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**Neurospin + INRIA**: statistical learning and inference for brain imaging

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Project vision and goals

Machine learning for applications and non-experts

- Focus on ease of use
- Light and easy-to-install package
- A general-purpose high-level language: **Python**

... with high standards

- State of the art algorithms
- High-quality bindings: performance and fine control

Open source

- BSD licensed
- Community-driven
API and design

Design principles

- Minimize number of different object interfaces
- Build abstractions for recurrent use cases
- Simplicity, simplicity, simplicity
  (no framework, no pipelines, no dataset objects)

Code sample

```python
from scikits.learn import svm
classifier = svm.SVC()
classifier.fit(X_train, Y_train)
Y_test = classifier.predict(X_test)
```
API and design

- All objects
  \[ \text{estimator.fit}(X_{\text{train}}, Y_{\text{train}}) \]

- Classification, regression, clustering
  \[ \text{Y}_{\text{test}} = \text{estimator.predict}(X_{\text{test}}) \]

- Filters, dimension reduction, latent variables
  \[ \text{X}_{\text{new}} = \text{estimator.transform}(X_{\text{test}}) \]

- Predictive models, density estimation
  \[ \text{test.score} = \text{estimator.score}(X_{\text{test}}) \]

- One day: on-line estimation
  \[ \text{estimator.refit}(X_{\text{train}}, Y_{\text{train}}) \]
Main features and algorithms

Supervised learning

■ SVM – high-quality LibSVM bindings
■ Sparse regression: Lasso and Elastic Net – Coordinate descent and LARS
■ Logistic Regression (L1 & L2) – LibLinear bindings
■ K-Nearest Neighbors: – Ball-Tree
■ . . .

Unsupervised learning

■ Gaussian mixtures models (work in progress)
To wrap up...

Scikit Learn:
- Machine learning without learning the machinery
- Focus on readability and simplicity of code:
  optimize only the critical parts
  code review
  unit testing
  coding standards

Well-suited for applications
- We use it on large datasets
- Building blocks for application-specific algorithms

Suggestions welcomed

http://scikits-learn.sf.net