PROJECT

Click on below link to download dataset:
Dataset link (https://info.stackoverflowsolutions.com/rs/719-EMH-566/images/stack-overflow-developer-survey-2022.zip)

importing libraries

In [1]:

```python
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np
import pycountry
import plotly.express as px
from wordcloud import WordCloud
import warnings; warnings.filterwarnings('ignore')
```

reading dataset

In [2]:

```python
survey_df = pd.read_csv('sods2022/survey_results_public.csv')
```

In [3]:

```python
schema_df = pd.read_csv('sods2022/survey_results_schema.csv')
```

In [4]:

```
survey_df.head()
```

Out[4]:

	ResponseId	MainBranch	Employment	RemoteWork	CodingActivities	EdLevel	LearnCode	
0	1	None of these	NaN	NaN	NaN	NaN	NaN	
1	2	I am a developer by profession	Employed, full-time	Fully remote	Hobby;Contribute to open-source projects	NaN	NaN	
2	3	I am not primarily a developer, but I write co...	Employed, full-time	Hybrid (some remote, some in-person)	Hobby	Master’s degree (M.A., M.S., M.Eng., MBA, etc.)	Books / Physical media;Friend or family member...	documenta
3	4	I am a developer by profession	Employed, full-time	Fully remote	I don’t code outside of work	Bachelor’s degree (B.A., B.S., B.Eng., etc.)	Books / Physical media;School (i.e., Universit...	
4	5	I am a developer by profession	Employed, full-time	Hybrid (some remote, some in-person)	Hobby	Bachelor’s degree (B.A., B.S., B.Eng., etc.)	Other online resources (e.g., videos, blogs, f...	doc

5 rows × 79 columns

preprocessing

we need column *qname* as index of `schema_df` DataFrame

In [4]:

```
schema_df.set_index('qname', inplace=True)
```

In [5]:

```
schema_df = schema_df.question
```

In [ ]:

```

```

only data in *question* column is useful, so we will delete other columns

In [ ]:

```

```

After deletion

In [ ]:

```
schema_df
```

In [9]:

```
schema_df.index
```

Out[9]:

```
Index(['S0', 'MetaInfo', 'S1', 'MainBranch', 'Employment', 'RemoteWork',
       'CodingActivities', 'S2', 'EdLevel', 'LearnCode', 'LearnCodeOnline',
       'LearnCodeCoursesCert', 'YearsCode', 'YearsCodePro', 'DevType',
       'OrgSize', 'PurchaseInfluence', 'BuyNewTool', 'Country', 'Currency',
       'CompTotal', 'CompFreq', 'S3', 'Language', 'Database', 'Platform',
       'Webframe', 'MiscTech', 'ToolsTech', 'NEWCollabTools', 'OpSys',
       'VersionControlSystem', 'VCInteraction', 'VCHosting',
       'OfficeStackAsync', 'OfficeStackSync', 'Blockchain', 'S4', 'NEWSOSites',
       'SOVisitFreq', 'SOAccount', 'SOPartFreq', 'SOComm', 'S5', 'Age',
       'Gender', 'Trans', 'Sexuality', 'Ethnicity', 'Accessibility',
       'MentalHealth', 'S6', 'TBranch', 'ICorPM', 'WorkExp', 'Knowledge',
       'Frequency', 'TimeSearching', 'TimeAnswering', 'Onboarding',
       'ProfessionalTech', 'SOTeamsUsage', 'TrueFalse', 'S7', 'SurveyLength',
       'SurveyEase', 'Knowledge_1', 'Knowledge_2', 'Knowledge_3',
       'Knowledge_4', 'Knowledge_5', 'Knowledge_6', 'Knowledge_7',
       'Frequency_1', 'Frequency_2', 'Frequency_3', 'TrueFalse_1',
       'TrueFalse_2', 'TrueFalse_3'],
      dtype='object', name='qname')
```

plot function

In [7]:

```python
def custom_plot(series, plot_height=15, plot_width=5,
                y_label_font_size=13.5,
                title = '', title_font_size=15,
                percent_font_size=14,
                color = 'light:#59C1BD'):

    # create figure to display plot
    plt.figure( figsize=(plot_width, plot_height) )

    # to hide square of the plot
    custom_params = {
                        "axes.spines.bottom": False,
                        "axes.spines.right": False,
                        "axes.spines.left"  : False,
                        "axes.spines.top": False
                    }

    sns.set_theme(style="white", rc=custom_params)

    # creating different shades of colors(color palette) of size series leng
    # pal stores rgb values for different color shades
    pal = sns.color_palette(color, len(series)) # light:#5A9

    # argsort return indices of elements according to sorting order..
    # means lowest number will be indexed as 0, and so on
    # rank stores rank of series whr highest count value comes first
    # using this rank to assign color shades to diffrnt bars in plot
    rank = series.argsort().argsort()

    ax = sns.barplot(x = series.values, y=series.index,
                     #palette='PuBuGn_r'
                     #order=series.sort_values('Growth').State,
                     palette=np.array(pal[::])[rank]
                    )

    # to calculate percentage
    s = series.values.sum()

    for rect in ax.patches:
        x_value = rect.get_width()
        y_value = (rect.get_y() + rect.get_height() / 2)
        space = 0

        # calculating percentage and assigning to variable label
        label = "{:.2f}%".format( (100*x_value/s))

        # to display percentage value on bar
        plt.annotate(
            text=label,                     # Use `label` as label
            xy=((x_value/2)-5, y_value),    # Place label at end of the bar,
            xytext=(space, 0),              # Horizontally shift label by `sp
            textcoords="offset points",     # Interpret `xytext` as offset in
            va='center',                    # Vertically center label
            color = 'white',
            #ha='center',
            weight='bold', size=percent_font_size
        )

    plt.title('\n'+title+'\n',
              fontdict=
              {
                  "color": 'black',
                  "weight":'bold',
                  "size":title_font_size
              }
```

```
             )


    plt.yticks(size=y_label_font_size)#, weight='bold')
    plt.xticks([], []) # to hide xticks

    f_dict={"color": 'black',"weight":'bold',  "size":15}
    plt.figtext(.74, .042, "Total Responses: {}".format(s),
                fontdict = f_dict);
```

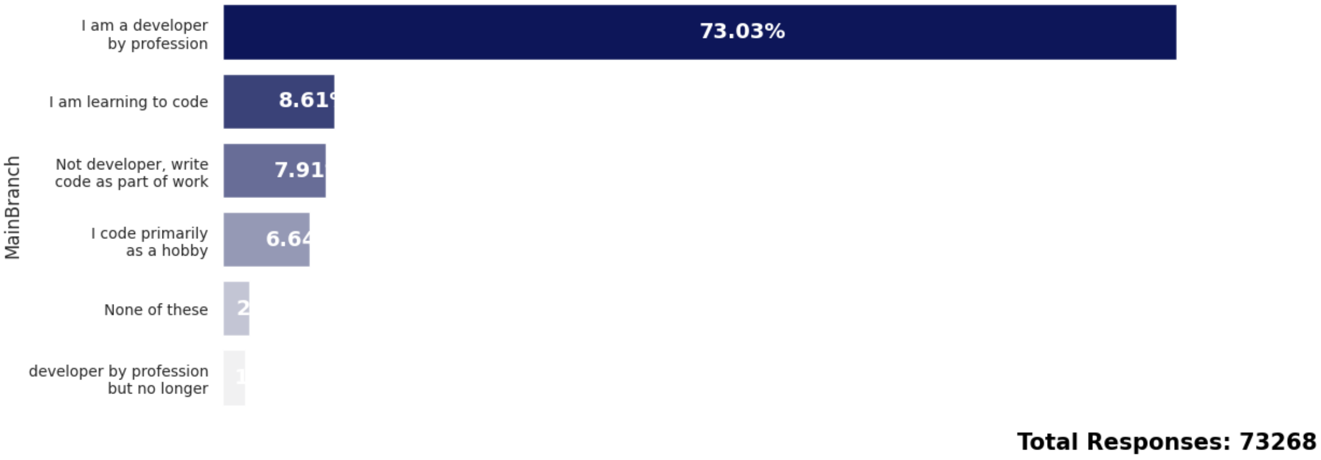
what is your main branch..?

In [11]:

```
def MainBranch_ylabel_text_process(s):
    if s == 'I am not primarily a developer, but I write code sometimes as p
        return 'Not developer, write\n code as part of work'
    elif s == 'I used to be a developer by profession, but no longer am':
        return 'developer by profession\n but no longer'
    elif s == 'I am a developer by profession':
        return 'I am a developer\n by profession'
    elif s == 'I code primarily as a hobby':
        return 'I code primarily\n as a hobby'
    else:
        return s
```

In [12]:

```
survey_df['MainBranch'] = survey_df.MainBranch.apply(MainBranch_ylabel_text_

mb = survey_df.MainBranch.value_counts()

custom_plot(
                mb, plot_height=5, y_label_font_size=10, plot_width=12,
                color = 'light:#000C66'
            )
```



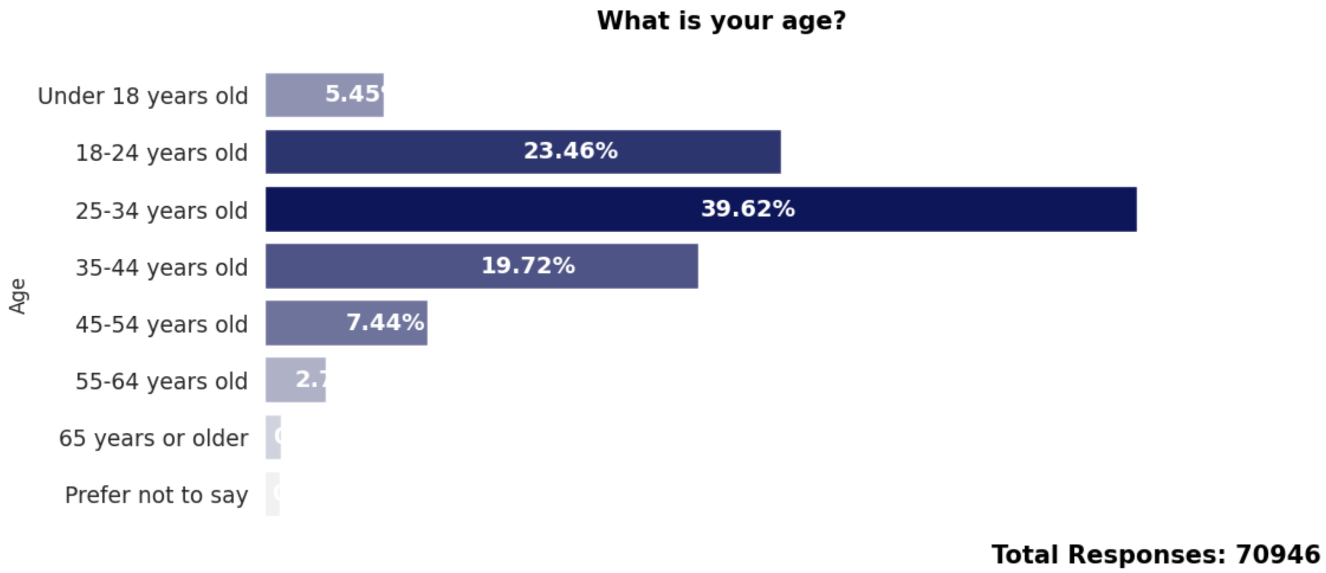
How old is the average professional developer..?

In [13]:

```
# Age
```

In [18]:

```
reorder_list = ['Under 18 years old', '18-24 years old',
               '25-34 years old', '35-44 years old',
                '45-54 years old', '55-64 years old',
                '65 years or older', 'Prefer not to say']

age_data = survey_df.Age.value_counts().reindex( reorder_list )

custom_plot(age_data, plot_height=5, color='light:#000C66',
           title = schema_df.Age, plot_width=10)
```



Employment status of an employee

In [19]:

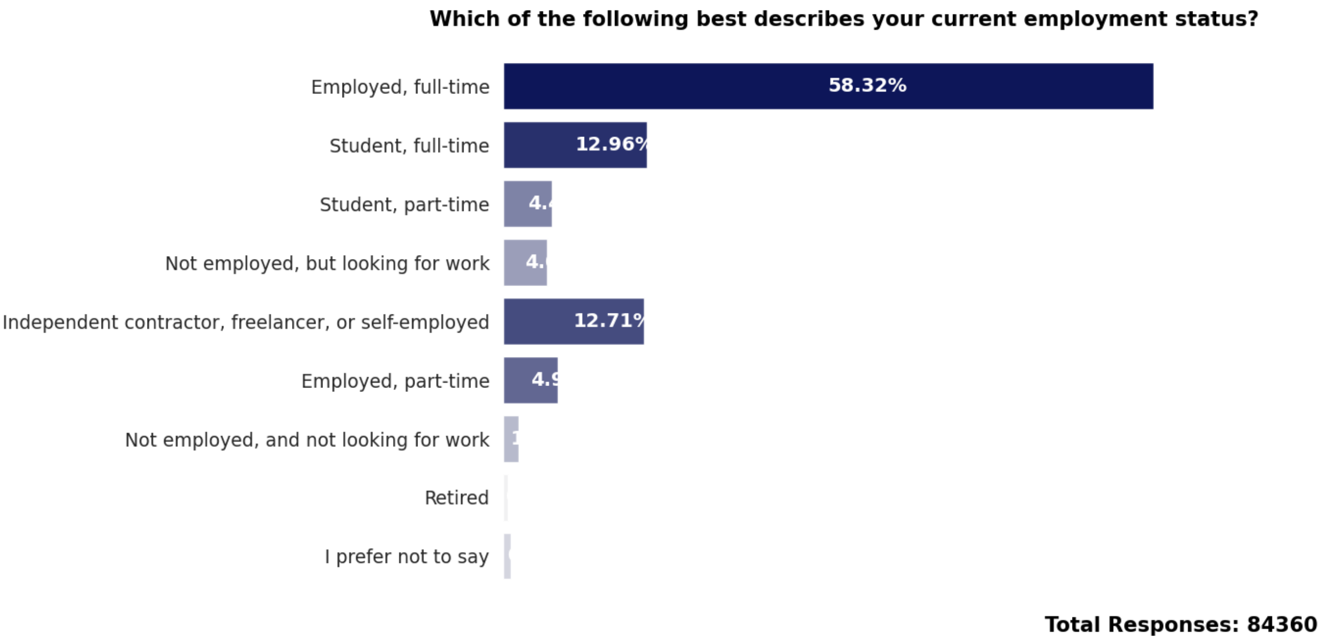
```
# Employment
```

In [23]:

```
def colum_expand( s ):
    d = {}

    for t in s.dropna().values:
        for i in t.split(';'):
            if i in d.keys():
                d[i] += 1
            else:
                d[i] = 1

    return pd.Series(d)

```

In [24]:

```python
emp = colum_expand(survey_df.Employment)

custom_plot(emp, plot_height=7, color='light:#000C66',
            title=schema_df.Employment, plot_width=9)
```



In [ ]:

```python

```

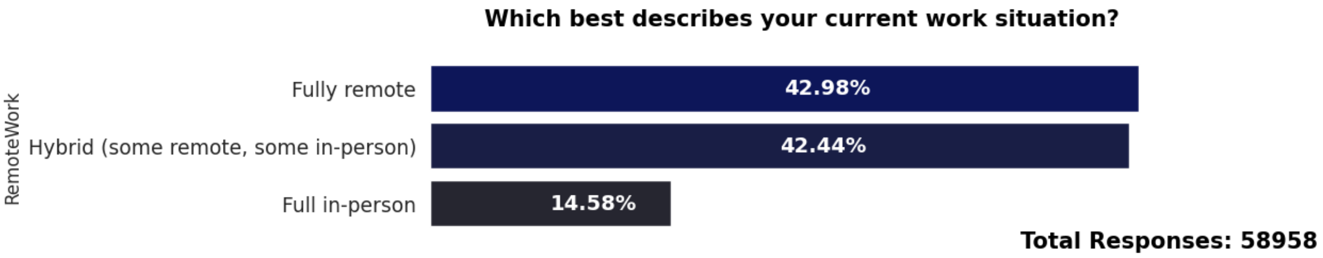
mode of working of employee(remote/hybrid)

In [ ]:

```python
# RemoteWork
```

In [27]:

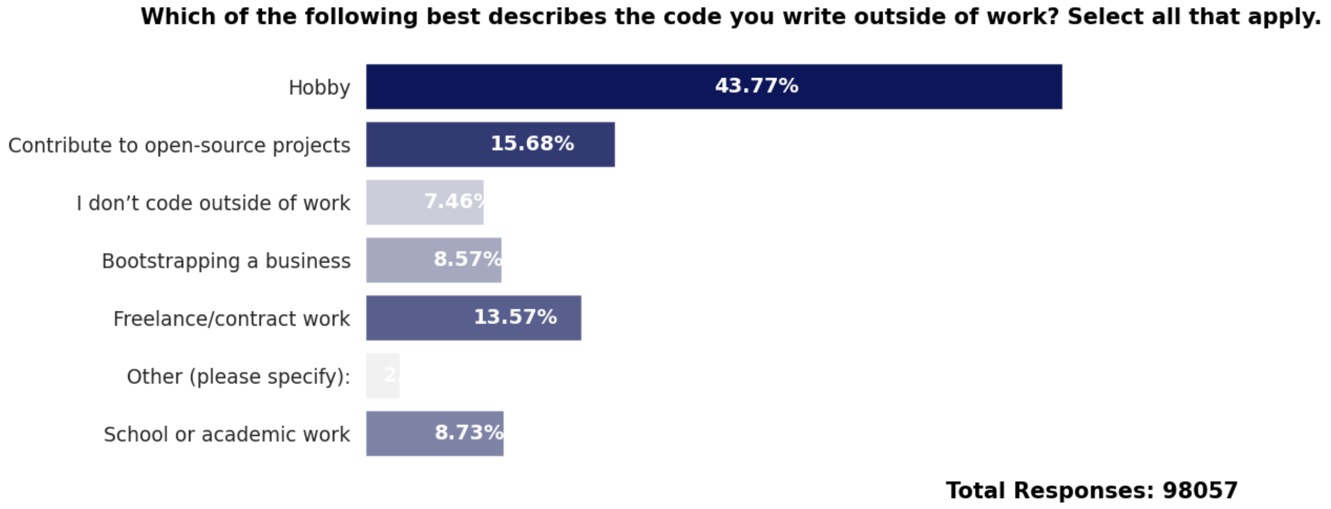
```python
remote_work = survey_df.RemoteWork.value_counts()

custom_plot(remote_work, plot_height=2.1, plot_width=9
            , color='dark:#000C66', title=schema_df.RemoteWork)
```



how many of you write code outside of your work

In [30]:

```python
coding_act = colum_expand(survey_df.CodingActivities)

custom_plot(coding_act, plot_height=5, plot_width=9,
            color='light:#000C66', title=schema_df.CodingActivities)
```



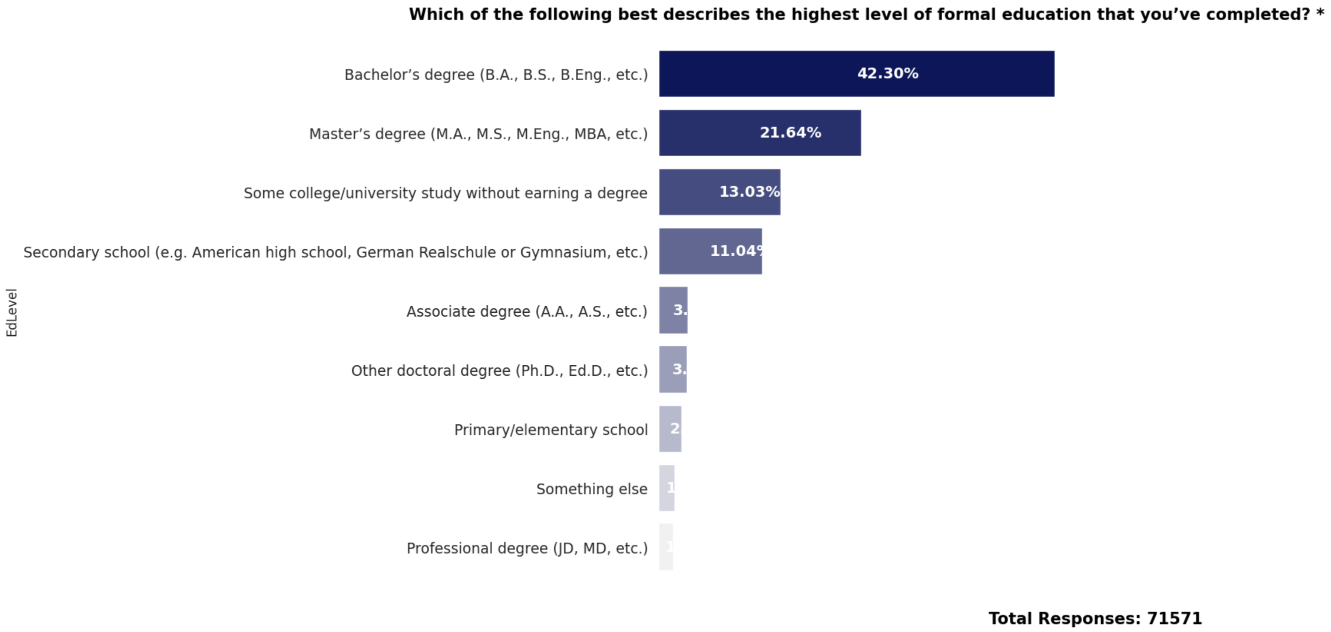
In [ ]:

```python

```

What is your highest level of formal education..?

In [67]:

```python
edu = survey_df.EdLevel.value_counts()

custom_plot(edu, plot_height=9, plot_width=7, color='light:#000C66',
           title=schema_df.EdLevel)
```



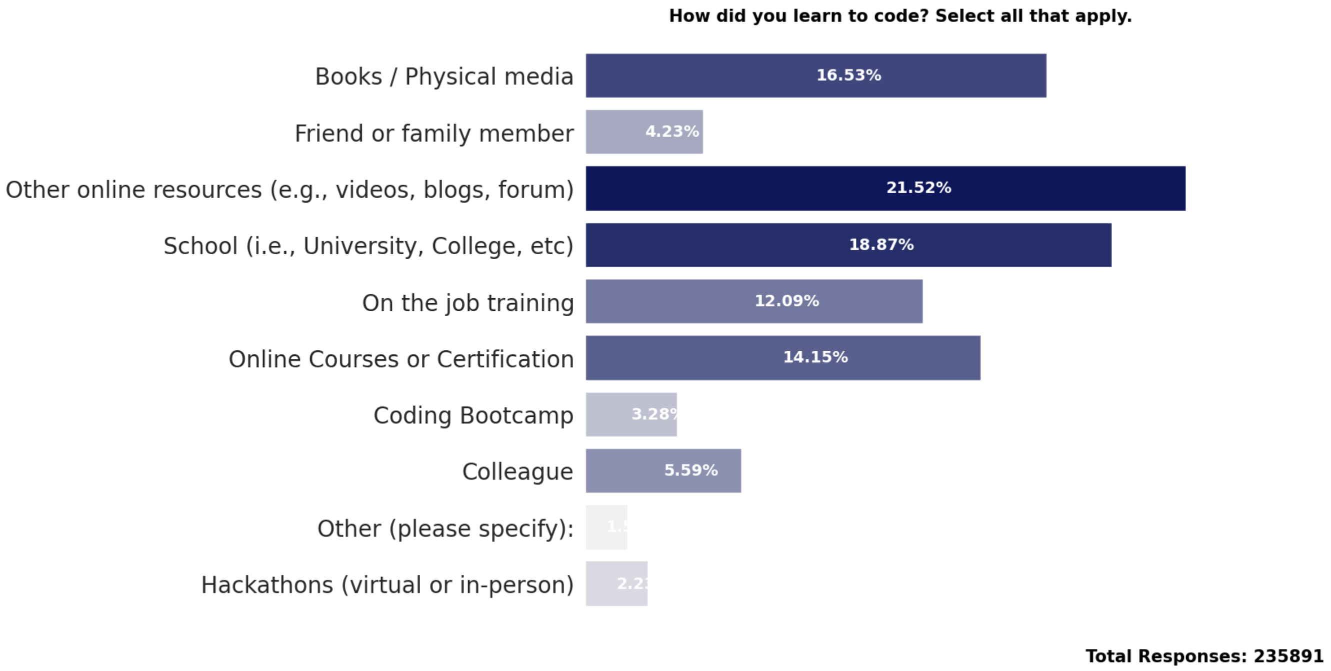
In [ ]:

```python

```

How did you learn to code

In [31]:

```python
learn_code_data = colum_expand(survey_df.LearnCode)



custom_plot(learn_code_data, plot_height=9, plot_width=10,
            color='light:#000C66', title=schema_df.LearnCode,
            y_label_font_size=20)

```



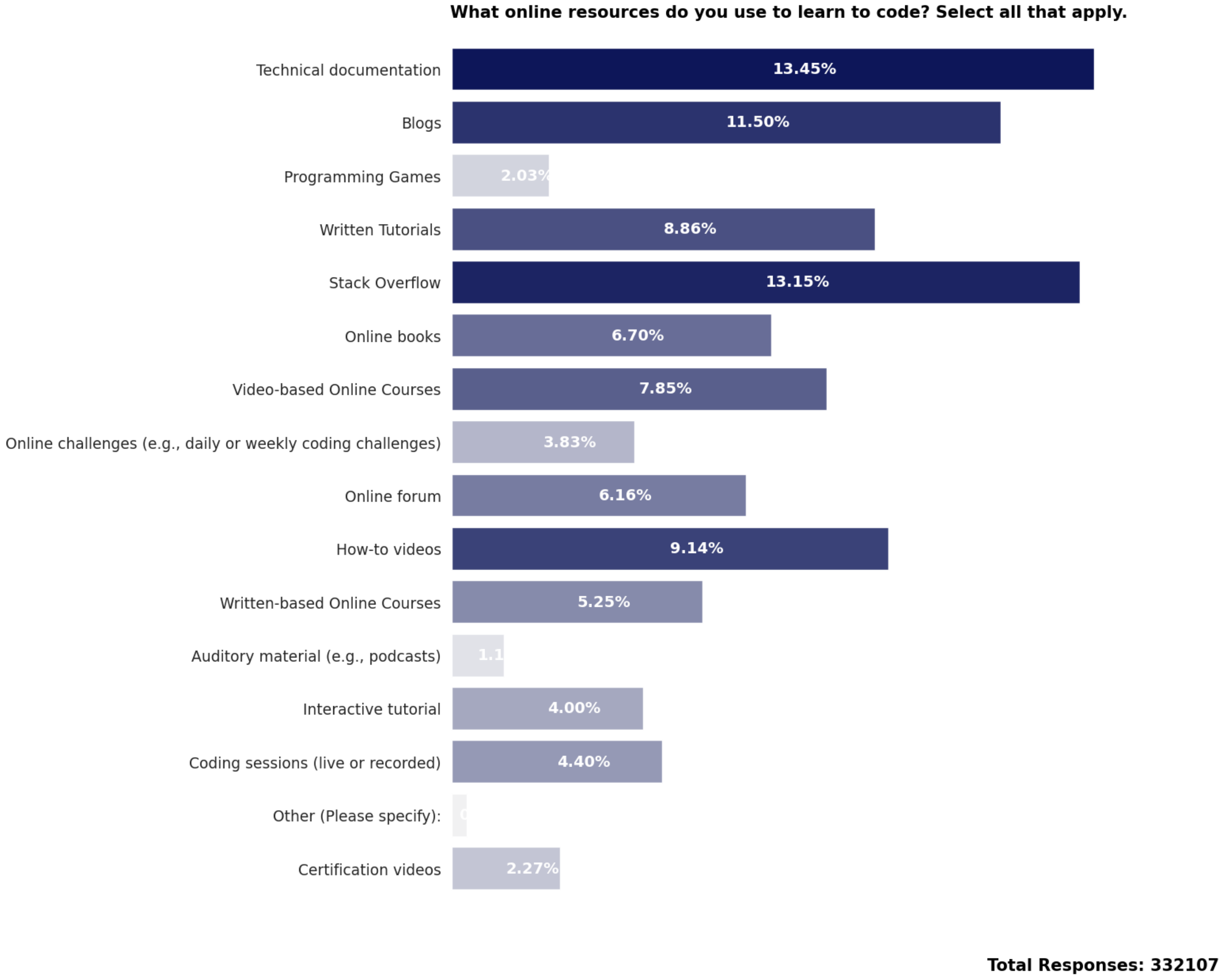
In [ ]:

```python

```

What online resources do you use to learn to code?

In [32]:

```python
learn_code_online = colum_expand(survey_df.LearnCodeOnline)


custom_plot(learn_code_online, plot_height=14, plot_width=11,
            color='light:#000C66', title=schema_df.LearnCodeOnline)

```


What online resources do you use to learn to code? Select all that apply.

Total Responses: 332107

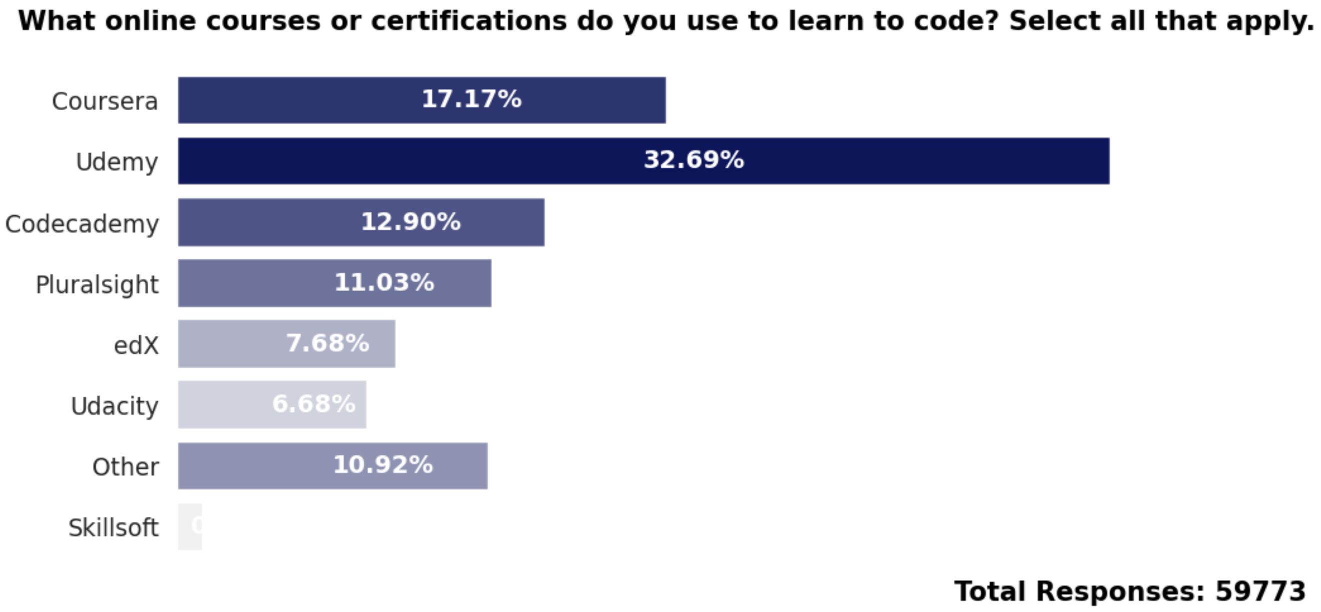
In [ ]:

```python

```

What online courses or certifications do you use to learn to code?

In [36]:

```python
learn_code_cert = colum_expand(survey_df.LearnCodeCoursesCert)

custom_plot(learn_code_cert, plot_height=5, plot_width=10,
            color='light:#000C66', title=schema_df.LearnCodeCoursesCert)
```



In [ ]:

how many years have you been coding in total (Including education)

In [37]:

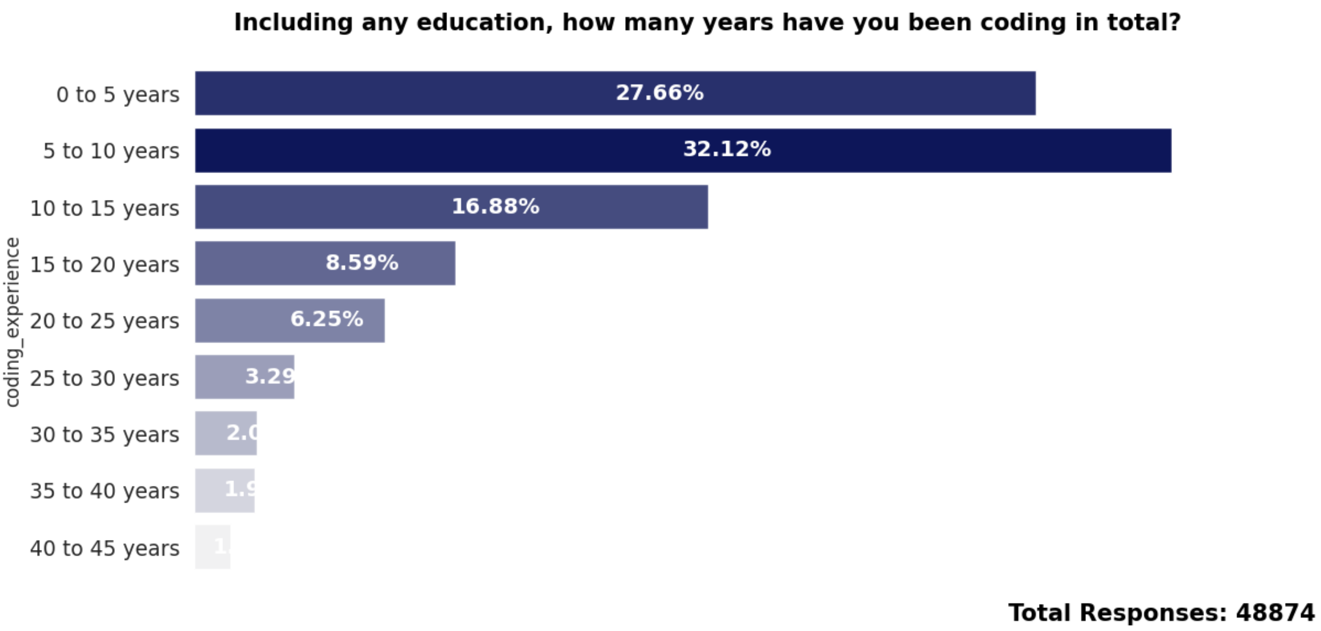
```python
def make_groups(s):
    try:
        s = int(s)
        if s > 0 and s < 5:
            return '0 to 5 years'
        if s > 5 and s < 10:
            return '5 to 10 years'
        if s > 10 and s < 15:
            return '10 to 15 years'
        if s > 15 and s < 20:
            return '15 to 20 years'
        if s > 20 and s < 25:
            return '20 to 25 years'
        if s > 25 and s < 30:
            return '25 to 30 years'
        if s > 30 and s < 35:
            return '30 to 35 years'
        if s > 35 and s < 40:
            return '35 to 40 years'
        if s > 40 and s < 45:
            return '40 to 45 years'
        if s > 45 and s < 50:
            return '45 to 50 years'
    except (TypeError, ValueError):
        pass

```

In [38]:

```python
survey_df['coding_experience'] = survey_df.YearsCode.apply(make_groups)
```

In [40]:

```

reorder_list = ['0 to 5 years', '5 to 10 years', '10 to 15 years',
                '15 to 20 years', '20 to 25 years', '25 to 30 years',
                '30 to 35 years','35 to 40 years', '40 to 45 years']

ce = survey_df.coding_experience.value_counts().reindex(reorder_list)

custom_plot(ce, plot_height=6, plot_width=12,
            title=schema_df.YearsCode, color='light:#000C66')
```



how many years have you been coding in total (not Including education)

In [ ]:

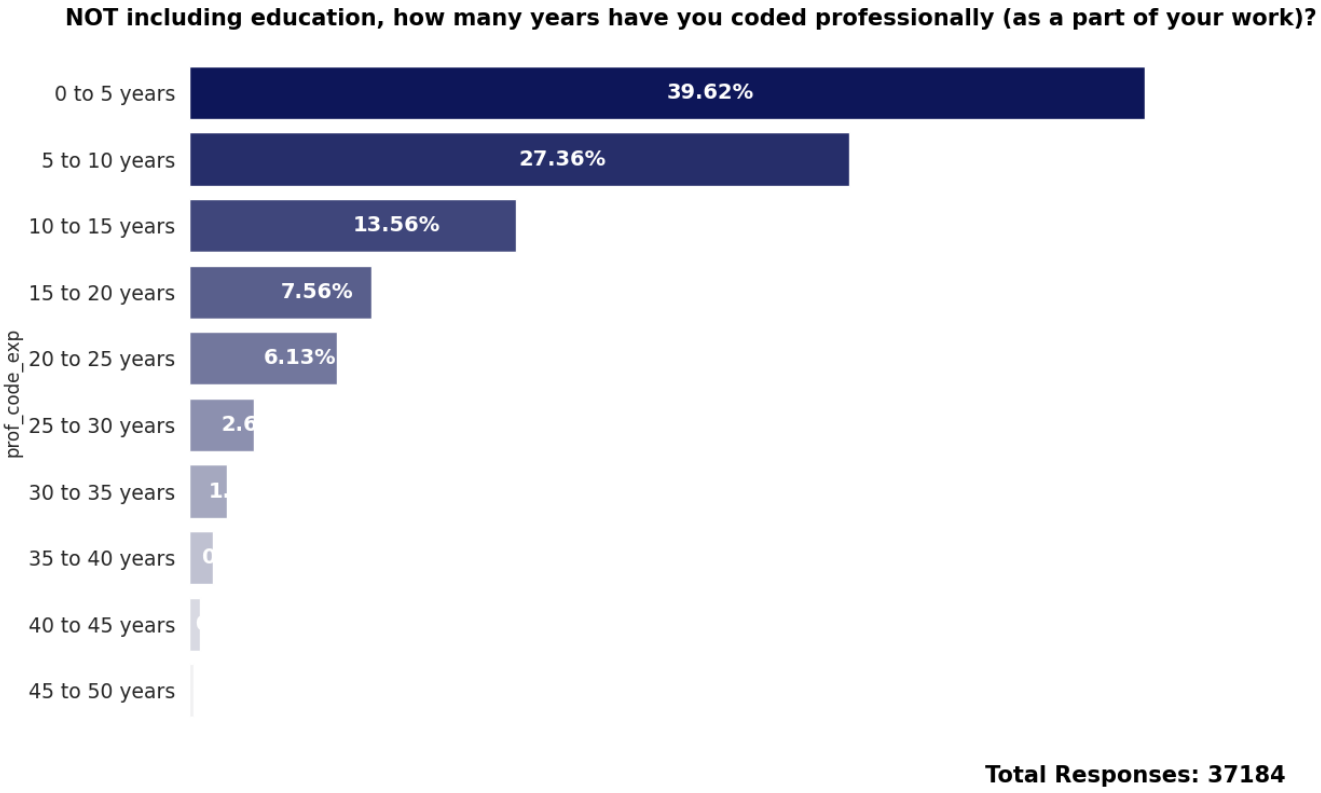
```
# YearsCodePro
```

In [46]:

```
survey_df['prof_code_exp'] = survey_df.YearsCodePro.dropna().apply(make_grou
```

In [49]:

```
pce = survey_df.prof_code_exp.value_counts()

custom_plot(pce, plot_height=8,plot_width=12,
            title=schema_df.YearsCodePro, color='light:#000C66')
```



what kind of developer you are..?

In [ ]:

```
# DevType
```

In [50]:

```
schema_df.DevType
```

Out[50]:

```
'Which of the following describes your current job? Please select all that appl
y.'
```

In [51]:

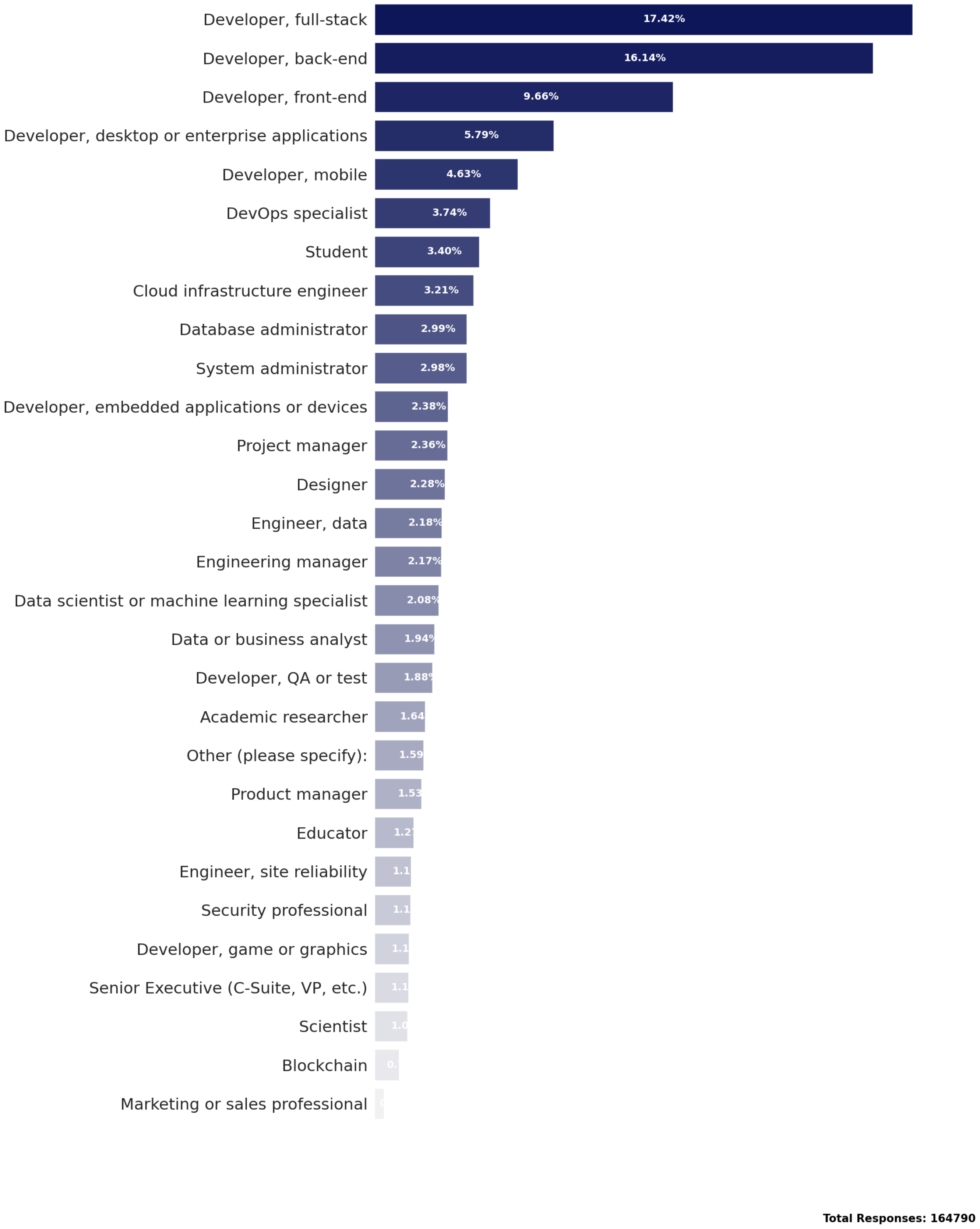
```
survey_df.DevType
```

Out[51]:

```
0                                                      NaN
1                                                      NaN
2        Data scientist or machine learning specialist;...
3                                     Developer, full-stack
4        Developer, front-end;Developer, full-stack;Dev...
                               ...
73263                                  Developer, back-end
73264        Data scientist or machine learning specialist
73265    Developer, full-stack;Developer, desktop or en...
73266    Developer, front-end;Developer, desktop or ent...
73267    Developer, front-end;Engineer, data;Engineer, ...
Name: DevType, Length: 73268, dtype: object
```

In [53]:

```python
dev_type = colum_expand(survey_df.DevType)

dev_type = dev_type.sort_values(ascending=False)

custom_plot(dev_type, color='light:#000C66', plot_height=28,
            plot_width=14, y_label_font_size=22)
```



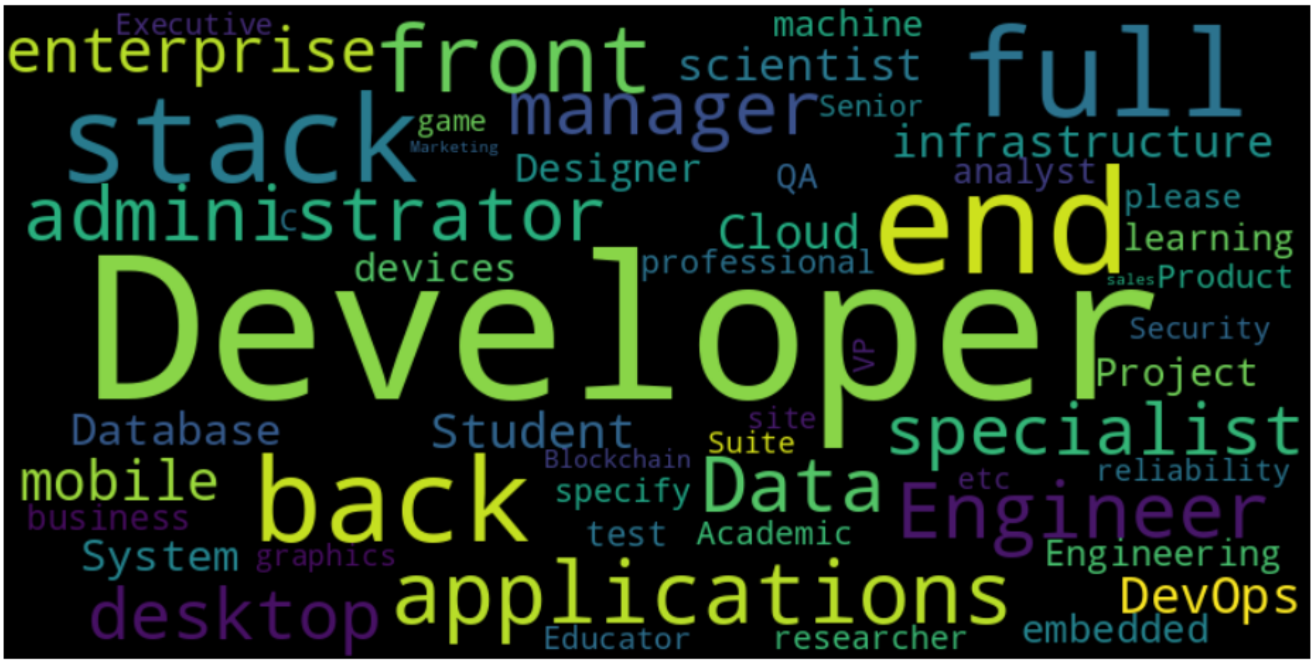
WordCloud for developer type

In [58]:

```python
words = ' '.join((job for job in survey_df.DevType.dropna().str.replace(';',
```

In [ ]:
```

```

In [61]:
```python
# Generate word cloud
wordcloud = WordCloud(collocation_threshold=int(1e6), width=800, height=400,
                      background_color='black').generate(words)

# Plot the word cloud
plt.figure(figsize=(12, 6))
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis('off')
plt.show()
```



In [ ]:
```

```

what is organization size of the developer...?

In [ ]:
```python
# OrgSize
```

In [62]:
```python
schema_df.OrgSize
```

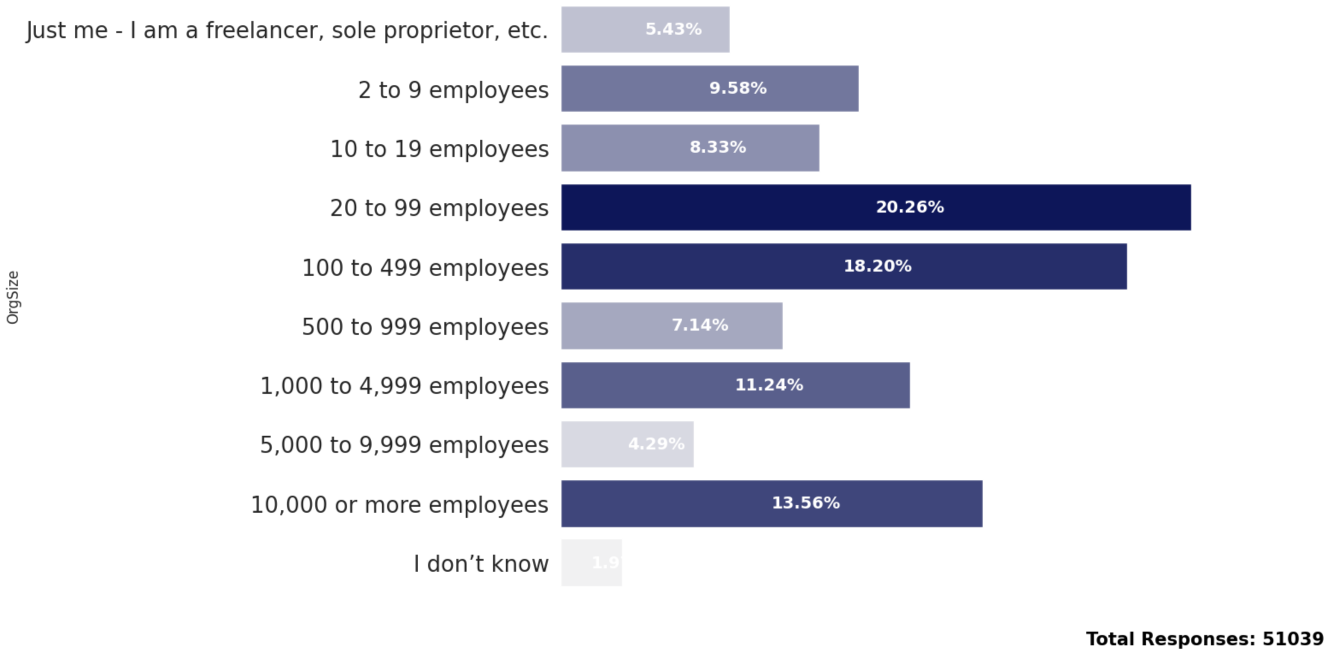
Out[62]:
```
'Approximately how many people are employed by the company or organization you
currently work for? '
```

In [65]:
```python
survey_df.OrgSize.value_counts()
```

Out[65]:
```
OrgSize
20 to 99 employees                                    10343
100 to 499 employees                                   9289
10,000 or more employees                               6922
1,000 to 4,999 employees                               5736
2 to 9 employees                                       4887
10 to 19 employees                                     4251
500 to 999 employees                                   3645
Just me - I am a freelancer, sole proprietor, etc.     2771
5,000 to 9,999 employees                               2189
I don’t know                                           1006
Name: count, dtype: int64
```

In [66]:

```
reorder_list = [
    "Just me - I am a freelancer, sole proprietor, etc.",
    "2 to 9 employees", "10 to 19 employees", "20 to 99 employees",
    "100 to 499 employees", "500 to 999 employees",
    "1,000 to 4,999 employees", "5,000 to 9,999 employees",
    "10,000 or more employees", "I don’t know"
]

org_size = survey_df.OrgSize.value_counts().reindex(reorder_list)

custom_plot(org_size, plot_height=9, plot_width=10,
            color = 'light:#000C66',
            y_label_font_size=18.5)
```



donut plot function using pie plot

In [104]:

```
def plot_pie(data , title='', distance_btwn_pieces=0.09, startangle=-11):

    explode = (distance_btwn_pieces,) * len(data)
    plt.figure(figsize=(14,10))


    plt.pie( data, explode=explode,  labels=data.index, pctdistance=0.75,
             colors = ['red', 'blue', 'yellow','pink','blue'],
             wedgeprops={'linewidth': 1.5, 'edgecolor' : "green" },
             textprops={"weight":'bold', "size":20, 'family':'serif'},
             autopct='%1.1f%%',  startangle=startangle, shadow=True,
           )

    #plt.setp(pcts, color='black')
    hfont = {'fontname': 'serif', 'weight': 'bold'}
    plt.title(title, size=25, **hfont)

    centre_circle = plt.Circle((-0.08,0), 0.5, fc='white')
    fig = plt.gcf().gca().add_artist(centre_circle)
    ;
```

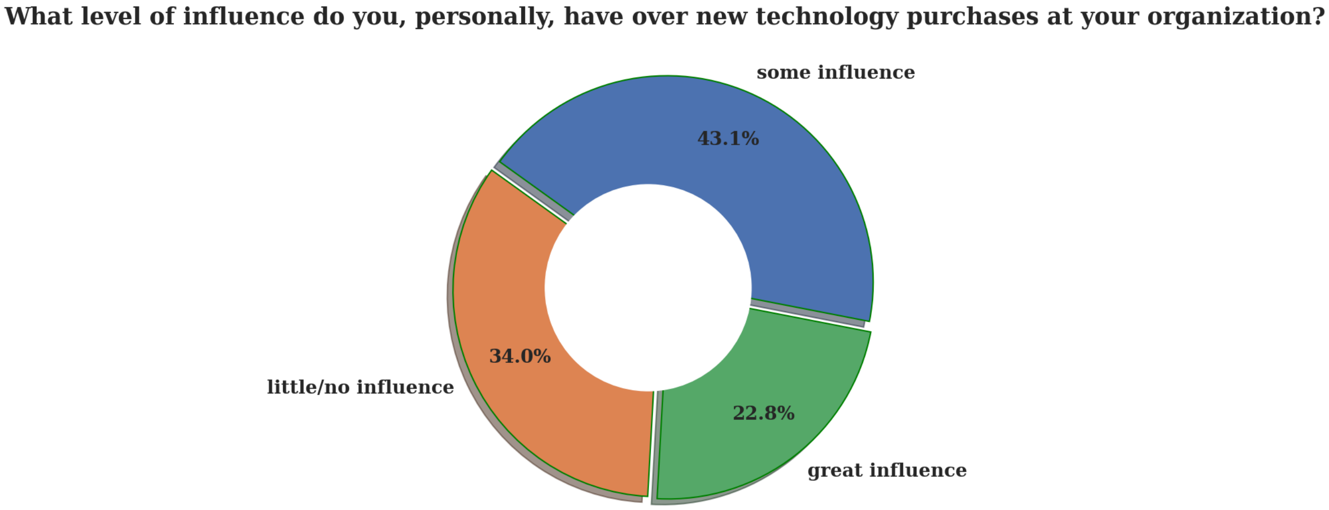
What level of influence developer, have over new technology purchases at your organization?

In [ ]:

```
# PurchaseInfluence
```

In [76]:

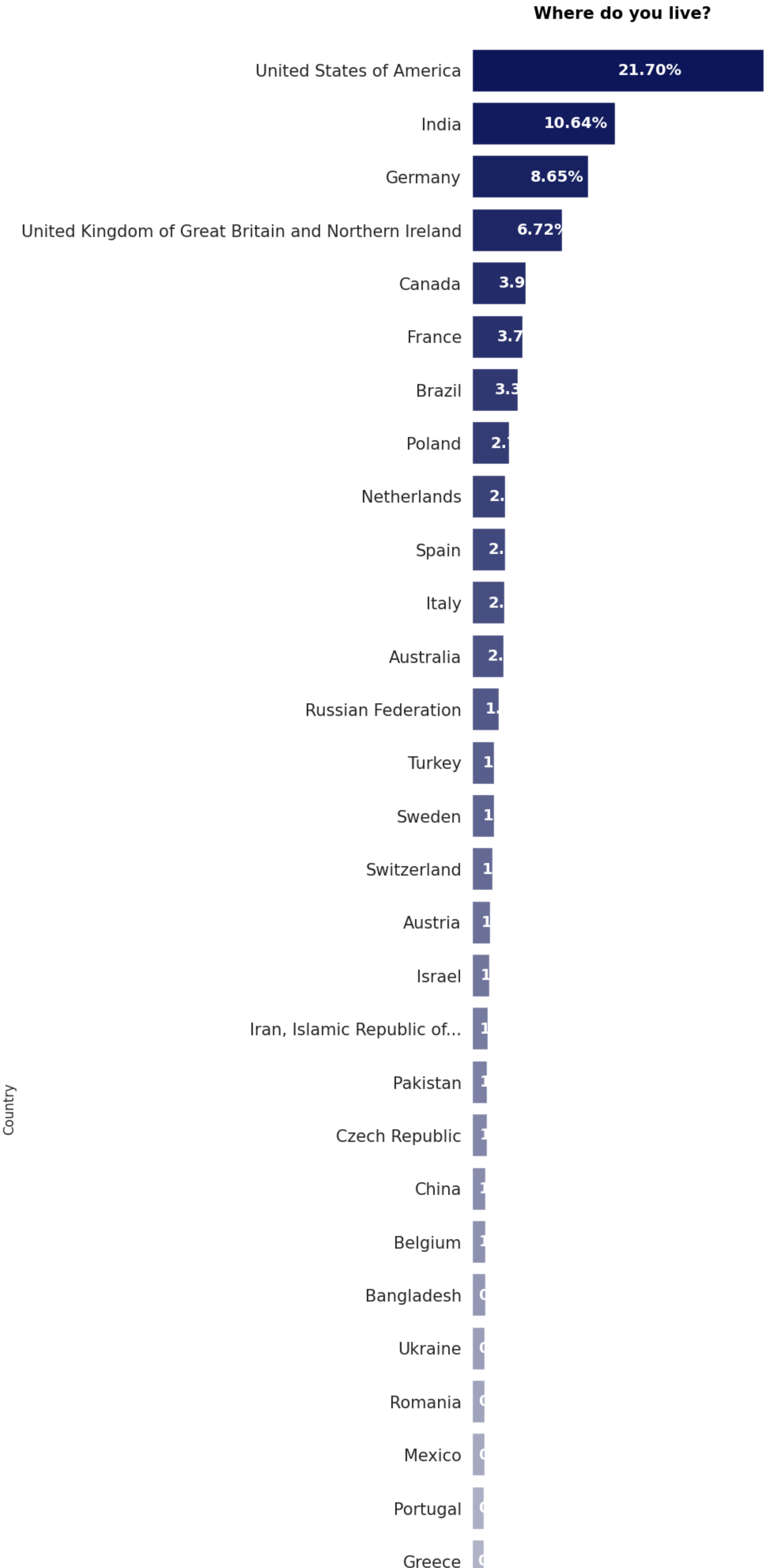
```
def shorten_names(s):
    if s == 'I have some influence':
        return 'some influence'
    elif s == 'I have little or no influence':
        return 'little/no influence'
    elif s == 'I have a great deal of influence':
        return 'great influence'

tech_influence = survey_df.PurchaseInfluence.apply(shorten_names)
tech_influence = tech_influence.value_counts()

plot_pie(data=tech_influence,
         title = schema_df.PurchaseInfluence,
         distance_btwn_pieces=0.03
        )
```



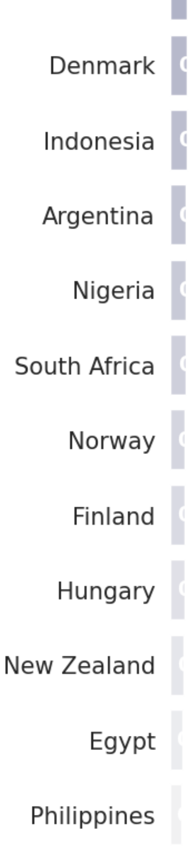
Where do developer live?

In [79]:

```python
country = survey_df.Country.value_counts()[:40]

custom_plot(country, y_label_font_size=15, plot_height=35,
            title= schema_df.Country.split('<')[0],
            color = 'light:#000C66')
```



Where do you live?



Total Responses: 62397

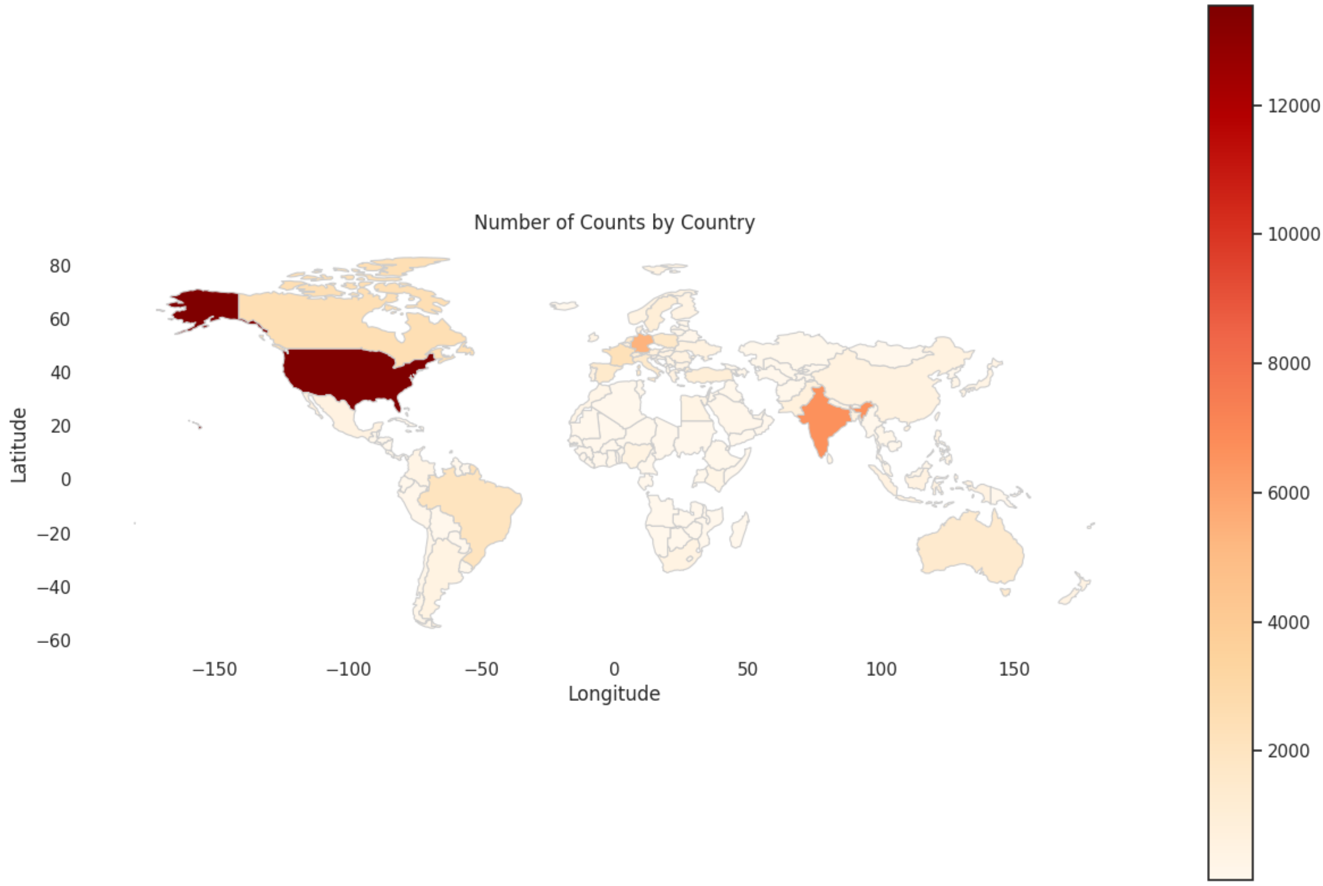
Map plot of country with developer count

```
In [119]: d = survey_df.Country.value_counts().reset_index()
```

```
In [107]: d.to_csv('country_for_map.csv')
```

In [84]:

```
import geopandas as gpd

data = pd.read_csv("country_for_map.csv")

# Load the world map
world = gpd.read_file(gpd.datasets.get_path('naturalearth_lowres'))

# Merge the world map with the data DataFrame
world = world.merge(data, how='left', left_on='name', right_on='Country')

# Plot the map
fig, ax = plt.subplots(1, 1, figsize=(15, 10))
world.plot(column='count', cmap='OrRd', linewidth=0.8, ax=ax, edgecolor='0.8


plt.title('Number of Counts by Country')
plt.xlabel('Longitude')
plt.ylabel('Latitude')

plt.show()
```



Which currency does developer use day-to-day?

In [ ]:

```
# Currency
```

In [85]:

```
schema_df.Currency
```

Out[85]:

```
"Which currency do you use day-to-day? If your answer is complicated, please pi
ck the one you're most comfortable estimating in. *"
```

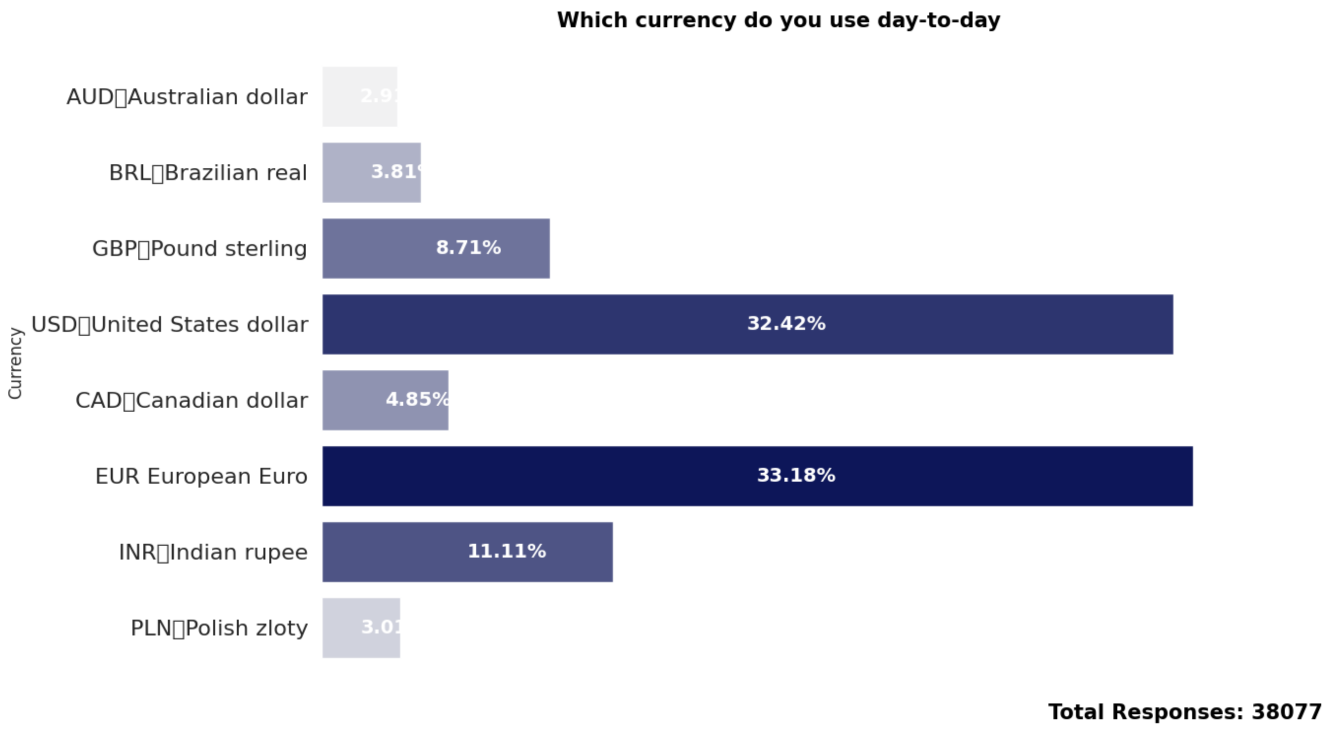
In [ ]:

```

```

```
In [88]: survey_df.Currency.value_counts()
```

```
Out[88]: Currency
EUR European Euro              12634
USD\tUnited States dollar      12346
INR\tIndian rupee               4229
GBP\tPound sterling             3318
CAD\tCanadian dollar            1847
                               ...  
BND\tBrunei dollar                 1
PGK\tPapua New Guinean kina        1
SHP\tSaint Helena pound            1
GIP\tGibraltar pound               1
TOP\tTongan pa'anga                1
Name: count, Length: 142, dtype: int64
```

```
In [97]: currency = survey_df.Currency.value_counts()[:8]
currency = currency.sample(len(currency))

custom_plot(currency, plot_height=8, plot_width=12,
            color = 'light:#000C66',
            title=schema_df.Currency.split('?')[0],
            y_label_font_size=16)
```



VersionControlSystem

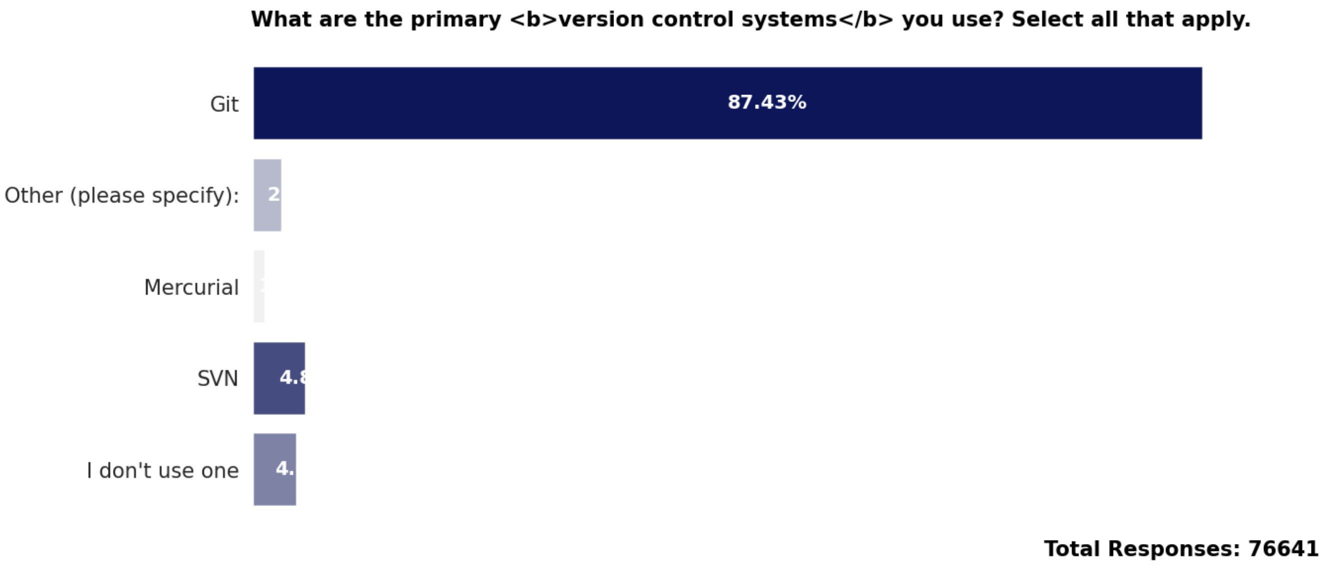
```
In [ ]: # VersionControlSystem
```

```
In [98]: schema_df.VersionControlSystem
```

```
Out[98]: 'What are the primary <b>version control systems</b> you use? Select all that a
pply.'
```

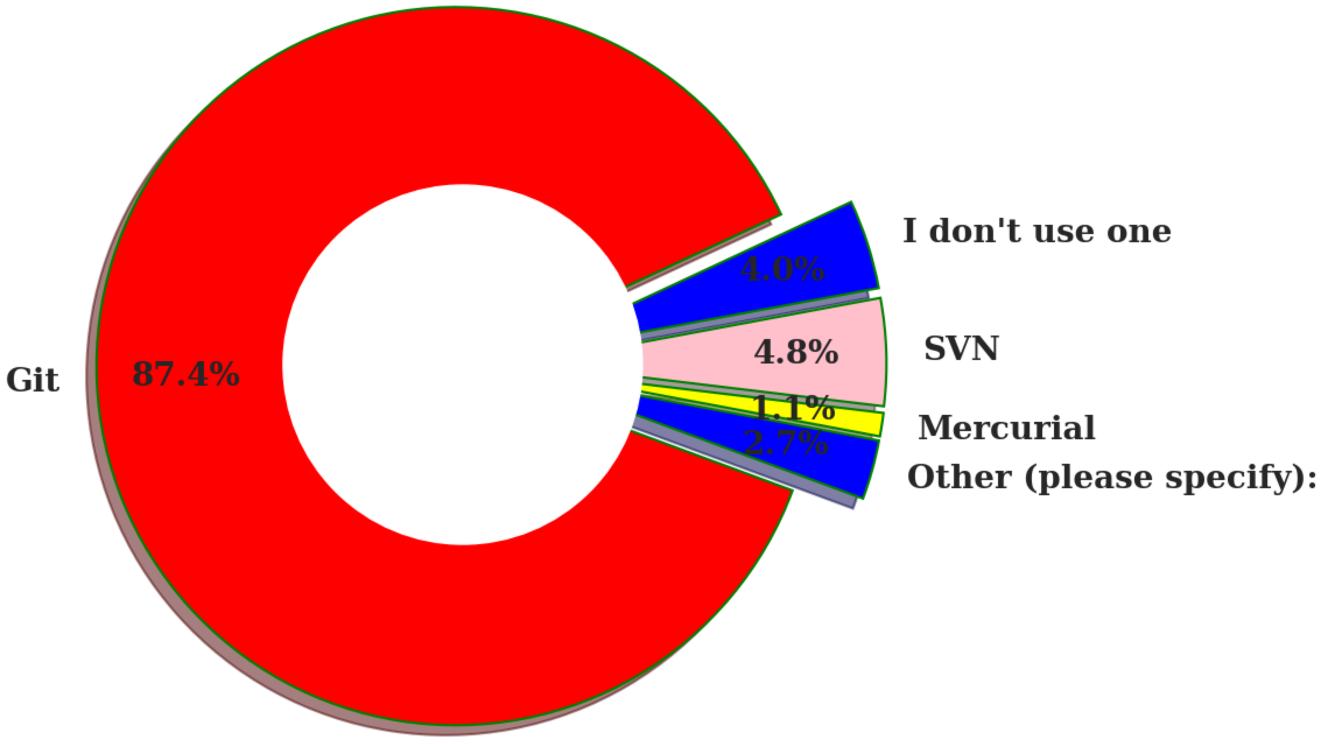
In [102]:

```
vcs = colum_expand(survey_df.VersionControlSystem)

custom_plot(vcs, plot_height=6, plot_width=13, color = 'light:#000C66',
            y_label_font_size=15, title=schema_df.VersionControlSystem)
```



In [105]:

```
plot_pie(vcs, startangle=25,
         distance_btwn_pieces=0.1)
```



what is your gender..?

In [ ]:

```
# Gender
```

In [108]:

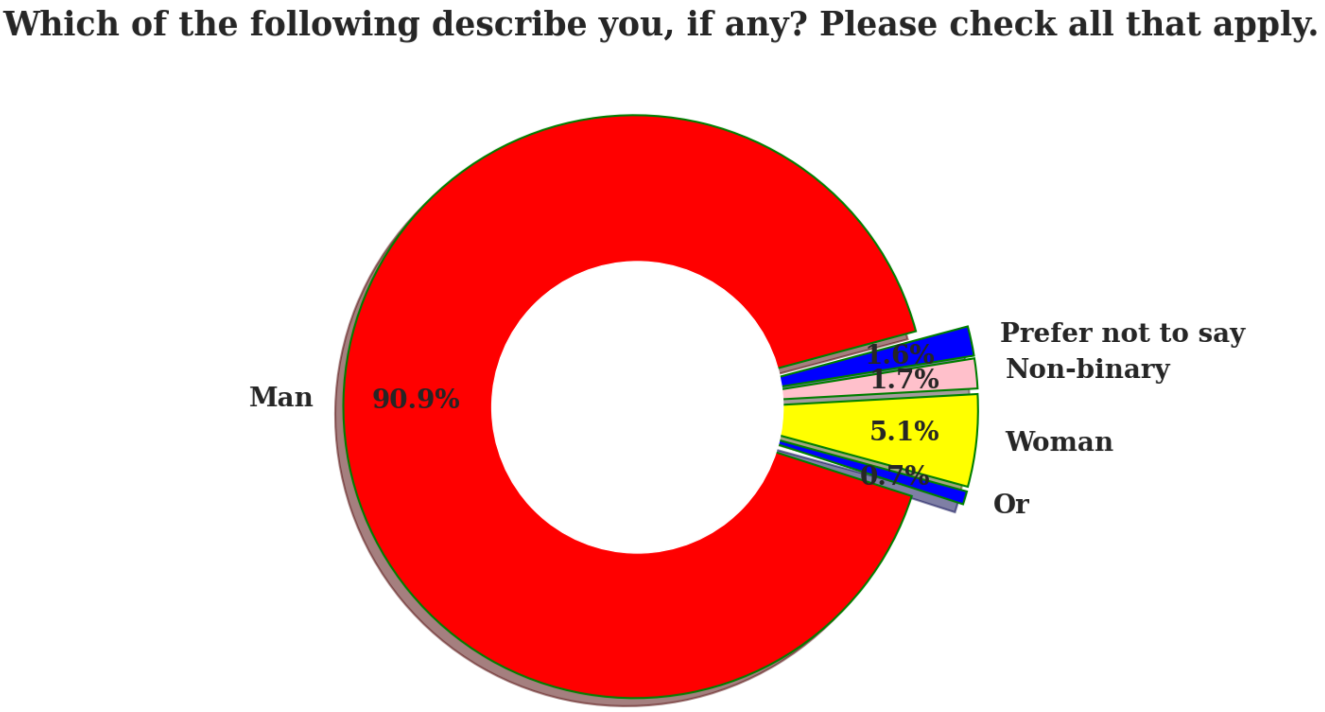
```
colum_expand(survey_df.Gender)
```

Out[108]:

```
Man                                                 65097
Or, in your own words:                                521
Woman                                                3662
Non-binary, genderqueer, or gender non-conforming    1186
Prefer not to say                                    1172
dtype: int64
```

In [109]:

```
gender = colum_expand(survey_df.Gender)

gender.rename( lambda x: x.split(',')[0], inplace=True )

plot_pie(gender,distance_btwn_pieces=0.09, startangle=15,
        title=schema_df.Gender)
```



ethincity of developer

In [ ]:

```
# Ethnicity
```

In [110]:

```
schema_df.Ethnicity
```

Out[110]:

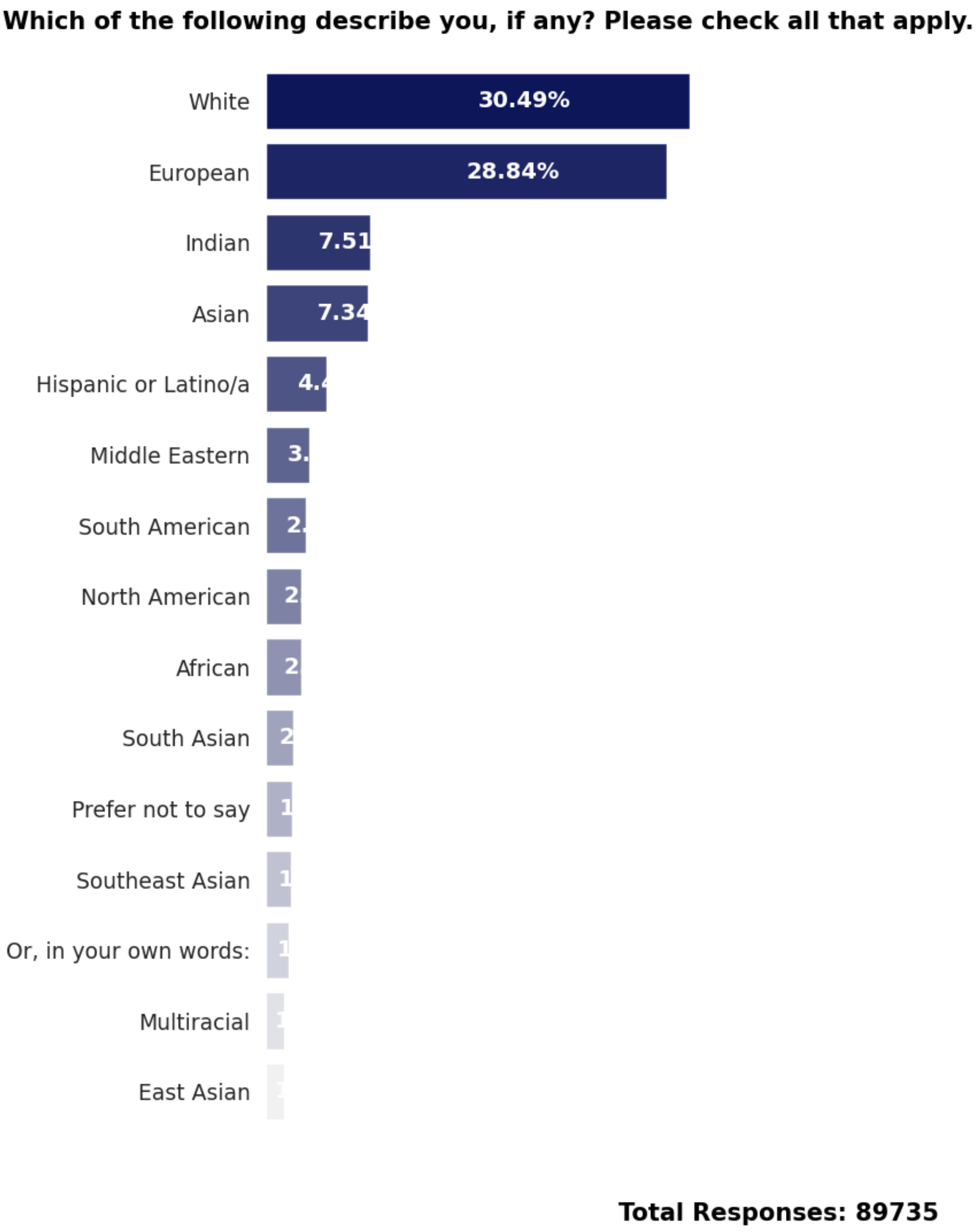
```
'Which of the following describe you, if any? Please check all that apply.'
```

```
In [113]: colum_expand(survey_df.Ethnicity)
```

```
Out[113]: White                                                            27360
          Or, in your own words:                                            1524
          Indian                                                            6739
          European                                                         25877
          North American                                                    2331
          Middle Eastern                                                    2850
          Ethnoreligious group                                               348
          Prefer not to say                                                 1732
          African                                                           2294
          Asian                                                             6586
          East Asian                                                        1214
          Black                                                             1028
          Caribbean                                                          460
          Southeast Asian                                                   1618
          Central American                                                   416
          North African                                                      611
          Hispanic or Latino/a                                              3967
          South American                                                    2624
          South Asian                                                       1797
          I don't know                                                       701
          Multiracial                                                       1222
          Biracial                                                           798
          Indigenous (such as Native American or Indigenous Australian)      330
          Pacific Islander                                                   147
          Central Asian                                                      397
          dtype: int64
```

In [114]:

```
ethincity = colum_expand(survey_df.Ethnicity).nlargest(15)

custom_plot(ethincity, plot_height=12, title=schema_df.Ethnicity, color = 'l
```



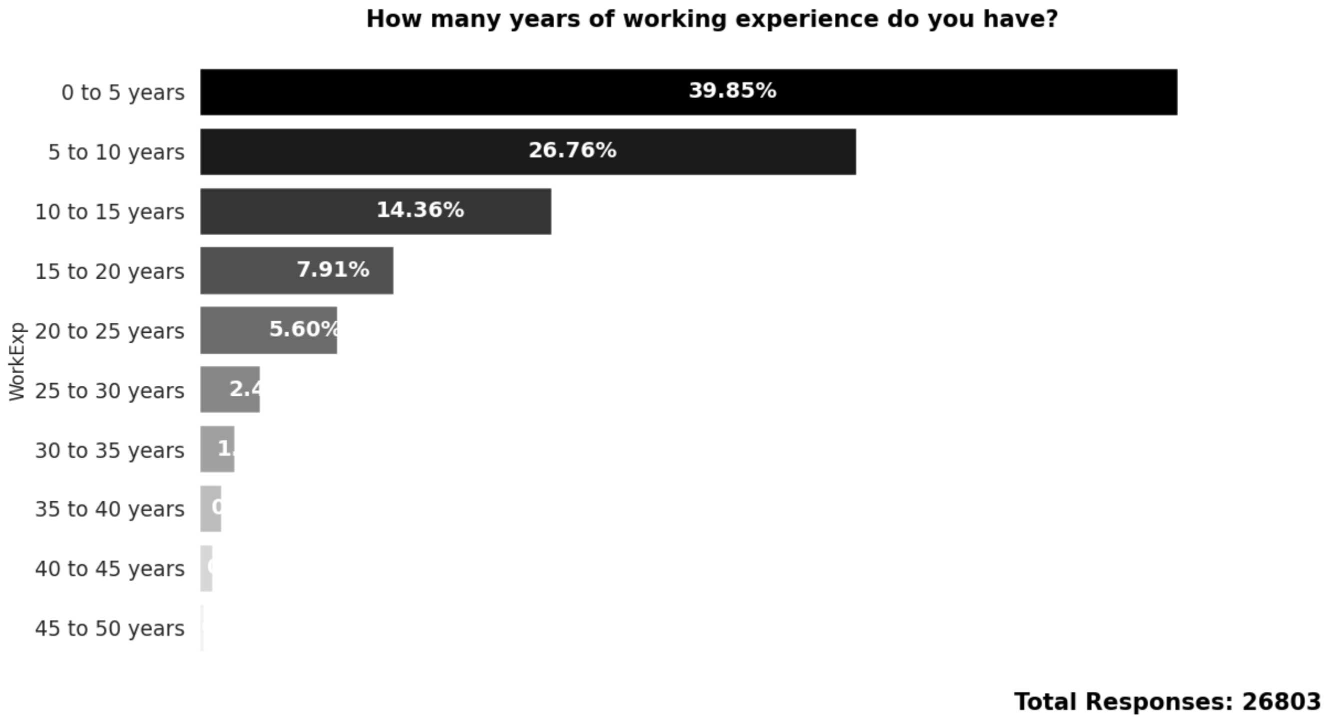
How many years of working experience do you have?

In [ ]:

```
# WorkExp
```

In [121]:

```
work_exp = survey_df.WorkExp.apply(make_groups).value_counts()


custom_plot(work_exp, plot_height=7, plot_width=12, title=schema_df.WorkExp,
```



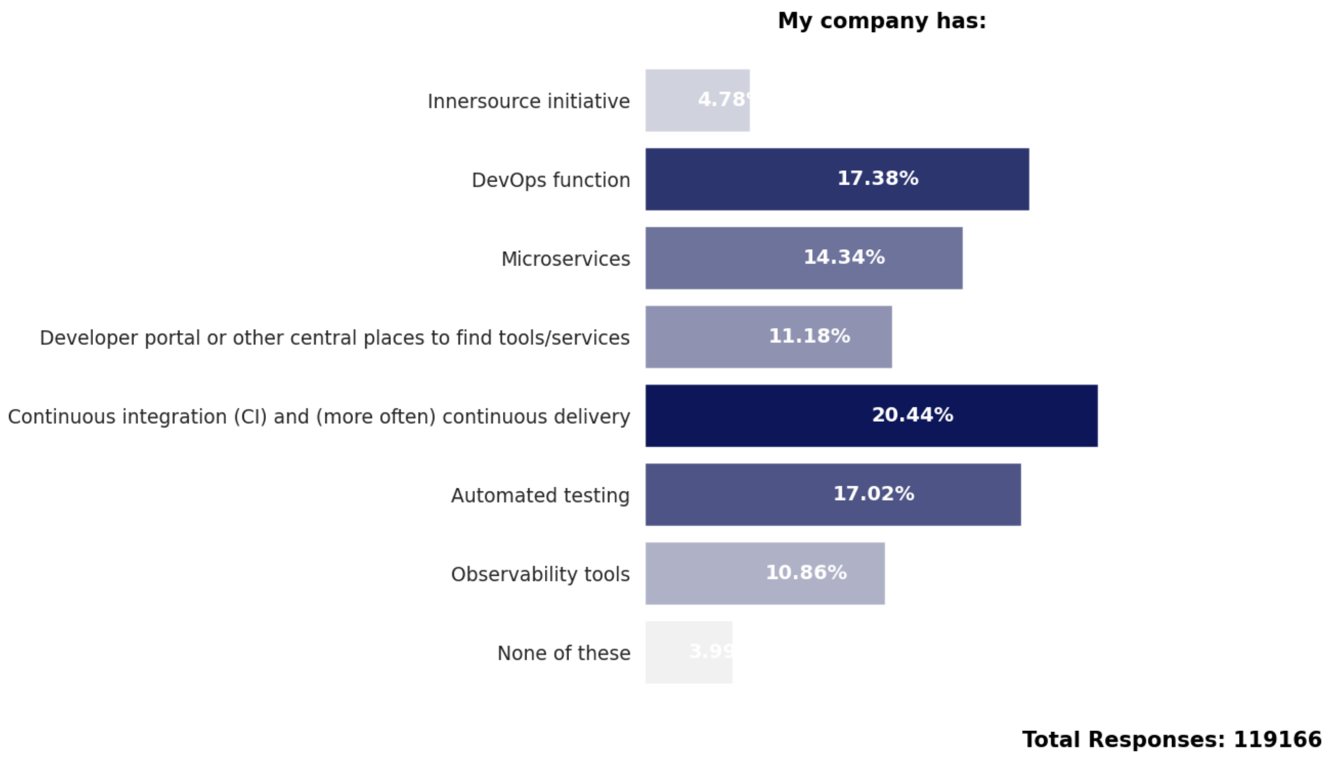
which technologies does your company have?

In [ ]:

```
# ProfessionalTech
```

In [125]:

```python
tech = colum_expand(survey_df.ProfessionalTech)

custom_plot(tech, plot_height=8, plot_width=6, color = 'light:#000C66',
            title=schema_df.ProfessionalTech)
```

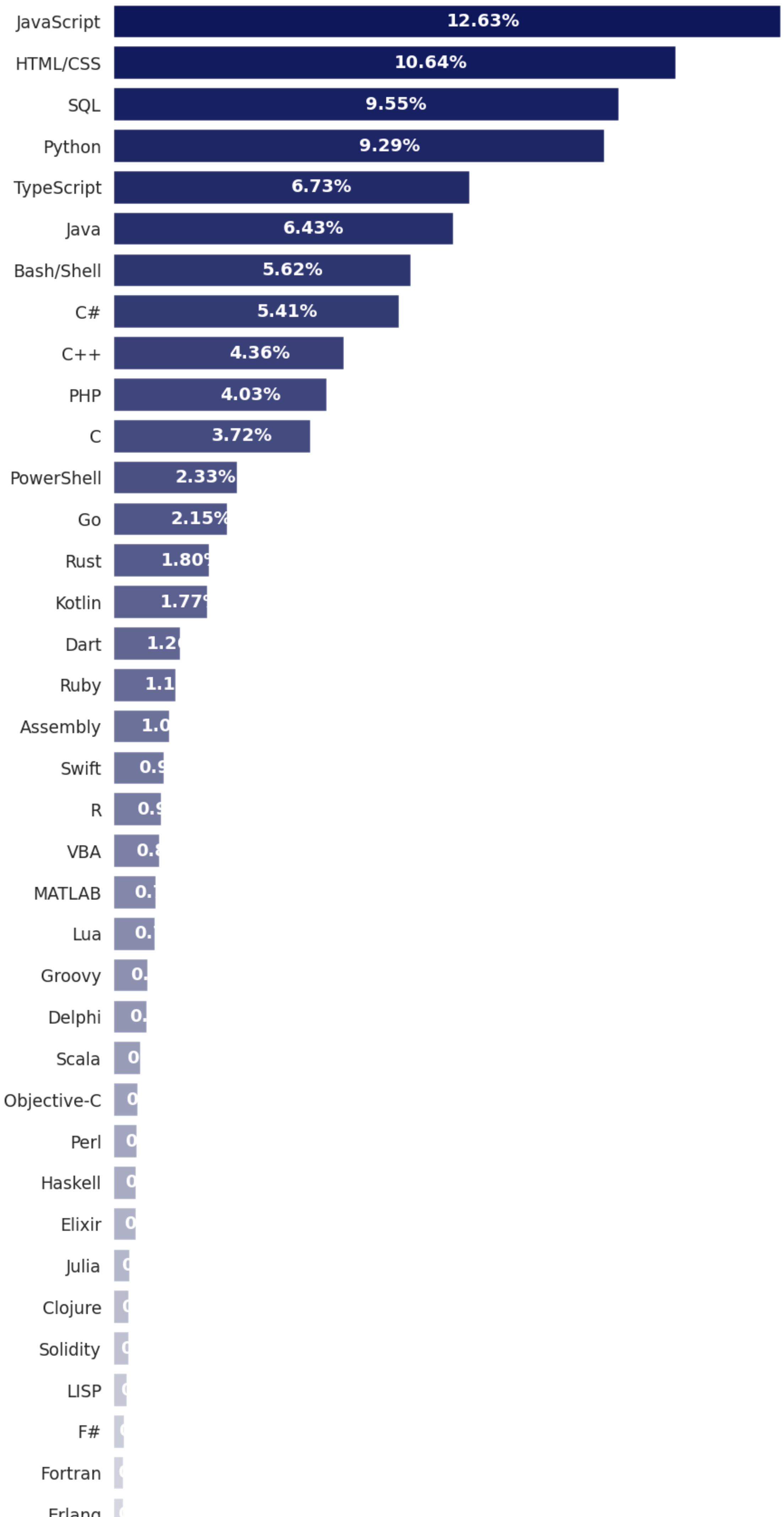


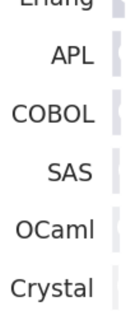
Which programming, scripting, and markup languages have you done extensive development work in over the past year

In [128]:

```
languages = colum_expand(survey_df.LanguageHaveWorkedWith).sort_values(ascen

s = 'Which following languages have you worked with?'

custom_plot(languages, plot_height=25,plot_width=10, title=s,color = 'light:
```

Which following languages have you worked with?





Total Responses: 367821

In [ ]:

```python

```

In [ ]:

```python
survey_df.WebframeHaveWorkedWith      # django flask
survey_df.WebframeWantToWorkWith

survey_df.LanguageWantToWorkWith

survey_df.DatabaseHaveWorkedWith
survey_df.DatabaseWantToWorkWith

survey_df.PlatformHaveWorkedWith
survey_df.PlatformWantToWorkWith

survey_df.MiscTechHaveWorkedWith
survey_df.MiscTechWantToWorkWith

survey_df.ToolsTechHaveWorkedWith
survey_df.ToolsTechWantToWorkWith

survey_df.CompTotal                   # annual income
survey_df['OpSysPersonal use']        # operating system
```

END