

PyCipio: Bayesian Time-series Prediction

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1 Introduction

1.1 Time Series Forecasting

1.2 Decomposition of a Signal

$$y(t) = g(t) + s(t) + \varepsilon$$

$$y(t) = g(t) \cdot s(t) \cdot \varepsilon$$

$$g(t) = \alpha + \beta \cdot x$$

$$s(t) = \sum_{n=1}^N \left(a_n \cos\left(\frac{2\pi n t}{P}\right) + b_n \sin\left(\frac{2\pi n t}{P}\right) \right)$$

$$F(t) = \left[\cos\left(\frac{2\pi 1 t}{7}\right), \dots, \sin\left(\frac{2\pi 8 t}{7}\right) \right]$$

$$s(t) = F(t) \cdot \omega$$

$$y(t) = \alpha + \beta \cdot x + s_1(t) + s_2(t)$$

1.3 Bayesian Framework

2 Implementation and Architecture

2.1 Object Oriented Programming

2.2 Primary Functions

2.3 Workflow

3 Related work and differences

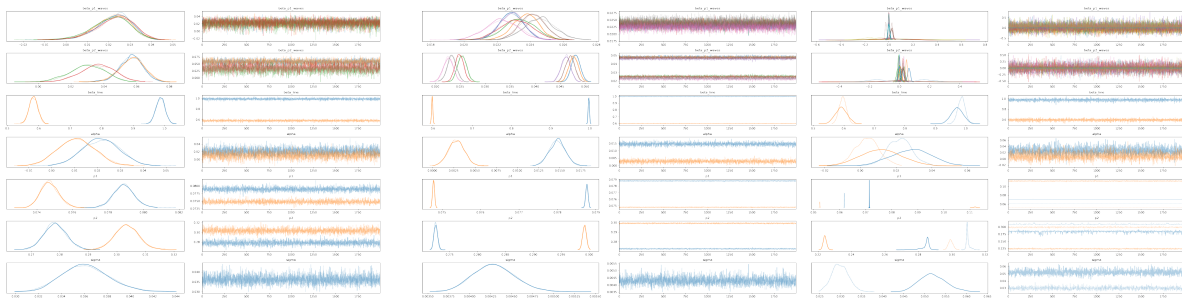
3.1 fpp3

3.2 Facebook Prophet

4 Examples

4.1 Example 1

Obviously here you write something, Obviously here you write something, Obviously here you write something, Obviously here you write something, Obviously here you write something, Obviously here you write something, Obviously here you write something, Obviously here you write something, Obviously here you write something, Obviously here you write something, Obviously here you write something, Obviously here you write something, Obviously here you write something, Obviously here you write something, Obviously here you write something,



(a) First plot

(b) Second plot

(c) Third Plot

Figure 1: Predictions in one and 2 groups

Obviously here you write something, Obviously here you write something, Obviously here you write something,
Obviously here you write something, Obviously here you write something, Obviously here you write something,
Obviously here you write something, Obviously here you write something,

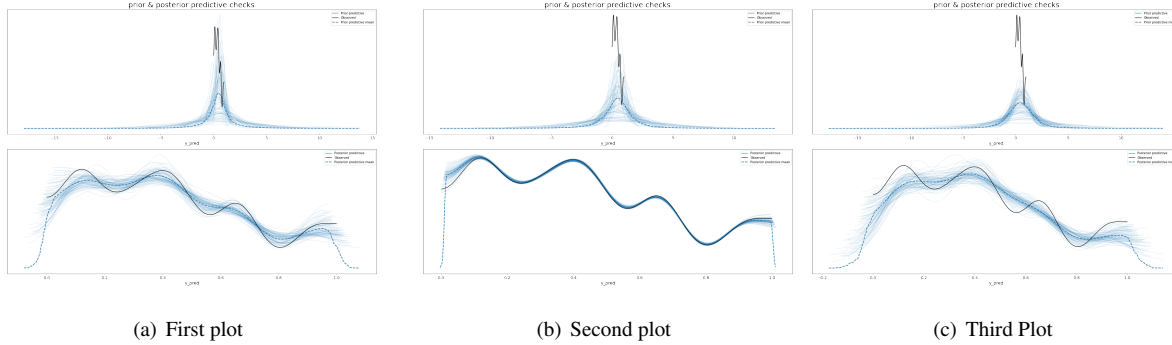


Figure 2: Predictions in one and 2 groups

Obviously here you write something, Obviously here you write something, Obviously here you write something,
Obviously here you write something, Obviously here you write something, Obviously here you write something,
Obviously here you write something,

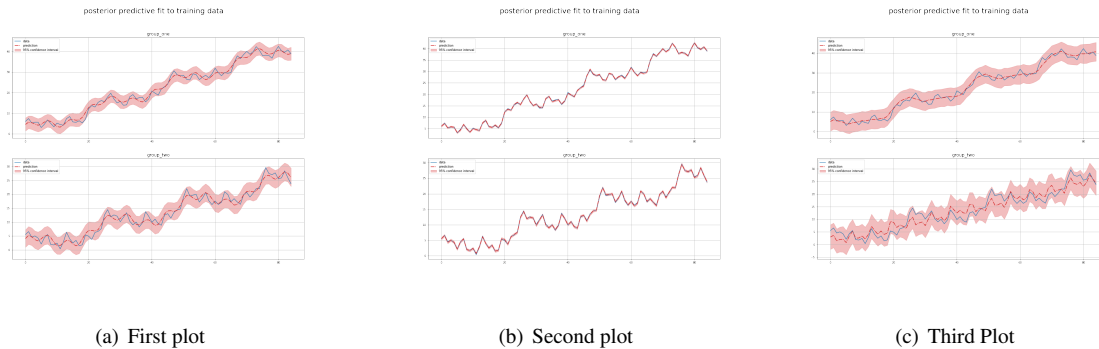
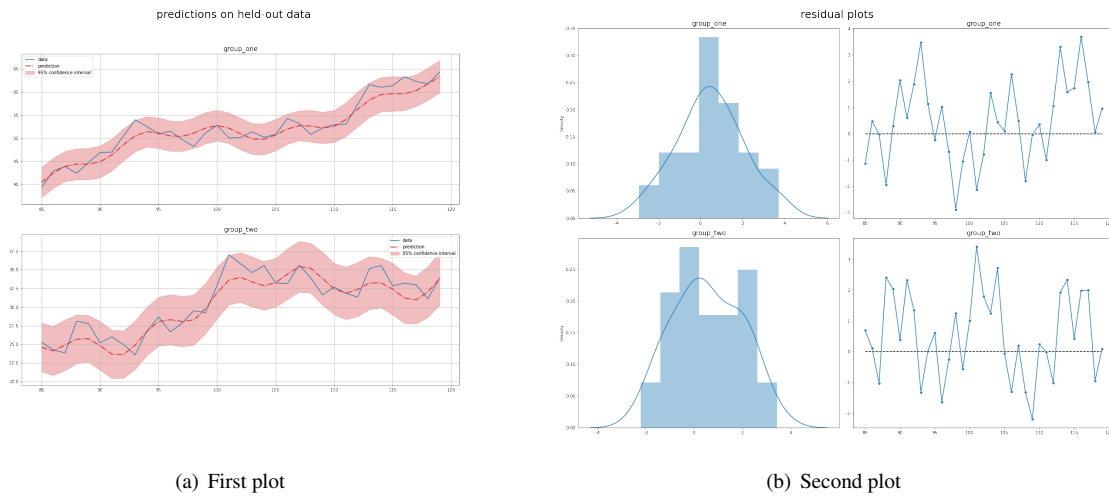


Figure 3: Predictions in one and 2 groups

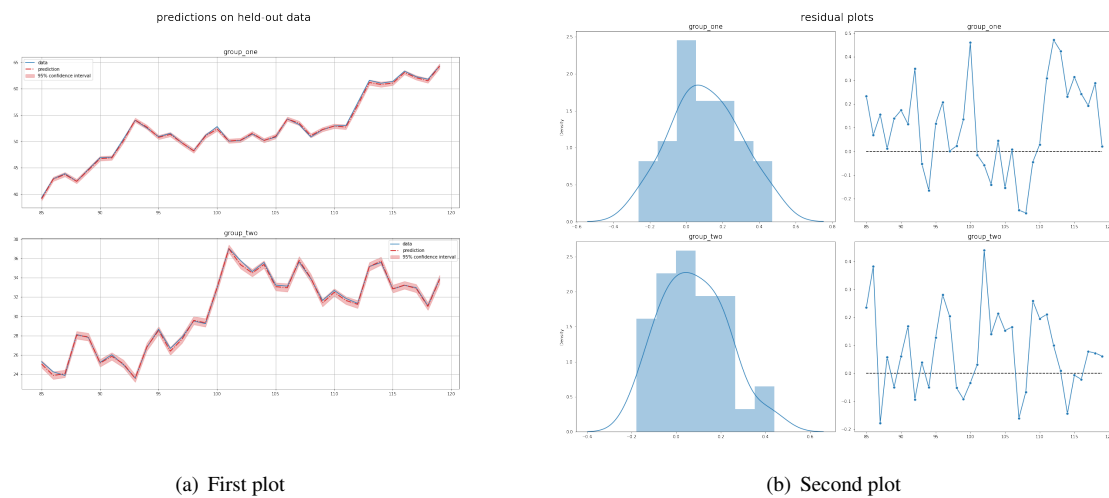
Obviously here you write something, Obviously here you write something, Obviously here you write something,
Obviously here you write something, Obviously here you write something, Obviously here you write something,
Obviously here you write something,



idx	RMSE	MAE	MAPE	sMAPE
group_one	1.62	1.27	2.46	2.41
group_two	1.5	1.21	4.01	3.98

(c) Third Plot

Figure 4: Predictions in one and 2 groups

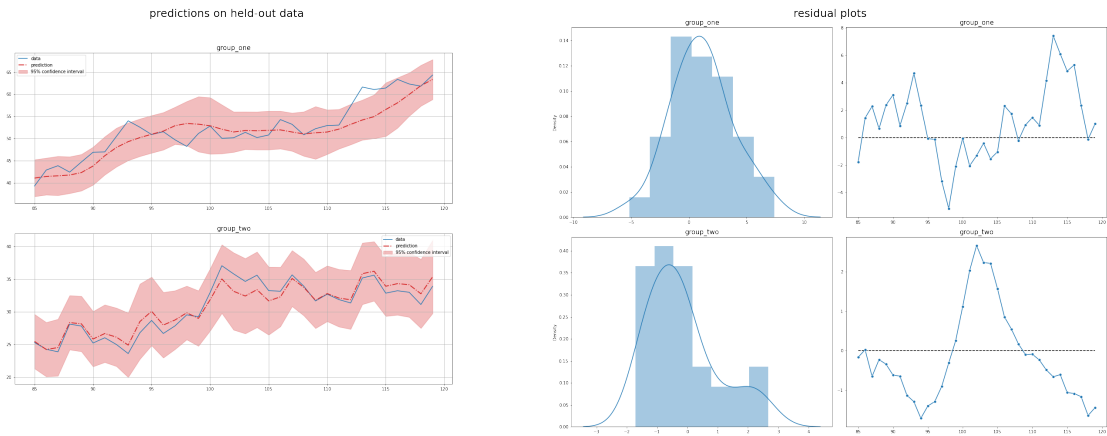


idx	RMSE	MAE	MAPE	sMAPE
group_one	0.21	0.17	0.33	0.32
group_two	0.17	0.13	0.44	0.45

(c) Third Plot

Figure 5: Predictions in one and 2 groups

Obviously here you write something, Obviously here you write something, Obviously here you write something,
Obviously here you write something, Obviously here you write something, Obviously here you write something,



(a) First plot

(b) Second plot

idx	RMSE	MAE	MAPE	sMAPE
group_one	2.89	2.23	4.31	4.25
group_two	1.16	0.94	3.13	3.03

(c) Third Plot

Figure 6: Predictions in one and 2 groups

4.2 Example 2

4.3 Example 3

5 Limitations and future work

5.1 The Goal of PyCipio

5.2 Flexibility

5.3 Hierarchical

5.4 Prediction on unseen data set

5.5 Why min-max scaling is great

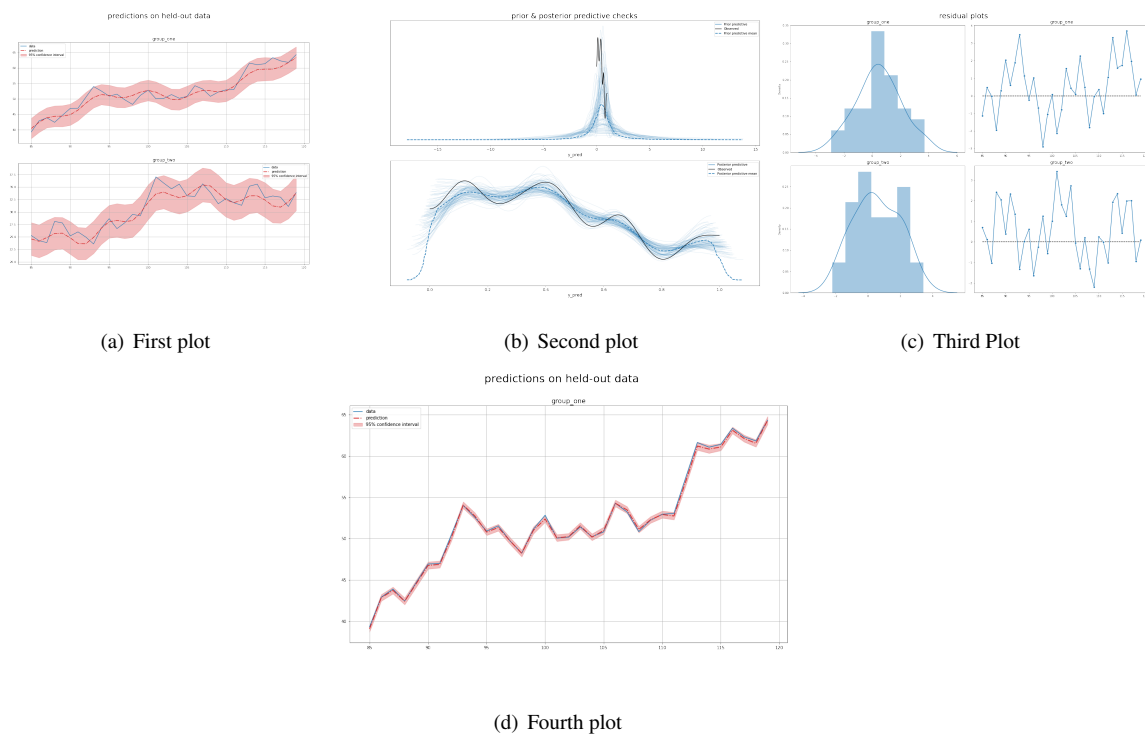


Figure 7: Predictions in one and 2 groups