Meta-learning Implicit Neural Representation for Sparse Time Series Functional Data Analysis

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1 Introduction

2 Related works

2.1 Functional Data

properties: differ from multidimensional data

what we care: derivatives, smoothness

difficulty for Sparse data: previous baseline- local polynomial regression

application: medicine

2.2 Implicit Neural Representation

SIREN for time series: advantage...

2.3 Meta-learning

different architecture: MAML / SNAIL

3 Method

advantage

4 Experiments

4.1 Synthetic data

4.1.1 what meta-learning learned in timeseries

global+differential property lead to a better PC estimation

1. periodicity
2. differential equations: No?
3. average phenomenon for meta prior model

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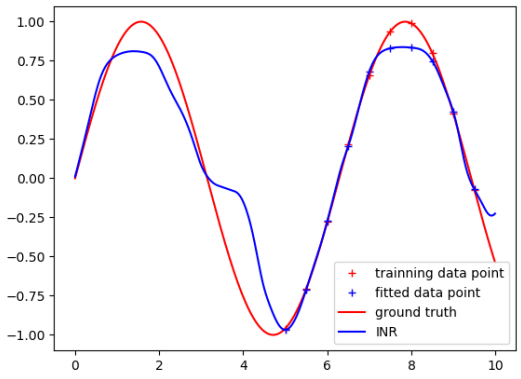

Figure 1: Learning periodicity

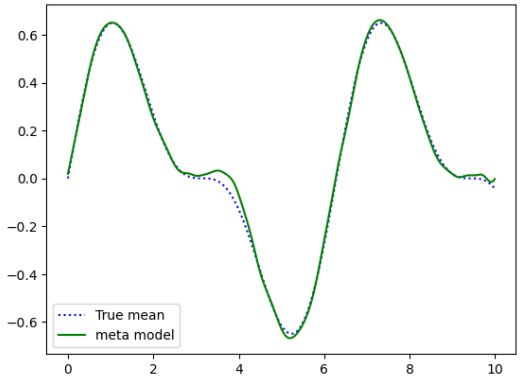

Figure 2: Learning mean

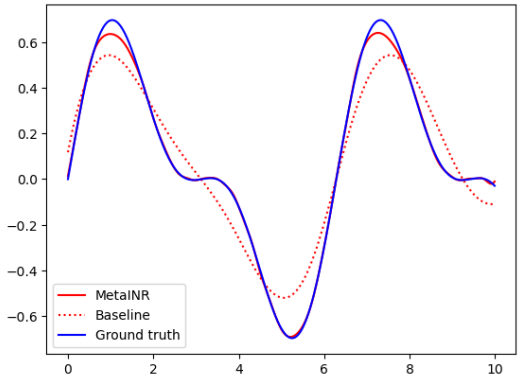

Figure 3: Mean estimation

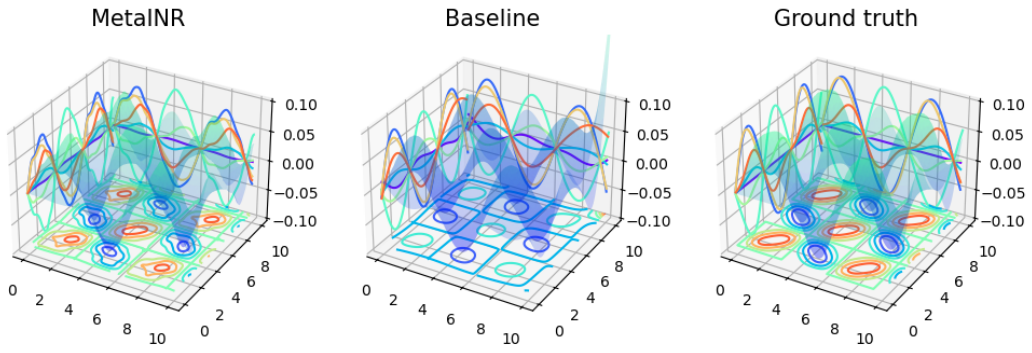

Figure 4: Covariance estimation

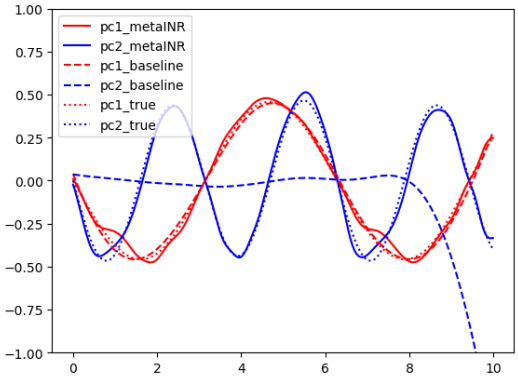

Figure 5: FPCA

4.1.2 Mean estimation

4.1.3 Covariance estimation

4.1.4 fPCA

4.1.5 Metalearning+PACE Representation(dimensional reduction)

4.2 Real-world data

5 Conclusion

6 Appendix

6.1 Traditional FDA for sparse functional data

6.2 Brief introduciton to SIREN