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# Scikit-mine: A pattern mining library in Python

Peggy Cellier

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# Scikit-mine

## A pattern mining library in Python

### 1. About the Scikit-mine project

#### 01. Context



Pattern mining tools  
(e.g., not exhaustive [2,3,4])

- Algorithms for discovering regularities
- Exploratory data science
- Unsupervised algorithms
- Tools not always easy to handle
- Mostly C/C++/Java implementations
- No popular libraries for easy combination with other Python libraries



- Machine learning library
- Mostly supervised algorithms
- Python
- Huge popularity
- Supported by Inria

#### 02. Project Scikit-mine

The Scikit-mine library [5]

- Focus on recent **MDL-based** pattern mining approaches [6]
  - Output few and meaningful patterns
  - Back up by Information Theory/statistics
- Python library **compatible with scikit-learn**
  - Easy to use for data scientists and practitioners
- Project started in January 2020
- 4 engineers worked on it



- <https://scikit-learn.org/stable/>
- <https://www.cs.waikato.ac.nz/ml/weka/>
- <https://www.knime.com>
- <https://www.philippe-fournier-viger.com/spmf/>
- <https://github.com/scikit-mine/scikit-mine>

### 3. What next?

Currently we are working on

- Adding more MDL-based algorithms (e.g., for graph datasets GraphMDL [10])
- Adding new Jupyter notebooks on medical/biology workflows (BidsProv project)

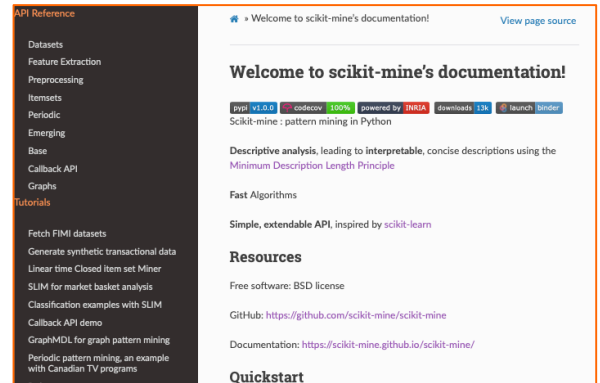
Further works

- Algorithms based on subjective interestingness [11]

### 4. Want to get involved?

Several ways to contribute

- Tutorials:** documentation is key
  - Tell us your success stories in pattern mining
  - We will turn the most impactful/pedagogic ones in public notebooks
- Development**
  - Implementation of algorithms
  - Mining speed will be important => Code reviews
- Other ideas?**
  - Contact us!



### 2. How to use it

Scikit-mine is a Python module for pattern mining built on top of Pandas/Numpy/SciPy.

- Easy installation with pypi `pip install https://github.com/scikit-mine/scikit-mine.git`
- Lot of tutorials (as Jupyter notebooks) and documentation online

Itemset mining	<p><b>LCM [7]</b> LCM is a classical itemset mining algorithm to efficiently extract <b>frequent closed itemsets</b>.</p>	<pre>&gt;&gt;&gt; from skmine.itemsets import LCM &gt;&gt;&gt; from skmine.datasets.fimi import fetch_chess &gt;&gt;&gt; chess = fetch_chess() &gt;&gt;&gt; lcm = LCM(min_supp=2000) &gt;&gt;&gt; patterns = lcm.fit_transform(chess) &gt;&gt;&gt; patterns.head() itemset support 0 [58] 3195 1 [52] 3185</pre>
Itemset mining	<p><b>SLIM [8]</b> SLIM is an MDL-based algorithm for the extraction of a set of itemsets that are well representative of the dataset.</p>	<pre>&gt;&gt;&gt; from skmine.itemsets import SLIM &gt;&gt;&gt; D = [{"bananas", "milk"}, {"milk", "bananas"}, {"cookies", "butter"}, {"tea"}] &gt;&gt;&gt; SLIM().fit(D).transform(D, singletons=True, return_tids=True) itemset tids 0 [bananas, milk] (0, 1) 1 [butter, tea] (2) 2 [cookies] (1, 2)</pre>
Sequence mining	<p><b>Periodic Pattern Mining [9]</b> The Periodic Pattern Mining algorithm is an MDL-based algorithm for extracting a set of periodic cycles from event logs that characterises the periodic structure present in the data.</p>	<pre>&gt;&gt;&gt; from skmine.periodic import PeriodicPatternMiner &gt;&gt;&gt; import pandas as pd &gt;&gt;&gt; S = pd.Series("ring_a_bell", [10, 20, 32, 40, 60, 79, 100, 240]) &gt;&gt;&gt; pcm = PeriodicPatternMiner().fit(S) &gt;&gt;&gt; pcm.transform(S) t0 pattern repetition_major period_major sum_E 0 20 (ring_a_bell)[r=5 p=20] 5 20 2</pre>
Example	<p><b>Classification examples with SLIM</b></p> <ul style="list-style-type: none"> <li>An integrated classifier in Scikit-mine is available and allows to solve binary and multiclass problems.</li> <li>It uses the SLIM compression algorithm.</li> <li>To use it, we need to have adiscretized dataset</li> </ul>	<p>In the example</p> <ul style="list-style-type: none"> <li>Scikit-learn to prepare the dataset</li> <li>Scikit-mine to learn a classifier</li> <li>Scikit-learn for the cross validation</li> </ul> <pre>from sklearn.model_selection import train_test_split (X_train, X_test, y_train, y_test) = train_test_split(X, y, random_state=1, test_size=0.2, shuffle=True) from skmine.itemsets.slim_classifier import SlimClassifier items = set(item for transaction in X for item in transaction) print("items", items) clf = SlimClassifier(items=items) clf.fit(X_train, y_train) from sklearn.model_selection import cross_val_score cross_validation = cross_val_score(clf, X, y, cv=10) print(f"&gt;= 10 Cross validation: (cross_validation.round(2))") print(f"&gt;= Mean Accuracy : {round(cross_validation.mean()*100,1)} %") -&gt; 10 Cross validation: [0.93 0.93 0.87 0.93 0.93 1. 1. 1. 0.93] -&gt; Mean Accuracy : 94.7 %</pre>

Contact [skm-dev@inria.fr](mailto:skm-dev@inria.fr)

#### Contributors

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| <p><b>CNRS</b></p> <ul style="list-style-type: none"> <li>Thomas Betton</li> <li>Hermann Courteille</li> <li>Cyril Regan</li> </ul> <p><b>Inria</b></p> <ul style="list-style-type: none"> <li>Rémi Adon</li> <li>Luis Galárraga</li> </ul> <p><b>University of Eastern Finland</b></p> <ul style="list-style-type: none"> <li>Esther Galbrun</li> </ul> | <p><b>University of Rennes 1</b></p> <ul style="list-style-type: none"> <li>Mensah-David Assigbi</li> <li>Francesco Bariatti</li> <li>Arnaud-Cyriaque Djedjemel</li> <li>Josie Signe</li> <li>Alexandre Termier</li> </ul> <p><b>INSIA Rennes</b></p> <ul style="list-style-type: none"> <li><a href="#">Peggy Cellier</a> (speaker)</li> </ul> |
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GitHub:  
<https://github.com/scikit-mine/scikit-mine>  
Documentation:  
<https://scikit-mine.github.io/scikit-mine/>

