

Conform Prediction in Practice with PUNCC

Joseba DALMAU

Mouhcine MENDIL

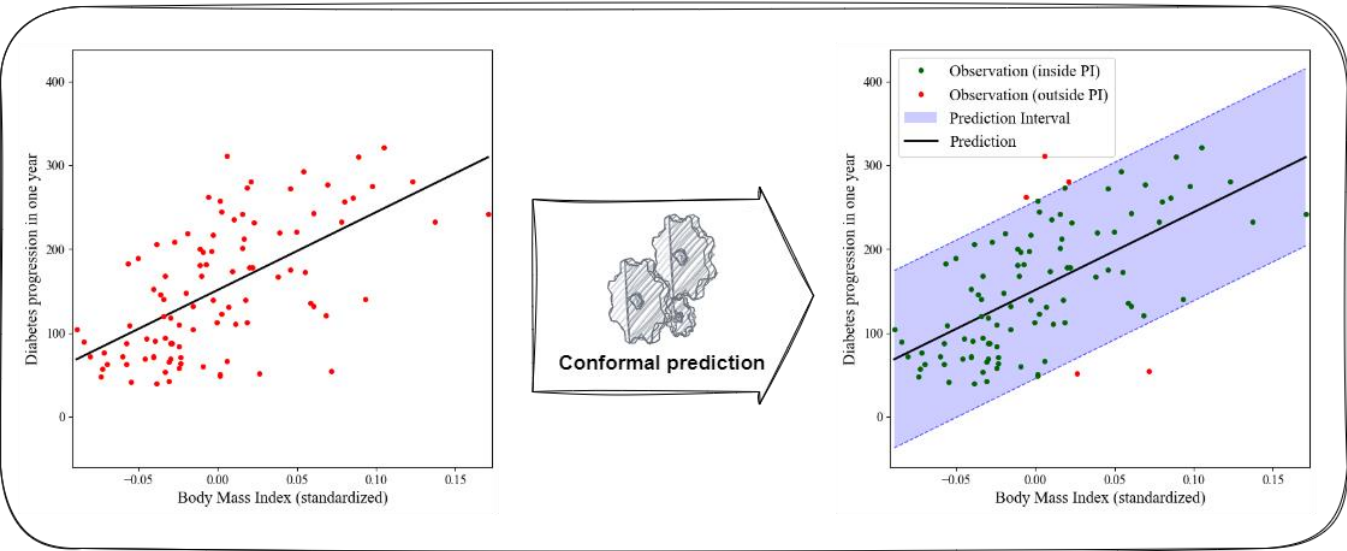
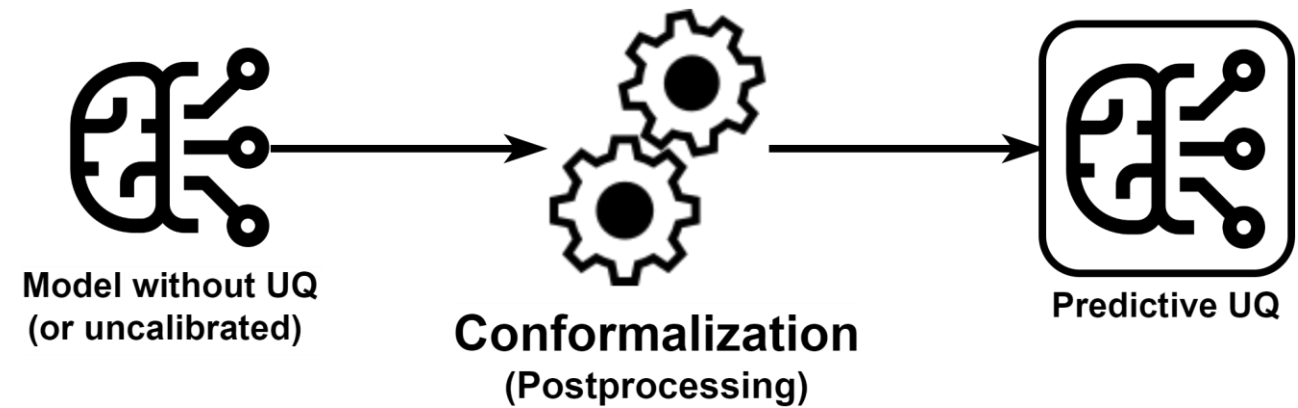


Hands-on Tutorial

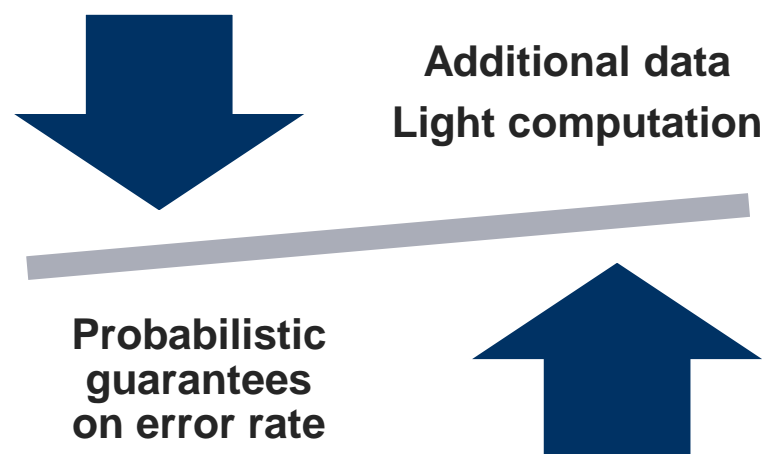
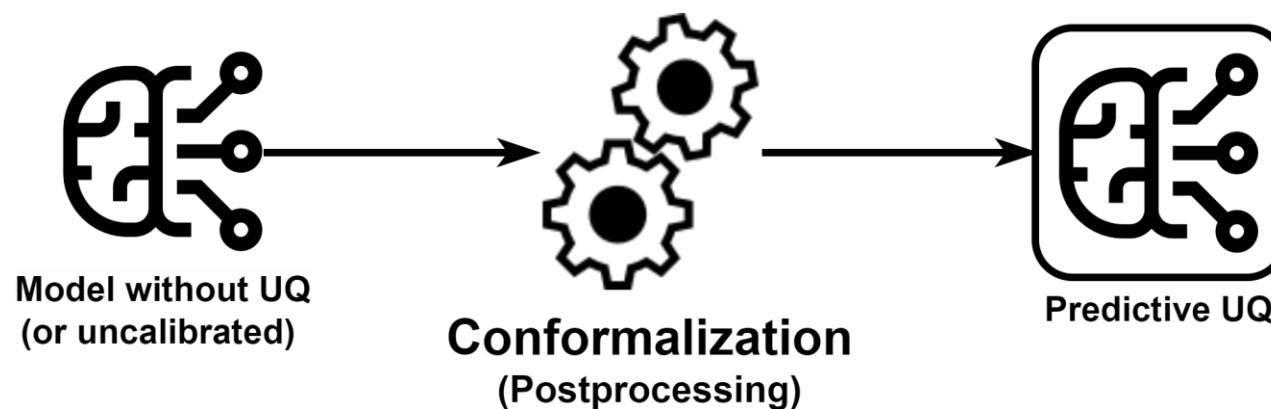


<https://github.com/M-Mouhcine/puncc-tutorial-pfia2024>

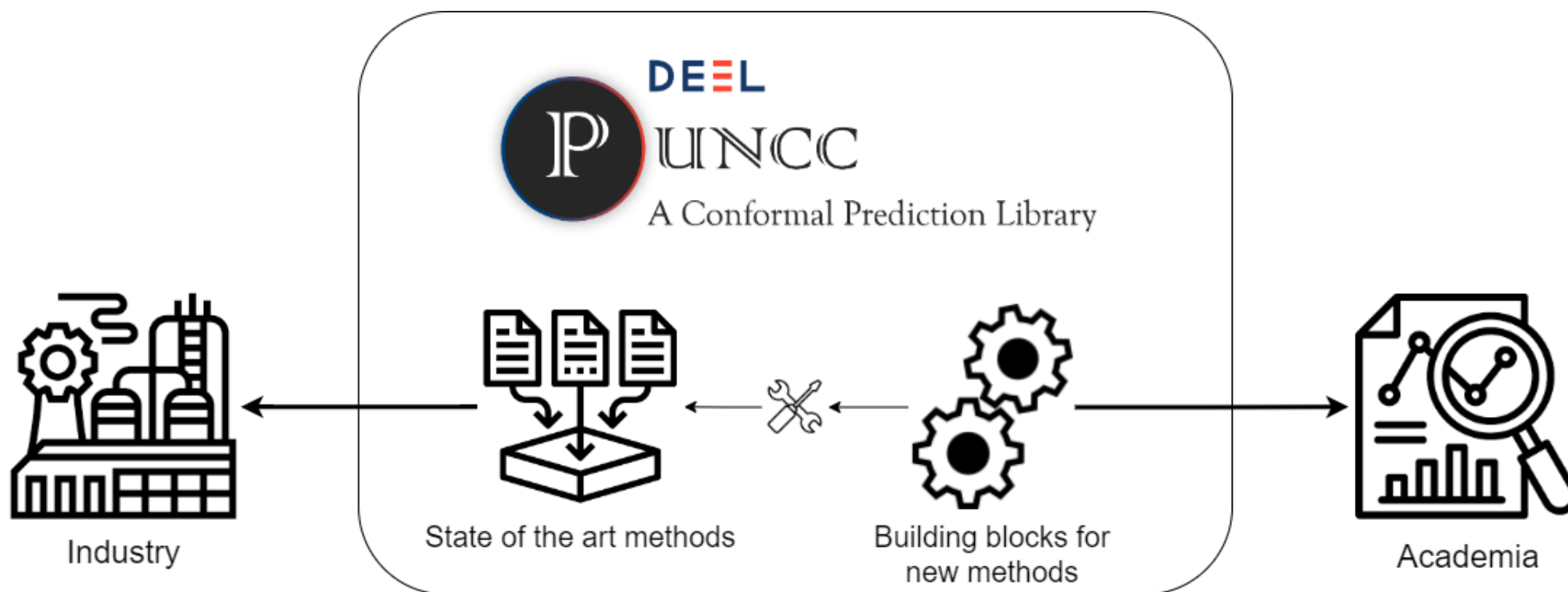
Conformal Prediction: Procedure



Conformal Prediction: Procedure

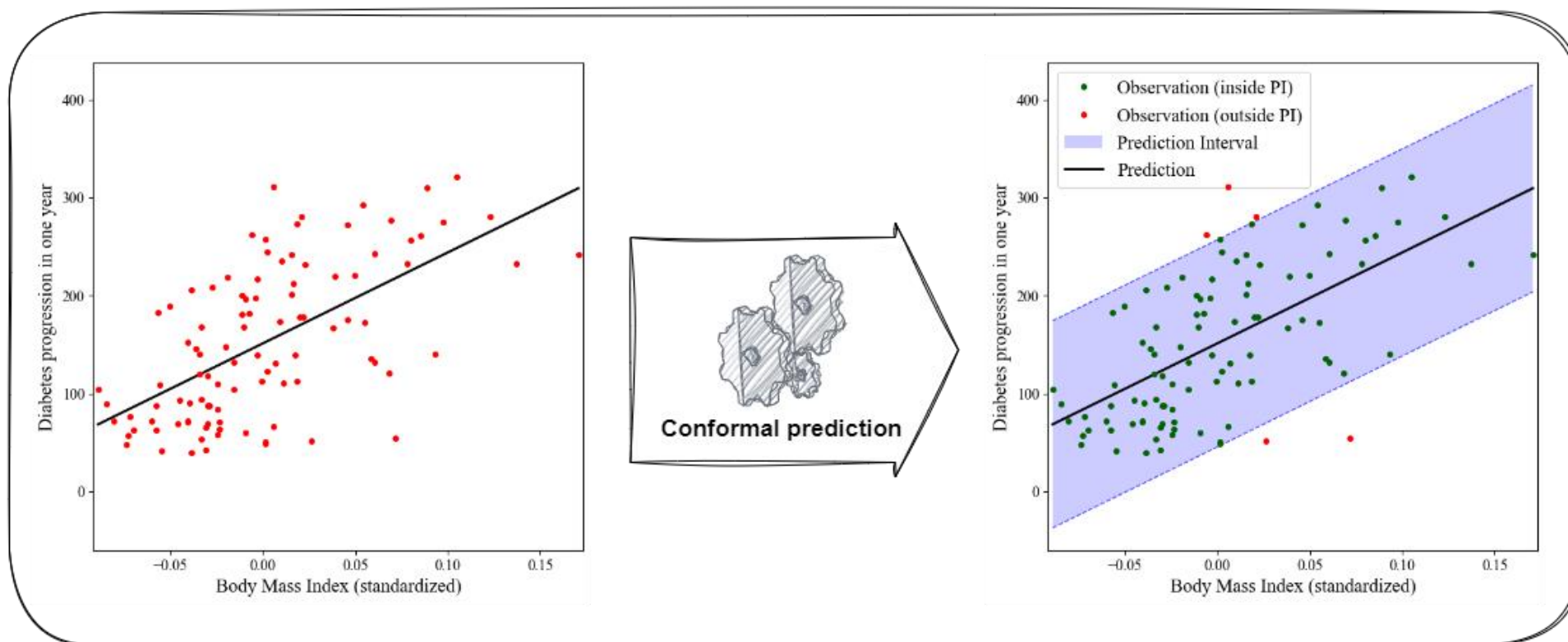


PUNCC Library (Predictive UNcertainty Calibration and Conformalization)



<https://github.com/deel-ai/puncc>

PUNCC: Conformal Regression



Conformal Regression in few lines of code

```
from deel.puncc.regression import SplitCP

# Instantiate conformal predictor
cp_algo = SplitCP(predictor, train=True)

# Fit model and compute nonconformity scores
cp_algo.fit(
    X_fit=X_fit,
    y_fit=y_fit,
    X_calib=X_calib,
    y_calib=y_calib,
)
# or splitcp.fit(X_train, y_train, fit_ratio=0.5)

# Generate prediction intervals for a risk level of 10%
y_pred, y_pred_lower, y_pred_upper = cp_algo.predict(X_new, alpha=0.1)
```

Interoperability

- ❑ PUNCC supports popular data types and ML libraries and more ...



```
from deel.puncc.api.prediction import BasePredictor
from deel.puncc.classification import APS

# My scikit-learn classifier
sklearn_classifier_model = ...

# Redefine the predict method of your classifier
def MyPredictor(BasePredictor):
    def predict(X):
        return self.model.predict_proba(X)

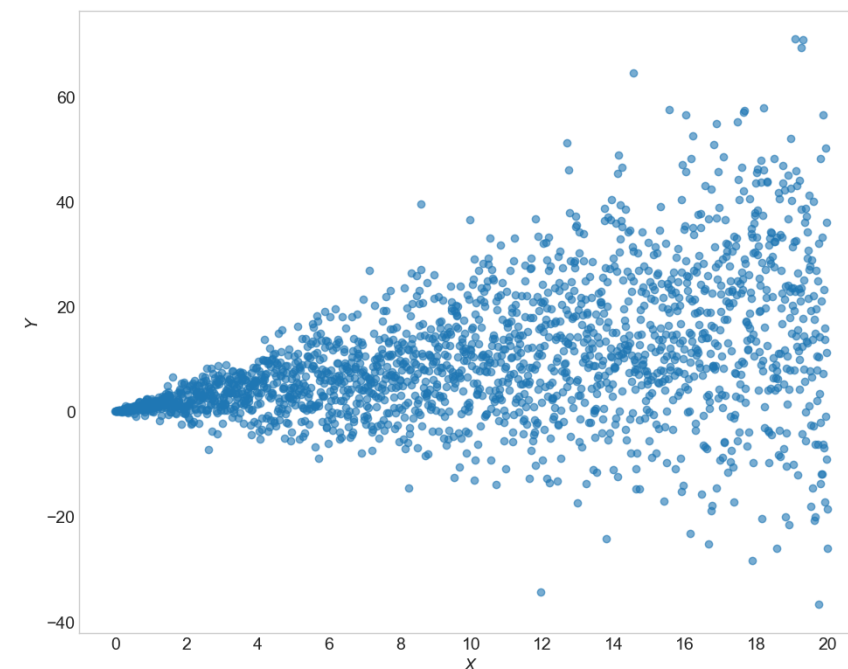
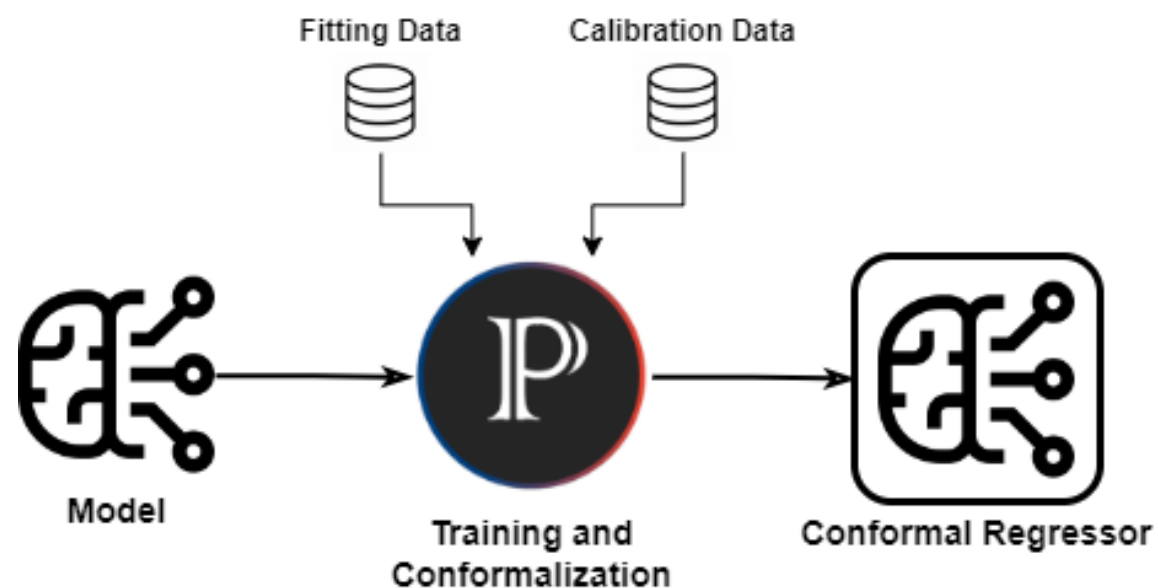
# Wrap scikit-learn classifier to interoperate with puncc
predictor = MyPredictor(sklearn_classifier_model)

# Instantiate the model
cp_alg = APS(predictor)
```

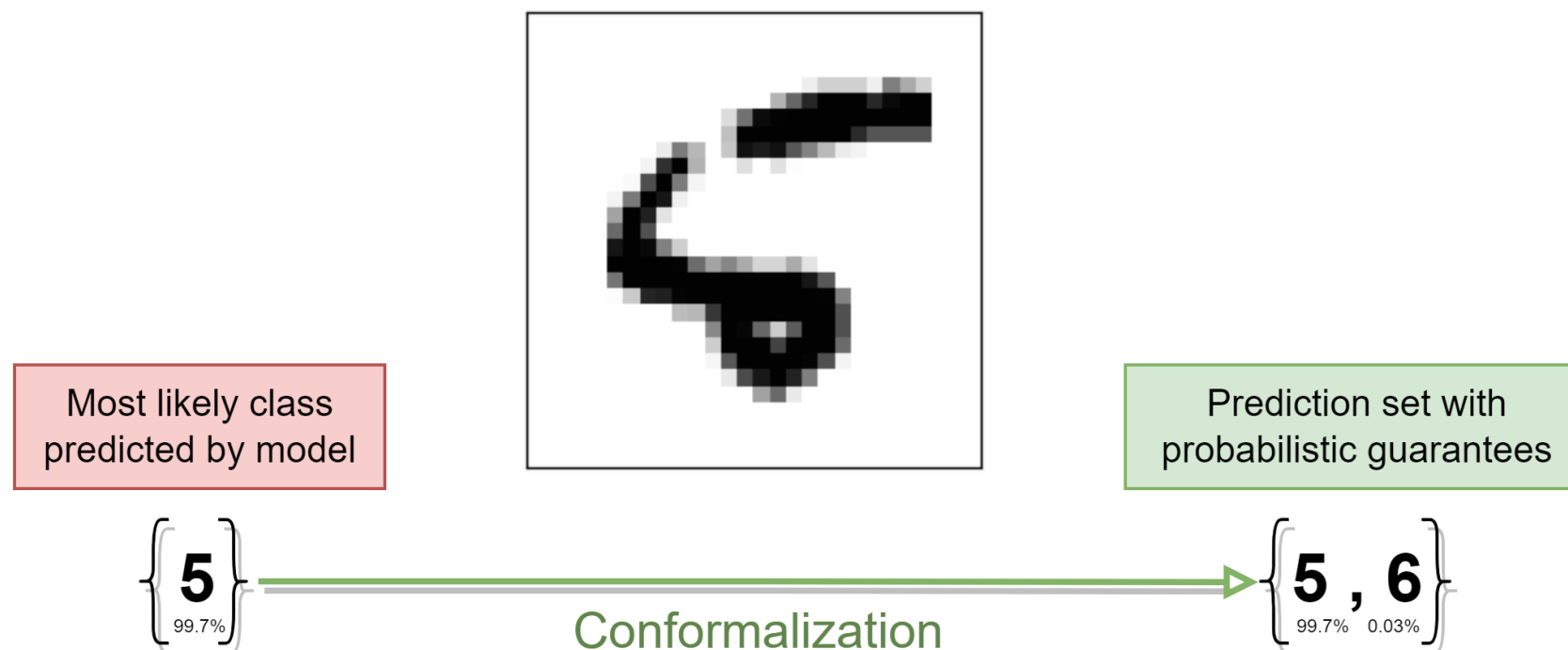
- ❑ Can work on top of UQ models and libraries

Demo: Conformal Regression

- ❑ Experimentation with different CP methods



PUNCC: Conformal Classification



Conformal Classification in few lines of code

```
from deel.puncc.classification import APS

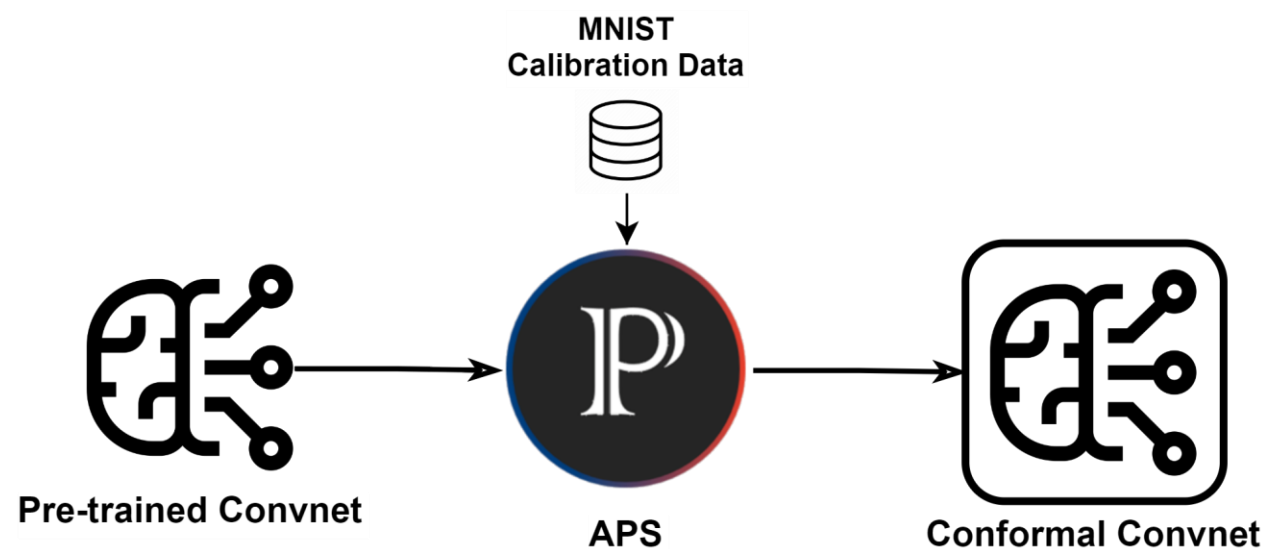
# Instantiate conformal predictor
aps = APS(predictor, train=False)

# Compute nonconformity scores
aps.fit(X_calib=X_calib, y_calib=y_calib)

# Generate prediction sets for a risk level of 5%
y_pred, y_pred_set = splitcp.predict(X_new, alpha=0.05)
```

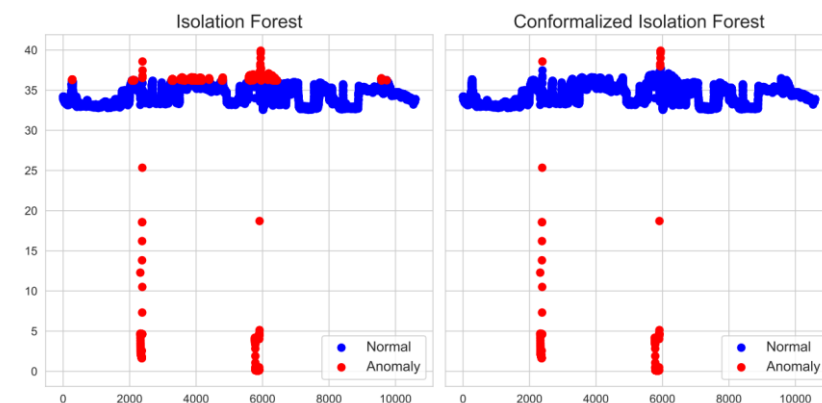
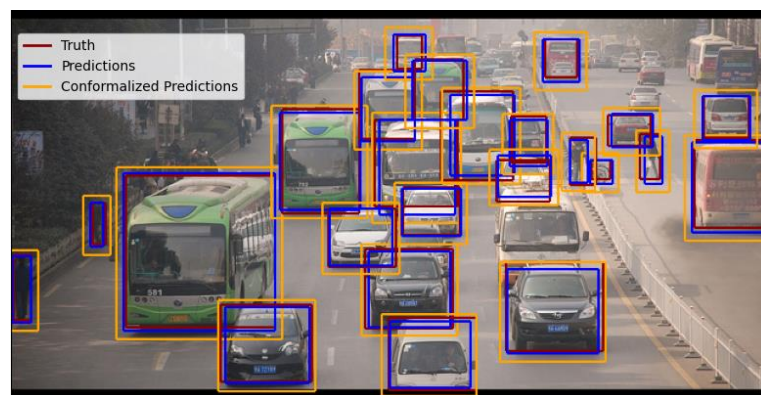
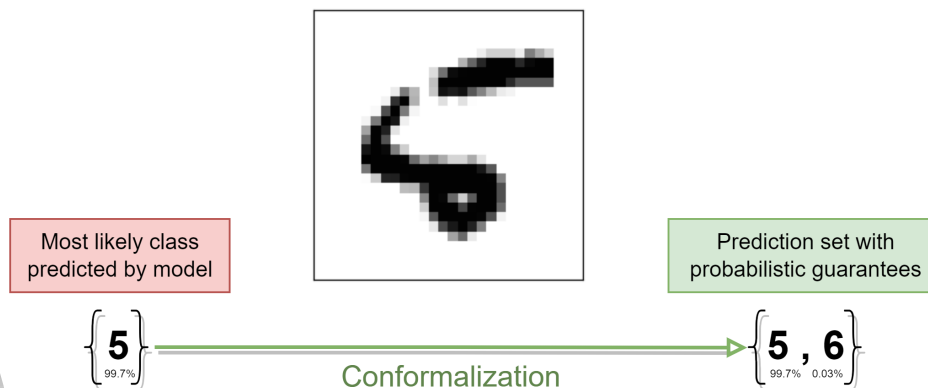
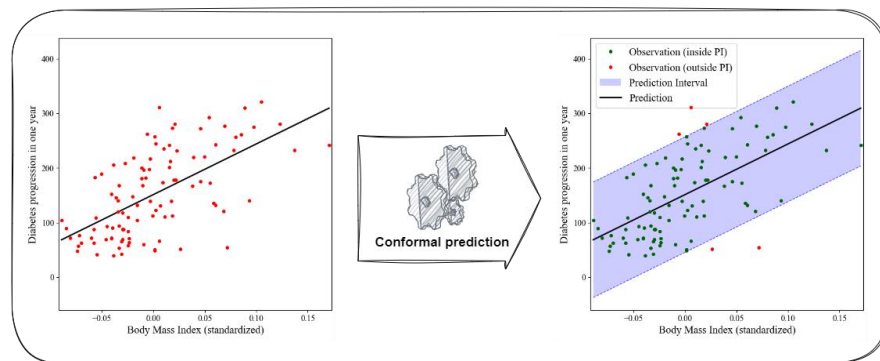
Demo: Conformal Classification

- Pretrained classifier within existing ML pipeline



Source: D. Decoste

PUNCC for different ML Tasks



PUNCC Project

☐ Documentation

☐ Tutorials

☐ Tests

☐ Updates

☐ Open to contributions: issues, PR, ...



<https://github.com/deel-ai/puncc>



Thanks for your attention !

