 'lobe', 'lobed', 'localize', 'localsimilarity', 'locate', 'locating', 'lochtenberg', 'lock2', 'locus', 'logically', 'loitsianskii', 'longest', 'longitudinalvortices', 'longtime', 'loo', 'looking', 'loop', 'lopatoff', 'lose', 'lost', 'lotz', 'loudspeaker', 'louis', 'lowaspect', 'lowsubsonic', 'lowturbulence', 'ltd', 'lubricant', 'lucid', 'ludweigs', 'ludwig', 'luftfahrt', 'luidens', 'lunar', 'lw', 'lyapunovs', 'lynn', 'lyskov', 'm1', 'm1991', 'm2117', 'm2190', 'm2234', 'm2427', 'm245', 'm2742', 'm2971', 'm3011', 'm3012', 'm3054', 'm3115', 'm3224', 'm3286', 'm359', 'm6', 'm68', 'm685', 'm7', 'm82', 'm9', 'mabey', 'macadam', 'macdonald', 'machell', 'machined', 'machnumber', 'mackenzie', 'macneal', 'magasarian', 'magnesium', 'magnetoacoustic', 'magnetofluidmechanics', 'magnetogas', 'magnetogasdynamics', 'magnetogasdynamics', 'magnetoplasma', 'mahony', 'maillard', 'maintainance', 'maintenance', 'majorminor', 'malfunction', 'malvestuto', 'manager', 'maneuvering', 'mang', 'manocuvres', 'manoeuvring', 'manometer', 'manufacture', 'marin', 'marins', 'mario', 'maritime', 'marsden', 'martellucci', 'maryland', 'masi', 'mask', 'masked', 'massachusetts', 'massbalance', 'massbalanced', 'master', 'mat', 'mather', 'maurice', 'mautner', 'maximuin', 'maxwell', 'mayes', 'mayo', 'mbt', 'mccarthy', 'mccomb', 'mcconnell', 'mcdearmon', 'mcgraw', 'mcgregor', 'mcisaac', 'mckenzie', 'mckinnon', 'mclachlan', 'mclafferty', 'mclean', 'mcmillan', 'mcnown', 'md1', 'mdc', 'mead', 'meansquare', 'meant', 'measurable', 'mechapp', 'mechinst', 'mechs', 'meh', 'mehtod', 'meissner', 'melamine', 'mello', 'melvin', 'memorial', 'mentioning', 'merely', 'merger', 'merging', 'merle', 'merriam', 'mescall', 'mesh', 'messiter', 'meteorite', 'methanol', 'methodof', 'mev', 'meyers', 'mf', 'mhd', 'mich', 'microinch', 'microinches', 'micromanometer', 'micron', 'microwave', 'midchord', 'middlesex',

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Stems from index Version 2 with Largest df:

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Stems from index Version 2 with Smallest df:

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Document ID with the largest maximum term frequency in collection: 673

Document ID with the largest document length in collection: 1313

Size(in Bytes) of uncompressed index Version 1 is: 2165933 Bytes

Size(in Bytes) of uncompressed index Version 2 is: 2082959 Bytes

Size(in Bytes) of compressed index Version 1 is: 1138418 Bytes

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Program Execution and Outputs Screenshots:

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Anaconda Prompt (Anaconda3)
(base) E:\The University of Texas at Dallas\Spring 2020\Information Retrieval CS 6322.001\Assignment 2>python main_indexing.py
[nltk_data] Downloading package stopwords to
[nltk_data] C:\Users\sadam\AppData\Roaming\nltk_data...
[nltk_data] Package stopwords is already up-to-date!
[nltk_data] Downloading package wordnet to
[nltk_data] C:\Users\sadam\AppData\Roaming\nltk_data...
[nltk_data] Package wordnet is already up-to-date!

The number of postings in Version 1 of the index is: 10209
The number of postings in Version 2 of the index is: 8299

-----Index Version 1 Results for the term list: ['reynolds', 'nasa', 'prandtl', 'flow', 'pressure', 'boundary', 'shock'] -----

Term: boundary
Document Frequency: 467
Term Frequency: 1185
Individual Frequencies in their Respective Documents are:
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Document ID with the largest maximum term frequency in collection: 673

Document ID with the largest document length in collection: 1313

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(base) E:\The University of Texas at Dallas\Spring 2020\Information Retrieval CS 6322.001\Assignment 2>

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csgrads1.utdallas.edu - PuTTY
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[nltk_data] Package stopwords is already up-to-date!
[nltk_data] Downloading package wordnet to
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('The number of postings in Version 1 of the index is:', 10209)
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Screenshot of the Program Execution on CSgrads1 UTD Server using Putty!