SDP Poject

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In [106]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
import seaborn as sns
```

In [107]:

```
data= pd.read_csv('investments_VC.csv',encoding='unicode_escape')
```

In [108]:

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 54294 entries, 0 to 54293
Data columns (total 39 columns):
 #   Column                Non-Null Count  Dtype  
---  ------                --------------  -----  
 0   permalink             49438 non-null  object 
 1   name                  49437 non-null  object 
 2   homepage_url          45989 non-null  object 
 3   category_list         45477 non-null  object 
 4    market               45470 non-null  object 
 5    funding_total_usd    49438 non-null  object 
 6   status                48124 non-null  object 
 7   country_code          44165 non-null  object 
 8   state_code            30161 non-null  object 
 9   region                44165 non-null  object 
 10  city                  43322 non-null  object 
 11  funding_rounds        49438 non-null  float64
 12  founded_at            38554 non-null  object 
 13  founded_month         38482 non-null  object 
 14  founded_quarter       38482 non-null  object 
 15  founded_year          38482 non-null  float64
 16  first_funding_at      49438 non-null  object 
 17  last_funding_at       49438 non-null  object 
 18  seed                  49438 non-null  float64
 19  venture               49438 non-null  float64
 20  equity_crowdfunding   49438 non-null  float64
 21  undisclosed           49438 non-null  float64
 22  convertible_note      49438 non-null  float64
 23  debt_financing        49438 non-null  float64
 24  angel                 49438 non-null  float64
 25  grant                 49438 non-null  float64
 26  private_equity        49438 non-null  float64
 27  post_ipo_equity       49438 non-null  float64
 28  post_ipo_debt         49438 non-null  float64
 29  secondary_market      49438 non-null  float64
 30  product_crowdfunding  49438 non-null  float64
 31  round_A               49438 non-null  float64
 32  round_B               49438 non-null  float64
 33  round_C               49438 non-null  float64
 34  round_D               49438 non-null  float64
 35  round_E               49438 non-null  float64
 36  round_F               49438 non-null  float64
 37  round_G               49438 non-null  float64
 38  round_H               49438 non-null  float64
dtypes: float64(23), object(16)
memory usage: 16.2+ MB
```

In [109]:

```
data.rename(columns={' market ':'market',' funding_total_usd ':'funding_total_usd'},inplace
```

In [110]:

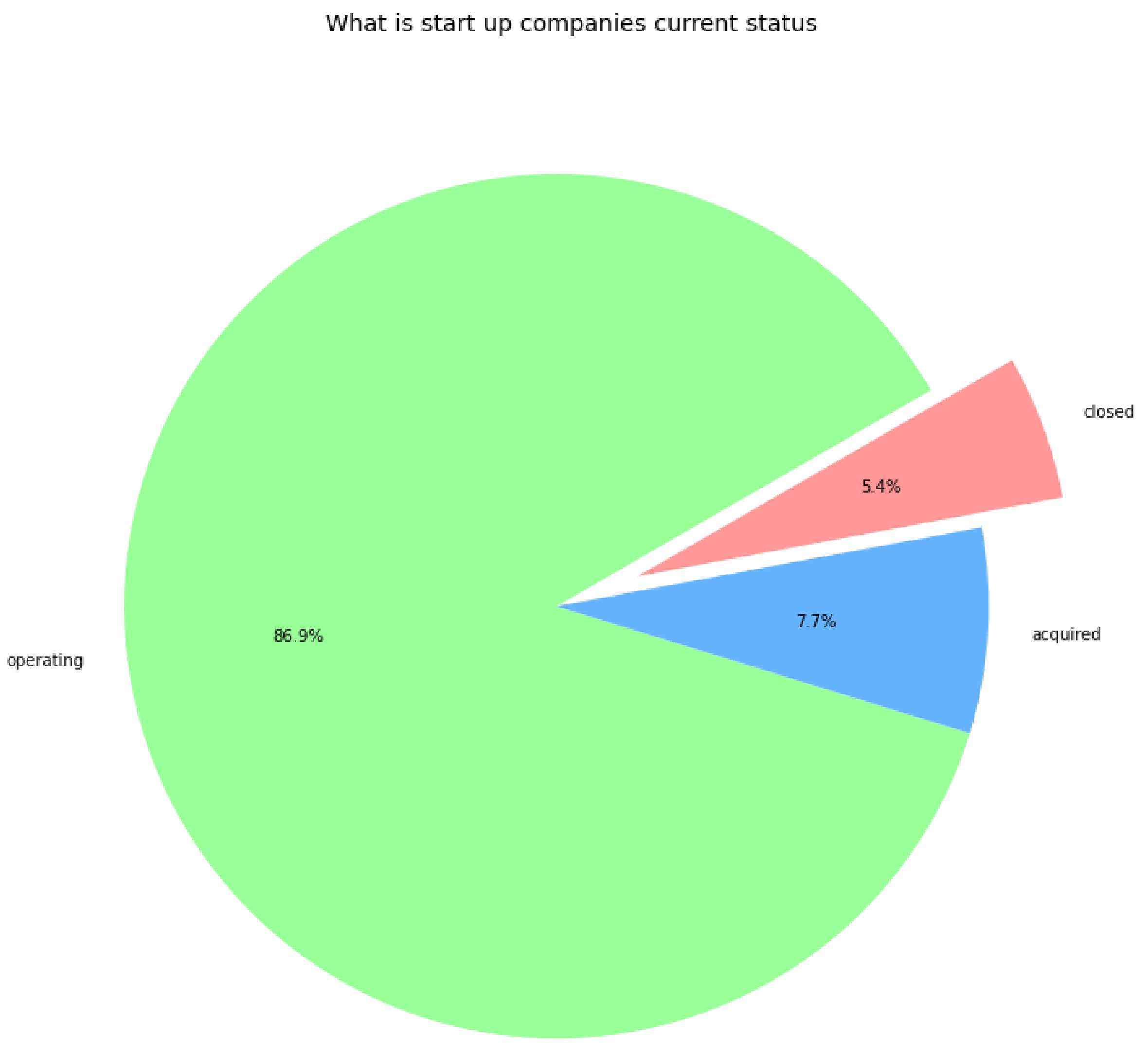
```
data.dropna(how='all',inplace=True)
```

Data visualization

In [111]:

```
plt.rcParams['figure.figsize'] = 10,10
labels = data['status'].value_counts().index.tolist()
sizes = data['status'].value_counts().tolist()
explode = (0, 0, 0.2)
colors = ['#99ff99','#66b3ff','#ff9999']

plt.pie(sizes, explode=explode, labels=labels, colors=colors, autopct='%1.1f%%',
        shadow=False
        , startangle=30)
plt.axis('equal')
plt.tight_layout()
plt.title("What is start up companies current status", fontdict=None, position= [0.48,1], s
plt.show()
```



In [112]:

```
data['market'].value_counts()[:5]
```

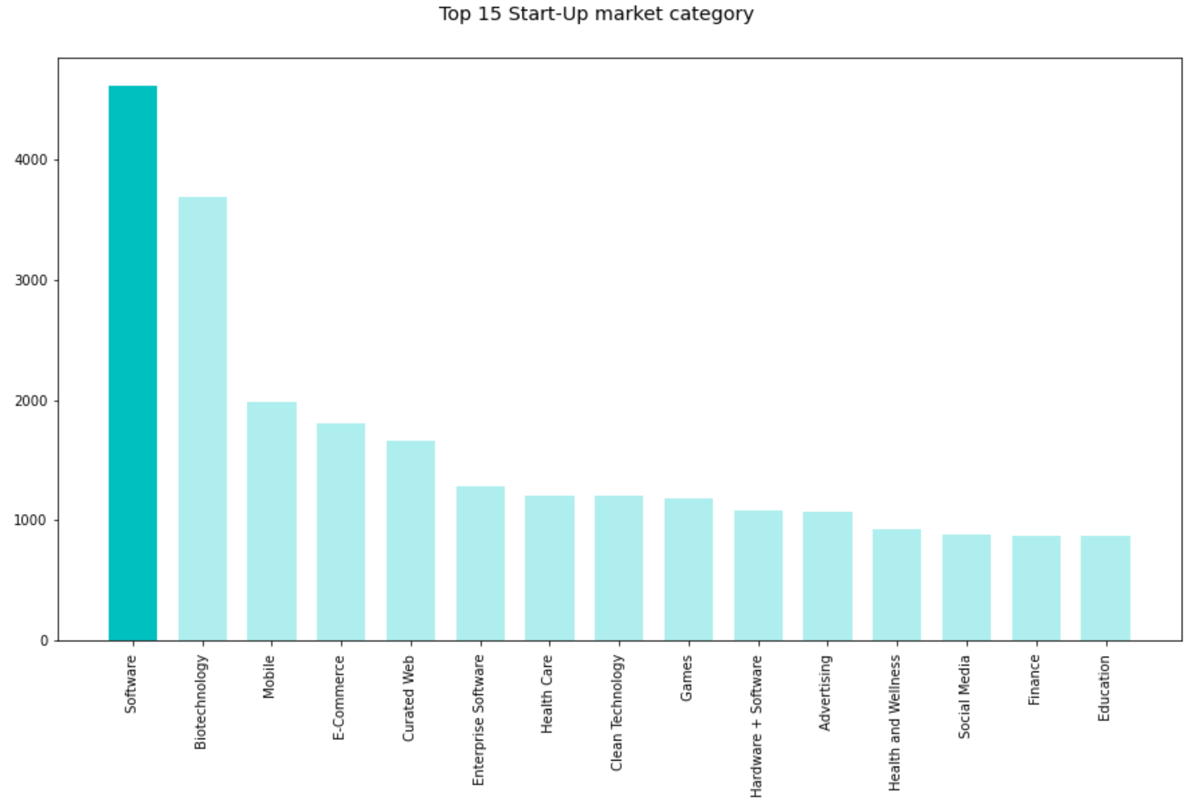
Out[112]:

```
 Software           4620
 Biotechnology      3688
 Mobile             1983
 E-Commerce         1805
 Curated Web        1655
Name: market, dtype: int64
```

In [113]:

```
plt.rcParams['figure.figsize'] = 15,8

height = data['market'].value_counts()[:15].tolist()
bars =  data['market'].value_counts()[:15].index.tolist()
y_pos = np.arange(len(bars))
plt.bar(y_pos, height , width=0.7 ,color= ['c']+['paleturquoise']*14)
plt.xticks(y_pos, bars)
plt.xticks(rotation=90)
plt.title("Top 15 Start-Up market category", fontdict=None, position= [0.48,1.05], size = '
plt.show()
```



In [114]:

```
data['count'] = 1
country_market = data[['count','country_code','market']].groupby(['country_code','market'])
# Change: groupby state_office and divide by sum
country_market_pct = country_market.groupby(level=0).apply(lambda x:
                                                 100 * x / float(x.sum()))
country_market_pct.reset_index(inplace = True)
```

In [115]:

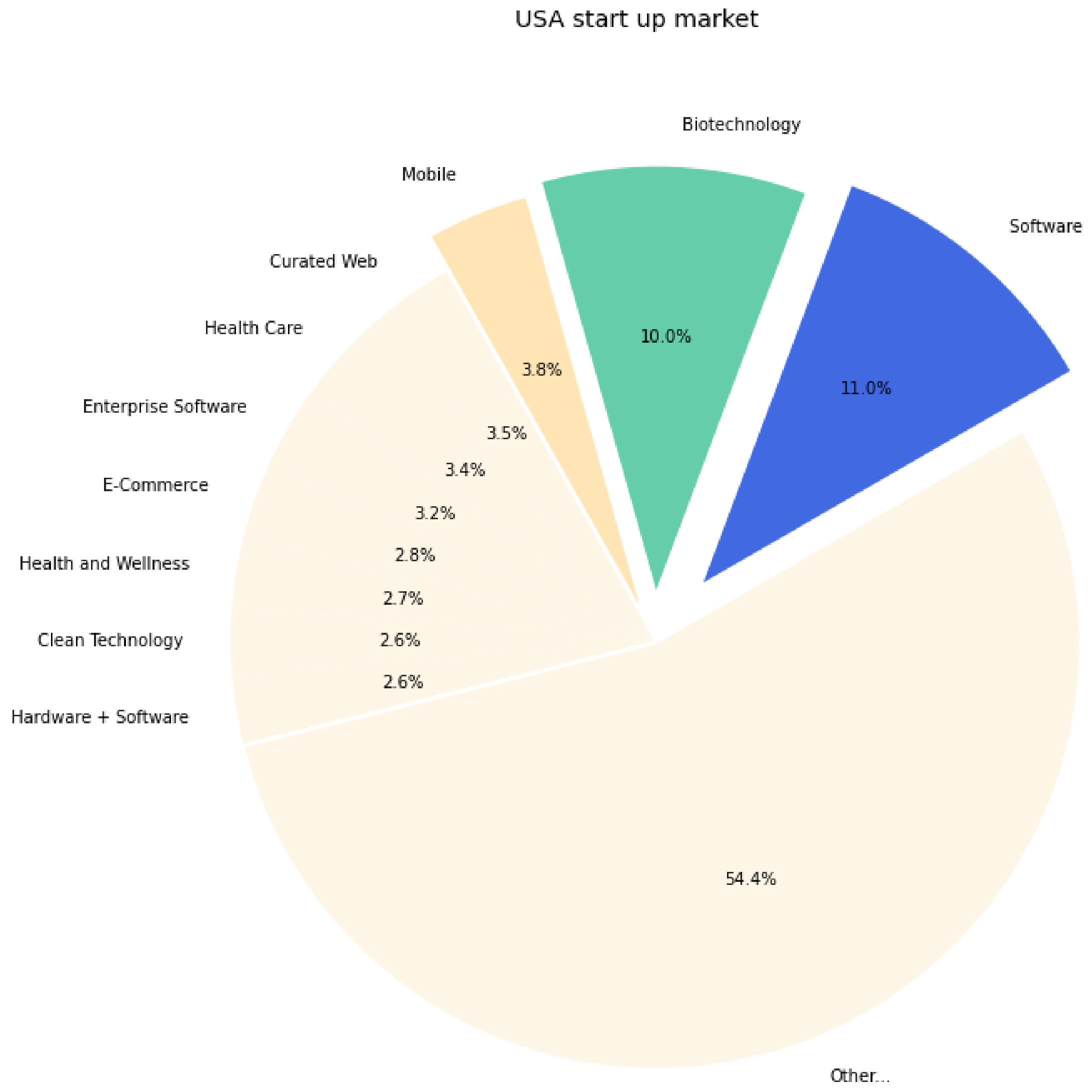
```
USA_market_pct = country_market_pct[country_market_pct['country_code'] == "USA"]
USA_market_pct = USA_market_pct.sort_values('count',ascending = False)[0:10]
```

In [116]:

```
plt.rcParams['figure.figsize'] =10,10
labels = list(USA_market_pct['market'])+['Other...']
sizes = list(USA_market_pct['count'])+[100-USA_market_pct['count'].sum()]
explode = (0.18, 0.12, 0.09,0,0,0,0,0,0,0,0.01)
colors =  ['royalblue','mediumaquamarine','moccasin'] +['oldlace']*8

plt.pie(sizes, explode = explode, colors = colors ,labels=labels, autopct='%1.1f%%',
        shadow=False, startangle=30)
plt.axis('equal')
plt.tight_layout()
plt.title("USA start up market", fontdict=None, position= [0.48,1.1], size = 'x-large')

plt.show()
```



In [117]:

```
data.drop(columns=['permalink','name','homepage_url','category_list','state_code','region',
```

In [118]:

```
data.head()
```

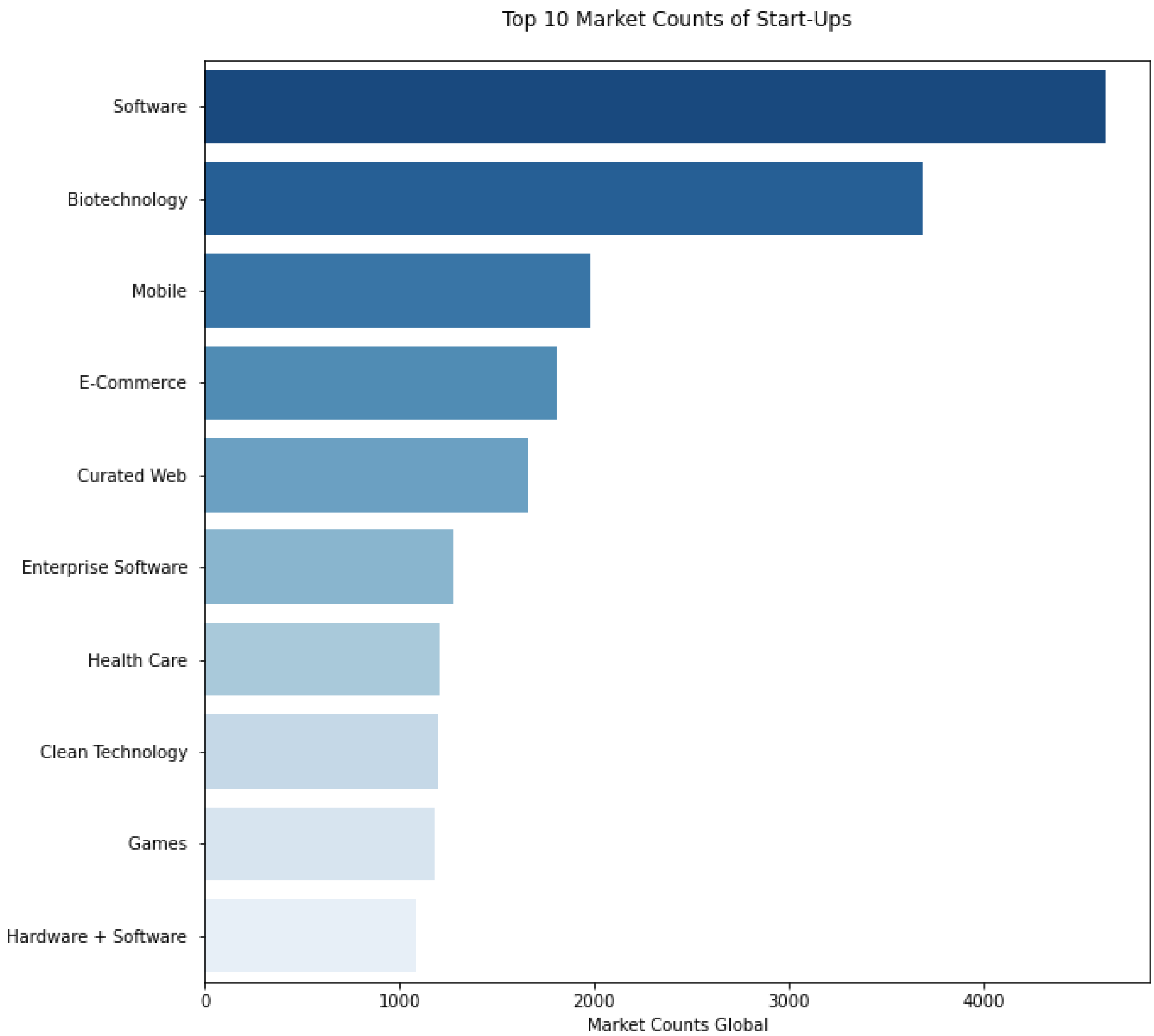
Out[118]:

	market	funding_total_usd	status	country_code	funding_rounds	seed	venture
0	News	17,50,000	acquired	USA	1.0	1750000.0	0.0
1	Games	40,00,000	operating	USA	2.0	0.0	4000000.0
2	Publishing	40,000	operating	EST	1.0	40000.0	0.0
3	Electronics	15,00,000	operating	GBR	1.0	1500000.0	0.0
4	Tourism	60,000	operating	USA	2.0	0.0	0.0

5 rows × 27 columns

In [119]:

```
market=data.market.value_counts()
market[(market>1000)][0:10]
market=market[(market>1000)][0:10].to_frame()
plt.figure()
ax1=sns.barplot(y=market.index,x=market.market,orient='h',palette='Blues_r')
ax1.set_title('Top 10 Market Counts of Start-Ups',pad=20)
ax1.set_xlabel('Market Counts Global')
plt.show()
```



In [120]:

```
data.funding_total_usd=data.funding_total_usd.str.replace(",",'').str.replace(' ',"")
data.funding_total_usd=data.funding_total_usd.replace("-",np.nan).astype('float',errors='ig
```

In [121]:

```
data['funding_total_usd']=data['funding_total_usd'].fillna(value=0)
data['status']=data['status'].fillna(value='closed')
```

In [122]:

```
data['market']= data['market'].fillna(value='Not sure')
data['country_code']= data['country_code'].fillna(value='NA')
```

In [123]:

```
X=data.iloc[:,:]
y=data.iloc[:,2]
```

In [124]:

```
X.drop(['status'],axis=1,inplace=True)
```

In [125]:

```
X.head()
```

Out[125]:

	market	funding_total_usd	country_code	funding_rounds	seed	venture	equity_cr
0	News	1750000.0	USA	1.0	1750000.0	0.0	
1	Games	4000000.0	USA	2.0	0.0	4000000.0	
2	Publishing	40000.0	EST	1.0	40000.0	0.0	
3	Electronics	1500000.0	GBR	1.0	1500000.0	0.0	
4	Tourism	60000.0	USA	2.0	0.0	0.0	

5 rows × 26 columns

In [126]:

```
y
```

Out[126]:

```
0         acquired
1        operating
2        operating
3        operating
4        operating
           ...
49433    operating
49434    operating
49435    operating
49436    operating
49437    operating
Name: status, Length: 49438, dtype: object
```

In [127]:

```
markets= pd.get_dummies(X['market'],drop_first=True)
```

In [94]:

```
country=pd.get_dummies(X['country_code'],drop_first=True)
```

In [95]:

```
X=pd.concat([X,markets,country],axis=1)
```

In [96]:

```
X.drop(columns=['market','country_code'],axis=1,inplace=True)
```

In [97]:

```
X.info()
```

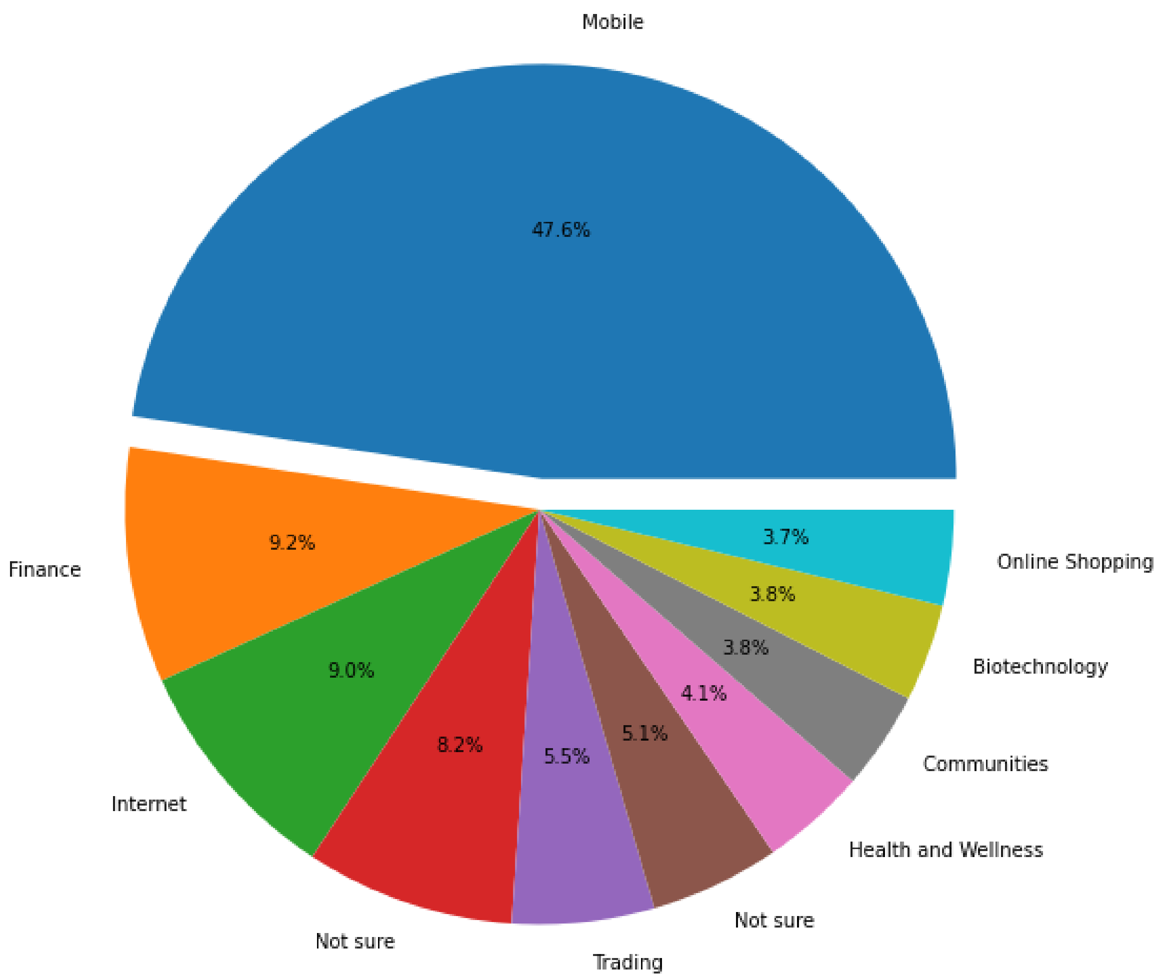
```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 49438 entries, 0 to 49437
Columns: 892 entries, funding_total_usd to ZWE
dtypes: float64(23), int64(1), uint8(868)
memory usage: 50.4 MB
```

In [103]:

```
lar=data.nlargest(n=10,columns='funding_total_usd')
explode = (0.075,0,0,0,0,0,0,0,0,0)
plt.pie(x=lar['funding_total_usd'],explode=explode,labels=lar['market'],autopct='%1.1f%%')
plt.xticks(rotation=90)
```

Out[103]:

```
(array([], dtype=float64), <a list of 0 Text major ticklabel objects>)
```



In [23]:

```
X_train,X_test,y_train,y_test= train_test_split(X,y,test_size=0.3,random_state=0)
```

In [24]:

```
from sklearn import svm
from sklearn.metrics import accuracy_score
from sklearn.preprocessing import StandardScaler
```

In [25]:

```
sc=StandardScaler()
X_train= sc.fit_transform(X_train)
X_test= sc.fit_transform(X_test)
print(y_test)
```

```
23184    operating
11254    operating
35091     acquired
23796    operating
33448    operating
           ...
23284    operating
26573    operating
30035    operating
40811    operating
15453    operating
Name: status, Length: 14832, dtype: object
```

In [26]:

```
y=y.str.replace('operating','0').str.replace('acquired','1').str.replace('closed','2')
```

In [28]:

```
y=y.astype(int)
```

In [29]:

```
y
```

Out[29]:

```
0        1
1        0
2        0
3        0
4        0
        ..
49433    0
49434    0
49435    0
49436    0
49437    0
Name: status, Length: 49438, dtype: int32
```

Support Vector

In [ ]:

```
cls=svm.SVC()
cls.fit(X_train,y_train)
```

In [31]:

```
y_pred= cls.predict(X_test)
```

In [32]:

```
print('accuracy :' , 100*accuracy_score(y_test, y_pred))
```

```
accuracy : 84.00755124056096
```

Random Forest

In [30]:

```
from sklearn.ensemble import RandomForestClassifier
```

In [32]:

```
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.5,random_state=0)
rf=RandomForestClassifier(criterion='entropy',n_estimators=50,random_state=0)
```

In [34]:

```
rf.fit(X_train,y_train)
```

Out[34]:

```
RandomForestClassifier(bootstrap=True, ccp_alpha=0.0, class_weight=None,
                       criterion='entropy', max_depth=None, max_features='au
to',
                       max_leaf_nodes=None, max_samples=None,
                       min_impurity_decrease=0.0, min_impurity_split=None,
                       min_samples_leaf=1, min_samples_split=2,
                       min_weight_fraction_leaf=0.0, n_estimators=50,
                       n_jobs=None, oob_score=False, random_state=0, verbose
=0,
                       warm_start=False)
```

In [35]:

```
y_pred=rf.predict(X_test)
print("Random forest accuracy: ",100*accuracy_score(y_test,y_pred))
```

```
Random forest accuracy:  82.70965653950402
```

Logistic Regression

In [37]:

```
from sklearn.linear_model import LogisticRegression
```

In [38]:

```
regressor = LogisticRegression()
regressor.fit(X_train,y_train)
y_pred=regressor.predict(X_test)
```

```
C:\Users\aftab\Anaconda3\lib\site-packages\sklearn\linear_model\_logistic.p
y:940: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html (https://scik
it-learn.org/stable/modules/preprocessing.html)
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regre
ssion (https://scikit-learn.org/stable/modules/linear_model.html#logistic-re
gression)
  extra_warning_msg=_LOGISTIC_SOLVER_CONVERGENCE_MSG)
```

In [40]:

```
from sklearn.metrics import classification_report
print("Classification report by Logistic Regression:")
print(classification_report(y_test,y_pred))
```

```
Classification report by Logistic Regression:
              precision    recall  f1-score   support

           0       0.84      1.00      0.91     20850
           1       0.18      0.01      0.03      1881
           2       0.00      0.00      0.00      1988

    accuracy                           0.84     24719
   macro avg       0.34      0.34      0.31     24719
weighted avg       0.73      0.84      0.77     24719


C:\Users\aftab\Anaconda3\lib\site-packages\sklearn\metrics\_classification.p
y:1272: UndefinedMetricWarning: Precision and F-score are ill-defined and be
ing set to 0.0 in labels with no predicted samples. Use `zero_division` para
meter to control this behavior.
  _warn_prf(average, modifier, msg_start, len(result))
```

In [41]:

```
print(accuracy_score(y_test,y_pred)*100)
```

```
84.06893482746067
```