In [1]:
```
import pandas as pd
import numpy as np
```

In [2]:
```
def f1(a1, a2):
    n = 0
    for i in a1:
        if i in a2:
            n += 1
    for i in a2:
        if i in a1:
            n += 1
    return n
```

In [3]:
```
def f3(a1, a2):
    n = 0
    n = map(lambda x, y: f1(x, y), a1, a2)
    return list(n)
```

In [4]:
```
N = 5
data = pd.DataFrame(np.random.uniform(1,9,(N,2)), columns=['A', 'B'], dtype=str)
%timeit data1 = data['A'].combine(data['B'], f1)
%timeit data1 = data.apply(lambda x: f1(x['A'], x['B']), axis=1)
%timeit data1 = f3(data['A'], data['B'])
%timeit data1 = [f1(x, y) for x, y in zip(data['A'], data['B'])]
%timeit data1 = f3(data['A'].values, data['B'].values)
```

```
218 µs ± 4.19 µs per loop (mean ± std. dev. of 7 runs, 1000 loops each)
698 µs ± 1.07 µs per loop (mean ± std. dev. of 7 runs, 1000 loops each)
37 µs ± 20.5 ns per loop (mean ± std. dev. of 7 runs, 10000 loops each)
36.5 µs ± 26.5 ns per loop (mean ± std. dev. of 7 runs, 10000 loops each)
16.9 µs ± 15.3 ns per loop (mean ± std. dev. of 7 runs, 100000 loops each)
```

In [5]:
```
N = 500
data = pd.DataFrame(np.random.uniform(1,9,(N,2)), columns=['A', 'B'], dtype=str)
%timeit data1 = data['A'].combine(data['B'], f1)
%timeit data1 = data.apply(lambda x: f1(x['A'], x['B']), axis=1)
%timeit data1 = f3(data['A'], data['B'])
%timeit data1 = [f1(x, y) for x, y in zip(data['A'], data['B'])]
%timeit data1 = f3(data['A'].values, data['B'].values)
```

```
13 ms ± 11.7 µs per loop (mean ± std. dev. of 7 runs, 100 loops each)
11.2 ms ± 18.8 µs per loop (mean ± std. dev. of 7 runs, 100 loops each)
1.02 ms ± 1.47 µs per loop (mean ± std. dev. of 7 runs, 1000 loops each)
982 µs ± 733 ns per loop (mean ± std. dev. of 7 runs, 1000 loops each)
1.01 ms ± 1 µs per loop (mean ± std. dev. of 7 runs, 1000 loops each)
```

In [ ]:
```
N = 50000
data = pd.DataFrame(np.random.uniform(1,9,(N,2)), columns=['A', 'B'], dtype=str)
%timeit data1 = data['A'].combine(data['B'], f1)
%timeit data1 = data.apply(lambda x: f1(x['A'], x['B']), axis=1)
%timeit data1 = f3(data['A'], data['B'])
%timeit data1 = [f1(x, y) for x, y in zip(data['A'], data['B'])]
%timeit data1 = f3(data['A'].values, data['B'].values)
```

```
1.29 s ± 3.74 ms per loop (mean ± std. dev. of 7 runs, 1 loop each)
1.04 s ± 2.83 ms per loop (mean ± std. dev. of 7 runs, 1 loop each)
99.6 ms ± 58.6 µs per loop (mean ± std. dev. of 7 runs, 10 loops each)
96.7 ms ± 121 µs per loop (mean ± std. dev. of 7 runs, 10 loops each)
```