In [19]:

```
import pydotplus
import pandas as pd
from IPython.display import Image
from sklearn import tree
import matplotlib.pyplot as plt
from sklearn.cross_validation import train_test_split
from sklearn.metrics import accuracy_score, classification_report
from sklearn.model_selection import cross_val_score
```

In [20]:

```
dataset = pd.read_csv("german_credit.csv")
```

In [21]:

```
# Посмотрим на признаки и их значения
dataset.head()
```

Out[21]:

	target	Account Balance	Duration of Credit (month)	Payment Status of Previous Credit	Purpose	Credit Amount	Value Savings/Stocks	Length of current employment
0	1	1	18	4	2	1049	1	2
1	1	1	9	4	0	2799	1	3
2	1	2	12	2	9	841	2	4
3	1	1	12	4	0	2122	1	3
4	1	1	12	4	0	2171	1	3

5 rows × 21 columns

Строим дерево с помощью sklearn

In [22]:

```
model = tree.DecisionTreeClassifier(max_depth=4)
model.fit(dataset[dataset.columns[1:]], dataset[dataset.columns[0]])
```

Out[22]:

```
DecisionTreeClassifier(class_weight=None, criterion='gini', max_depth=
4,
            max_features=None, max_leaf_nodes=None,
            min_impurity_split=1e-07, min_samples_leaf=1,
            min_samples_split=2, min_weight_fraction_leaf=0.0,
            presort=False, random_state=None, splitter='best')
```

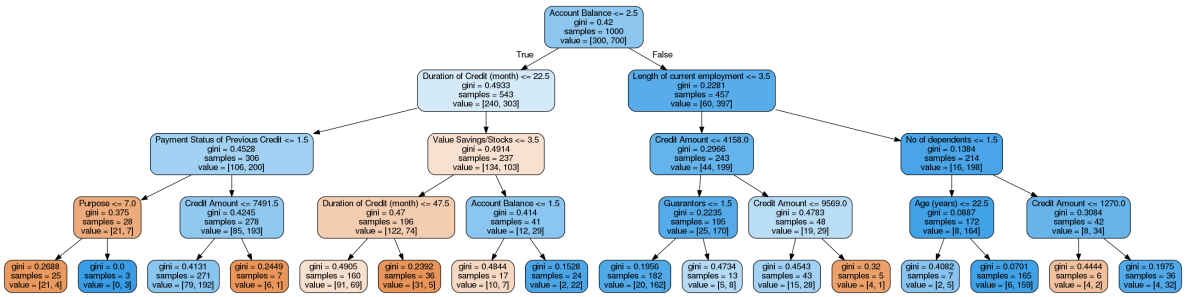
In [23]:

```
dot_data = tree.export_graphviz(model, out_file="tree.out",
                                feature_names=dataset.columns[1:],
                                filled=True, rounded=True)
```

In [24]:

```
graph = pydotplus.graphviz.graph_from_dot_file("tree.out")
Image(graph.create_png())
```

Out[24]:



Я сделала максимальную высоту дерева = 4, иначе ничего не видно.

Проинтерпретируем первые разбиения

Первый признак разбиения: первым делом проверяется размер счета сейчас. Потом в зависимости от его размера спрашивается срок данного кредита или же сведения о нынешней занятости. Вполне логично.

Оценим качество

In [25]:

```
train_data, test_data, train_target, test_target = train_test_split(dataset[dataset
                                                    dataset[dataset.columns[0]], test_s
```

In [26]:

```
model.fit(train_data, train_target)
```

Out[26]:

```
DecisionTreeClassifier(class_weight=None, criterion='gini', max_depth=
4,
            max_features=None, max_leaf_nodes=None,
            min_impurity_split=1e-07, min_samples_leaf=1,
            min_samples_split=2, min_weight_fraction_leaf=0.0,
            presort=False, random_state=None, splitter='best')
```

In [27]:

```
test_predictions = model.predict(test_data)
```

In [28]:

```
print(classification_report(test_target, test_predictions))
```

```
             precision    recall  f1-score   support

          0       0.60      0.49      0.54        57
          1       0.81      0.87      0.84       143

avg / total       0.75      0.76      0.75       200
```

Графики зависимости качества на кросс-валидации и на обучающей выборке от глубины дерева

In [29]:

```
#  построим деревья глубины от 1 до 20
#  для каждого случая посчитаем accuracy и cross_val_score
accuracy = []
cross_val = []

for depth in range(1, 50):
    model = tree.DecisionTreeClassifier(max_depth=depth)
    train_data, test_data, train_target, test_target =
        train_test_split(dataset[dataset.columns[1:]], dataset[dataset.columns[0]],
                                                           test_size = 0.2)
    model.fit(train_data, train_target)
    test_predictions = model.predict(test_data)
    accuracy.append(model.score(dataset[dataset.columns[1:]],
                                dataset[dataset.columns[0]]))
    cross_val.append(cross_val_score(model,
 dataset[dataset.columns[1:]], dataset[dataset.columns[0]], n_jobs=-1, cv=10, scori
```