1. **APP decomiple and recompile**

 subprocess.call(['apktool','d',apkname,'-f'], subprocess.DEVNULL, stderr=subprocess.STDOUT, shell=True)

    mytree  = ET.parse(apkpath+'/AndroidManifest.xml')

    # parsing using the string.

    # stringroot = ET.fromstring(XMLexample\_stored\_in\_a\_string)

    # printing the root.

    myroot = mytree.getroot()

    permissions = myroot.findall("uses-permission")

    for perm in permissions:

        for att in perm.attrib:

            if(perm.attrib[att] in unwanted):

                myroot.remove(perm)

                print("removed")

    mytree.write(apkpath+"/AndroidManifest.xml")

    subprocess.call(['apktool','b',apkpath], subprocess.DEVNULL, stderr=subprocess.STDOUT, shell=True)

1. **Permission Extraction**

apkpath=apkname.replace(".apk","")

  print("apkname",apkname)

    print("apkpath",apkpath)

    a, d, dx = misc.AnalyzeAPK(apkname)

    print(a.get\_permissions())

    print(" [\*] Success")

    perlist=a.get\_permissions()

    # perlist=pickle.load(open("perdata.pkl",'rb'))

    pickle.dump(perlist,open("perdata.pkl","wb"))

1. **Colaborative filtering and Frequent permission set mining**

df1=pd.read\_csv("output2.csv")

    df1=df1[df1["Category"]==ctype]

    print(df1)

    perlist=pickle.load(open("perdata.pkl",'rb'))

    dfcolumns=df1.columns.to\_list()

    dfcolumns=dfcolumns[2:]

    print(dfcolumns)

    print(perlist)

    Alist=[]

    for i in dfcolumns:

        if(i in perlist):

            Alist.append(1)

        else:

            Alist.append(0)

    print(Alist)

    colablist=[]

    sval=0

    dft=df1.drop(["App\_name","Category"],axis=1)

    for i in range(len(dft)):

        app1=dft.values.tolist()[i]

        print(len(app1))

        print(len(Alist))

        score=jaccard\_score(app1, Alist)

        if(score>sval):

            colablist=app1

            sval=score

        print(score)

        print("================")

    print(sval)

    print(colablist)

    collist=df1.columns.tolist()

    colabres=[]

    for i in range(len(colablist)):

        if(colablist[i]==1):

            pv=collist[i]

            if(pv not in colabres):

                colabres.append(pv)

    # print(dft.columns.tolist())

    print(colabres)

    pickle.dump(colabres,open("colabreslist.pkl","wb"))

    # ================================================================================

    df2=pd.read\_excel("sample android.xlsx")

    df2 = df2.loc[:, ~df2.columns.str.contains('^Unnamed')]

    print(df2)

    df2=df2.head(249)

    df2=df2[df2["App category"]==ctype]

    print("df2==>",df2)

    allpermissions=[]

    print(len(df2))

    for i in range(len(df2)):

        perlist1=[]

        try:

            pval=df2["App permissions"][i]

            plist=pval.split(",")

            for i in plist:

                if("\n" in i):

                    char = i.split("\n")

                    for k in char:

                        perlist1.append(k)

                else:

                    perlist1.append(i)

                perlist1=list(filter(None, perlist1))

                allpermissions.append(perlist1)

        except:

            pass

        # print(allpermissions)

    tr = TransactionEncoder()

    tr\_arr = tr.fit(allpermissions).transform(allpermissions)

    df3 = pd.DataFrame(tr\_arr, columns=tr.columns\_)

    frequent\_itemsets = apriori(df3, min\_support = 0.4, use\_colnames = True)

    res=frequent\_itemsets["itemsets"]

    reslist=[list(x) for x in res]

    frequentlist=[]

    for i in reslist:

        for j in i:

            if(j not in frequentlist):

                frequentlist.append(j)

        # print(i)

    print(frequentlist)

    pickle.dump(frequentlist,open("frequentlist.pkl","wb"))

    # ==========================================================================

    colablist=pickle.load(open("colabreslist.pkl","rb"))

    frequentlist=pickle.load(open("frequentlist.pkl","rb"))

    apppermission=pickle.load(open("perdata.pkl","rb"))

    print(colablist)

    print("================")

    print(frequentlist)

    print("================")

    print(apppermission)

    correctper=[]

    unwanted=[]

    for i in apppermission:

        if((i  in colablist) or (i in frequentlist)):

            correctper.append(i)

        else:

            unwanted.append(i)

    print("acutal permissions==>")

    print(correctper)

    print("removable permissions==>")

    print(unwanted)

**Tech stack**

1. Front End
   1. Android studio(Version: 2022.2.1)
   2. Java (Version :18)
2. Back End:
   1. Python (Version 3.8)
   2. Ananconda (version : v23.3.1)
   3. Django (version : 3.2)