Unboxing Default Argument Breaking Changes in Scikit Learn

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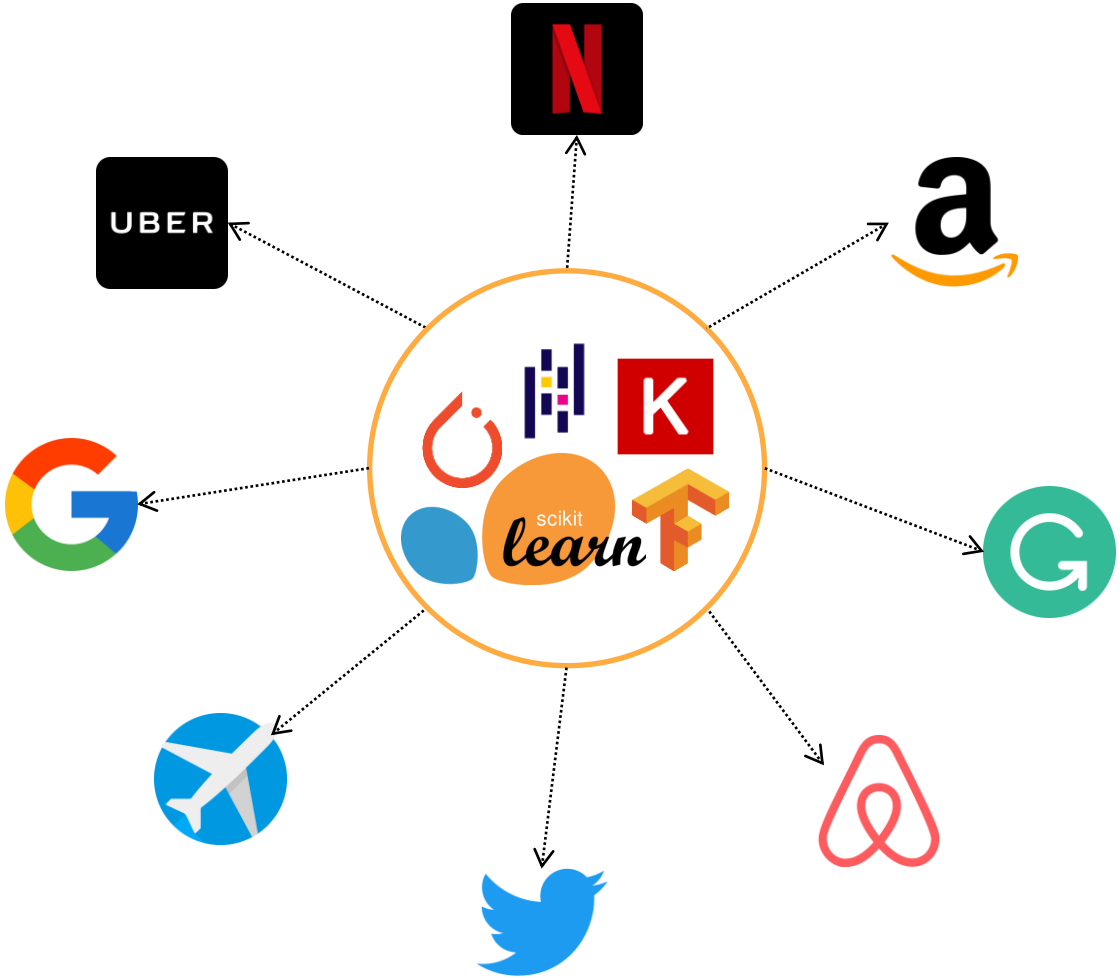
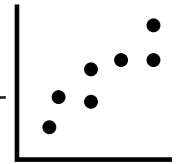

UBER
scikit
learn

```python
from sklearn.svm import SVC

X_train, X_test, y_train, y_test = ...

clf = SVC() # Just this?

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



15 parameters!

```
class SVC(BaseSVC):
    """ ... """
    def __init__(
        self, *, C=1.0, kernel="rbf", degree=3, gamma="auto",
        coef0=0.0, shrinking=True, probability=False, tol=1e-3,
        cache_size=200, class_weight=None, verbose=False, max_iter=-1,
        decision_function_shape="ovr", break_ties=False, random_state=None
    ):
```

```
clf = SVC() # How?
```

```
class SVC(BaseSVC):
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    ):
```

Default Argument Values!

```
clf = SVC() # SWEEET!
```

Changed in version 0.22: The default value of `gamma` changed from 'auto' to 'scale'.

```
class SVC(BaseSVC):
    """ ... """
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    ):
```

```
clf = SVC() # Wait... NOOOOO!
```

Changed in version 0.22: The default value of `gamma` changed from 'auto' to 'scale'.

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class SVC(BaseSVC):
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```

Default Argument Breaking Change (DABC)

```
clf = SVC() # Wait... NOOOOO!
```

Investigate the occurrence of DABCs in Scikit-Learn

Library

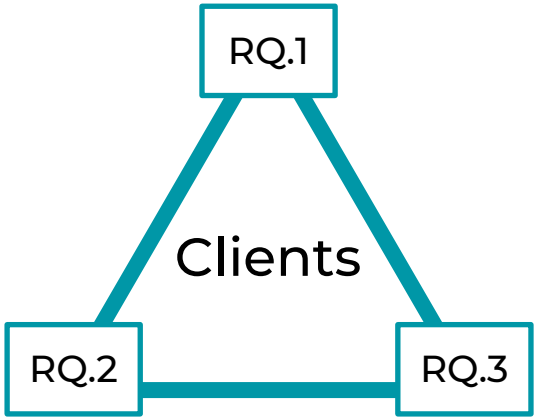
RQ.1: What are the Most Common DABCs?

RQ.2: In which version the DABCs were introduced?

RQ.3: In which modules the DABCs were introduced?

Clients

RQ.4: How clients are vulnerable to DABCs?



Library

On October 11th, 2022.

1. Cloned scikit-learn repository
2. Checked-out version 1.1.2 (latest public release)
3. Looked for `/\.\.versionchanged:: .+/` regex
4. Manually removed unrelated ones

```
class SVC(BaseSVC):
    """C-Support Vector Classification.
    ...
    Parameters
    ----------
    ...
    gamma : {'scale', 'auto'} or float, default='scale'
        Kernel coefficient for 'rbf', 'poly' and 'sigmoid'.

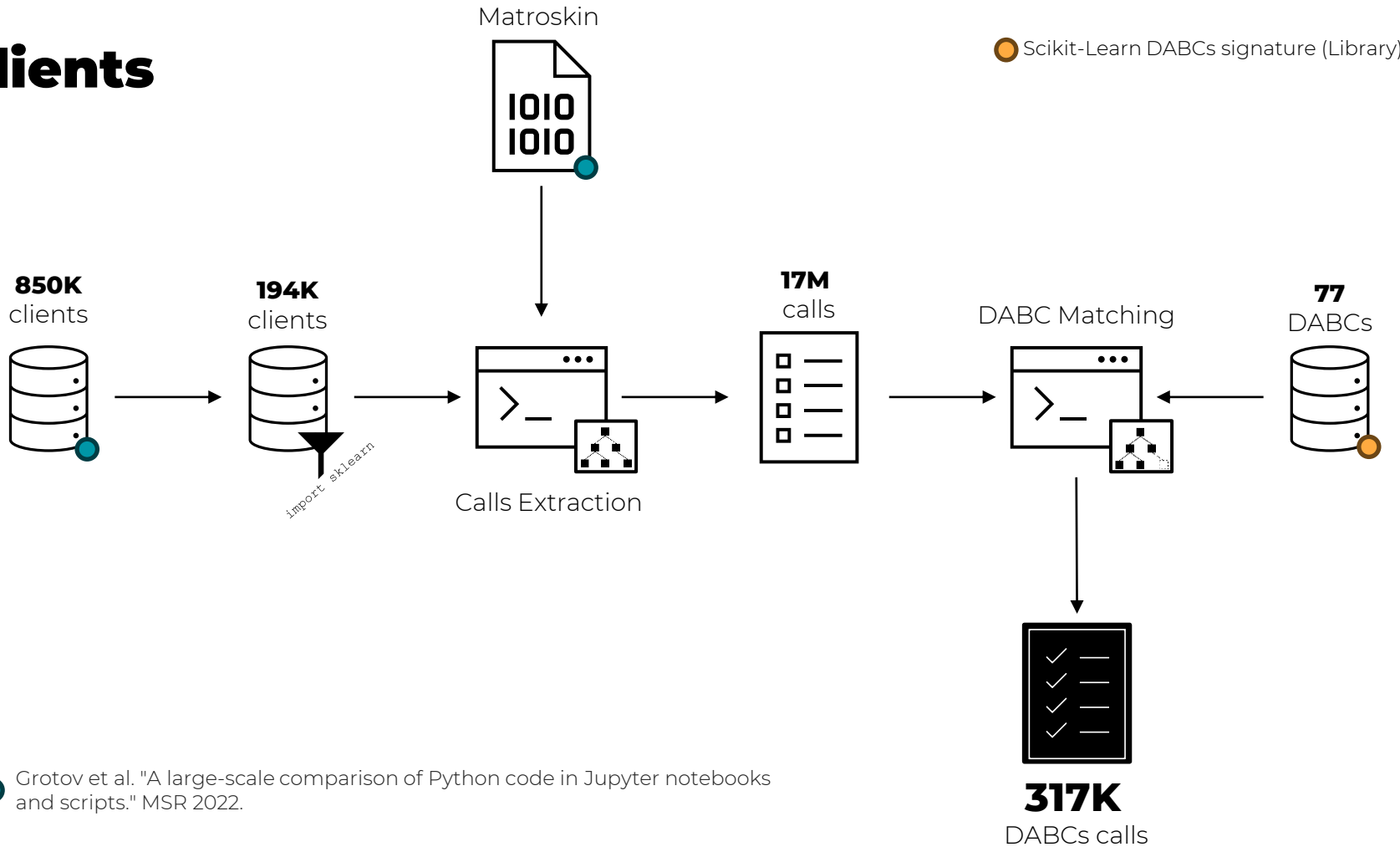
        - if ``gamma='scale'`` (default) is passed then it uses
          1 / (n_features * X.var()) as value of gamma,
        - if 'auto', uses 1 / n_features
        - if float, must be non-negative.

        .. versionchanged:: 0.22
           The default value of ``gamma`` changed from 'auto' to 'scale'.
    """
```

Library

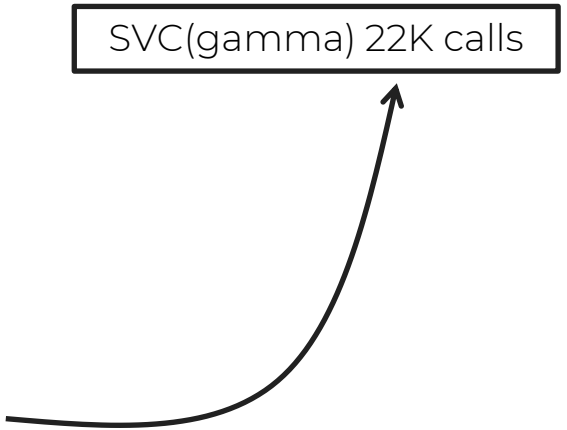
- **[RQ.1]** 77 DABCs in total.
- **[RQ.1]** 56 DABCs in class constructors.
- **[RQ.2]** DABCs in all majors between 0.19 and 1.1.
- **[RQ.3]** Model Training and Evaluation gather 79% of all DABCs

Clients



Grotov et al. "A large-scale comparison of Python code in Jupyter notebooks and scripts." MSR 2022.

Clients



- 10 DABCs concentrate 250K (79%)DABC calls.
- 67K (35%) clients are vulnerable.
- 312K (98%) calls deal with Model Training and Evaluation.

To Takeaway

- **[Researchers]** DABCs are a reality.
- **[Maintainers]** Default Arguments updates should follow strict version guidelines.
- **[Clients]** Avoid relying on default values.

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Unboxing Default Argument Breaking Changes in Scikit Learn (SCAM 2023)