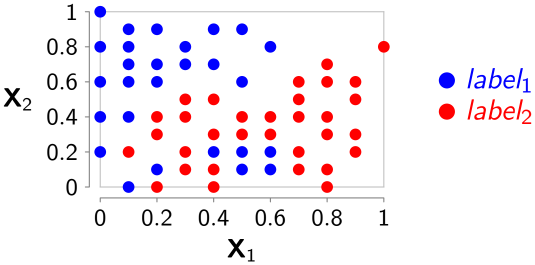
`libconform` v0.1.0: a Python library for conformal prediction

Jonas Faßbender

Conformal prediction

Conformal prediction



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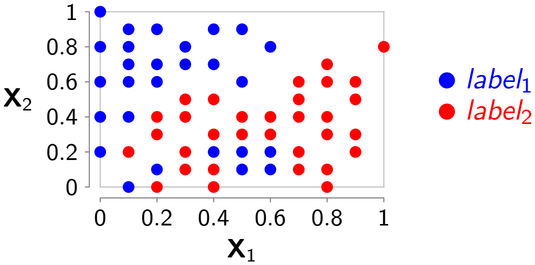

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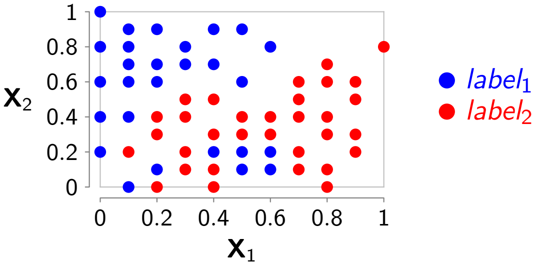

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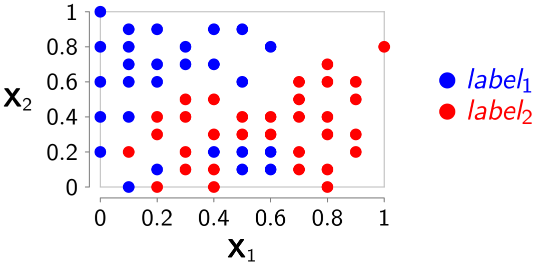

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- Example space $\mathbf{Z} := \mathbf{X} \times \mathbf{Y}$

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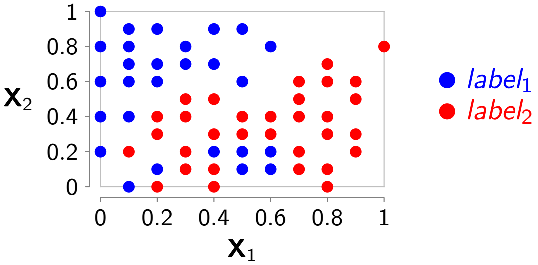

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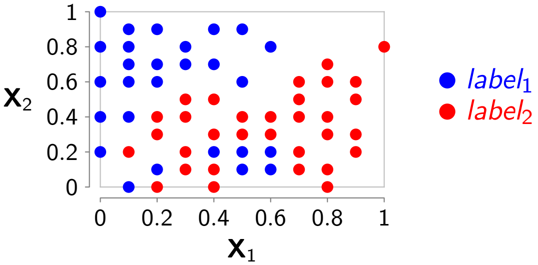

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- Datensatz $\wr z_1, \dots, z_n \int$

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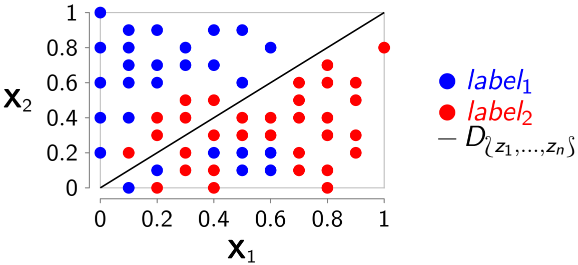

- Klassischer Machine Learning Predictor $D_{\wr z_1,\ldots,z_n \int}$

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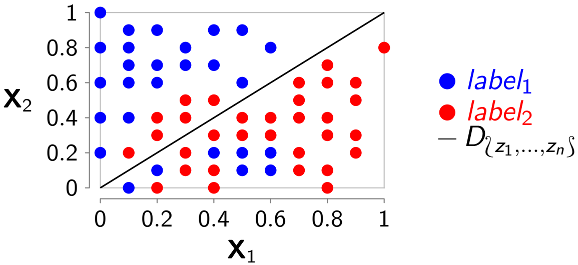

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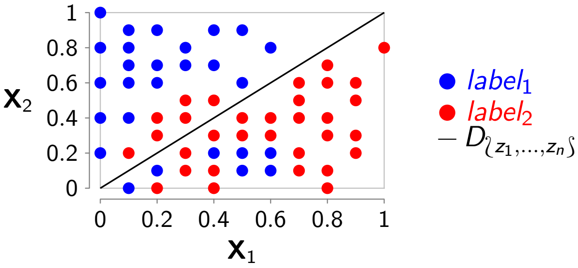

- Klassischer Machine Learning Predictor $D_{\wr z_1,\ldots,z_n \int}$
- Bare predictions, kein confidence Wert in prediction
- Kann zu sog. nonconformity measure umgewandelt werden (Basis von CP)

Conformal prediction

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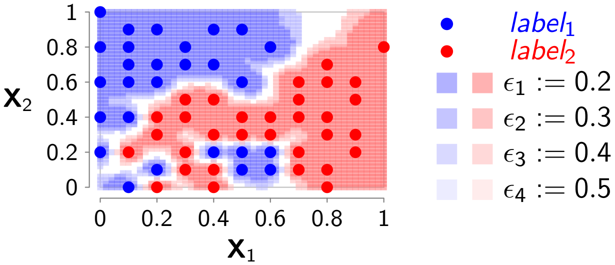

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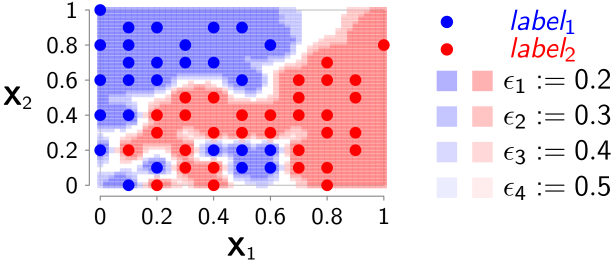

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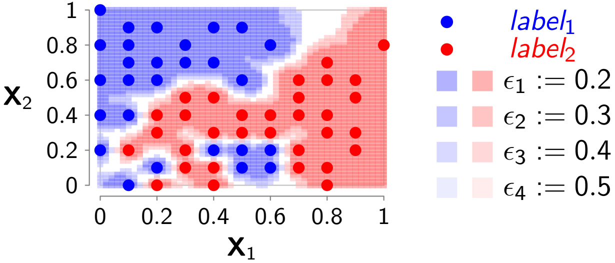

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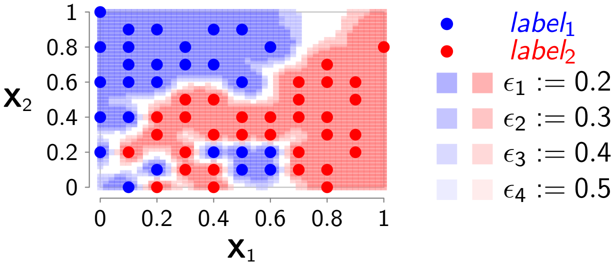

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- $\Gamma^{\epsilon}_{\wr z_1,\ldots,z_n \int}$ hat Genauigkeit von mindestens $1-\epsilon$ (wenn $z_1,\ldots,z_n$ exchangeable)
- In Realität: wahre exchangeablility selten, aber meistens nah genug dran

libconform

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```
import numpy as np
from libconform import CP
from libconform.ncs import
   NCSKNearestNeighbors

from sklearn.datasets import load_iris

X, y = load_iris(True)

# randomly permute X, y
indices = np.arange(len(X))
np.random.shuffle(indices)

X, y = X[indices], y[indices]

# split in train and test data set
X_train, y_train = X[:-20], y[:-20]
X_test,  y_test  = X[-20:], y[-20:]

ncs = NCSKNearestNeighbors(n_neighbors=1)
epsilons = [0.01, 0.02, 0.03, 0.04, 0.05]
cp = CP(ncs, epsilons)

cp.train(X_train, y_train)

res = cp.score(X_test, y_test)
print(res)
```

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- Grundlegensten Algorithmen der CP-Familie implementiert (CP, smoothed CP, inductive CP, mondrian CP, RRCM, Venn prediction,...)

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- Single-threaded und langsam
- Weitere Algorithmen der CP-Familie implementieren (aggregated CP cross-conformal prediction, Venn-Abers,...)
- Mehr nonconformity scores

Vielen Dank

Bei Interesse:

- `https://github.com/jofas/conform/`
- jonas@fassbender.dev