Generate explanations for time-series classification by ChatGPT

Xue Zhechang

CHAIR FOR PERVASIVE COMPUTING SYSTEMS, INSTITUTE OF TELEMATICS, DEPARTMENT OF COMPUTER SCIENCE

Outlines

■Motivation

■Reason of using ChatGPT

■A preliminary experiment

■Methodology

■Evaluation

Motivation

■Problem: Current methods to explain time series are **not user-friendly** for **non-researchers**.

■Idea: Use **ChatGPT** to explain why the feature can contribute to the classification

■Benefit:
 ■User-friendly and easy-accessible.
 ■Link features to knowledge in other fields.

Why?
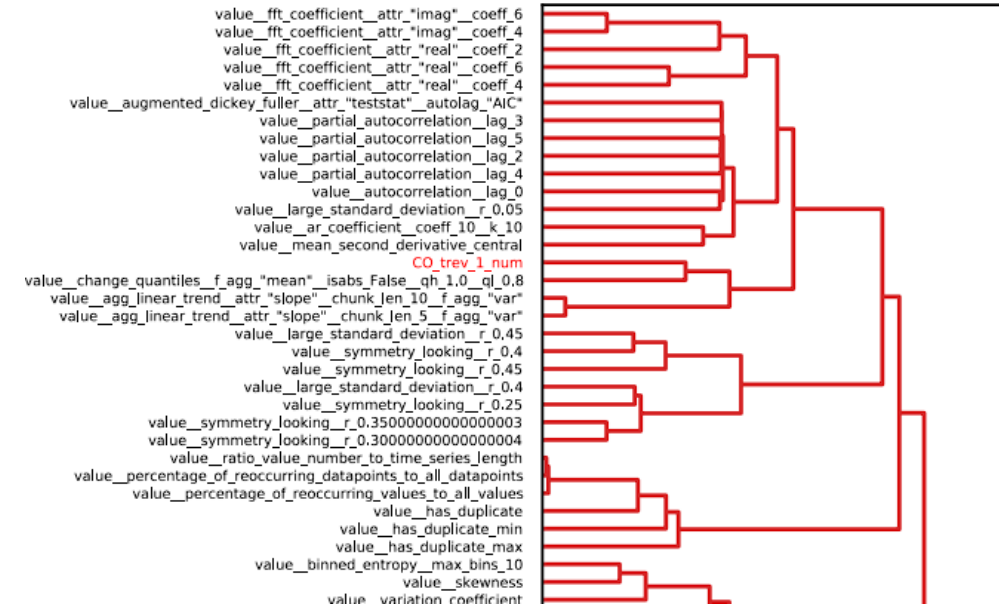
Reason of using ChatGPT
Related Works

- Forecasting via Prompt
  - Prompt-based method > numerical-based in forecasting time-series data
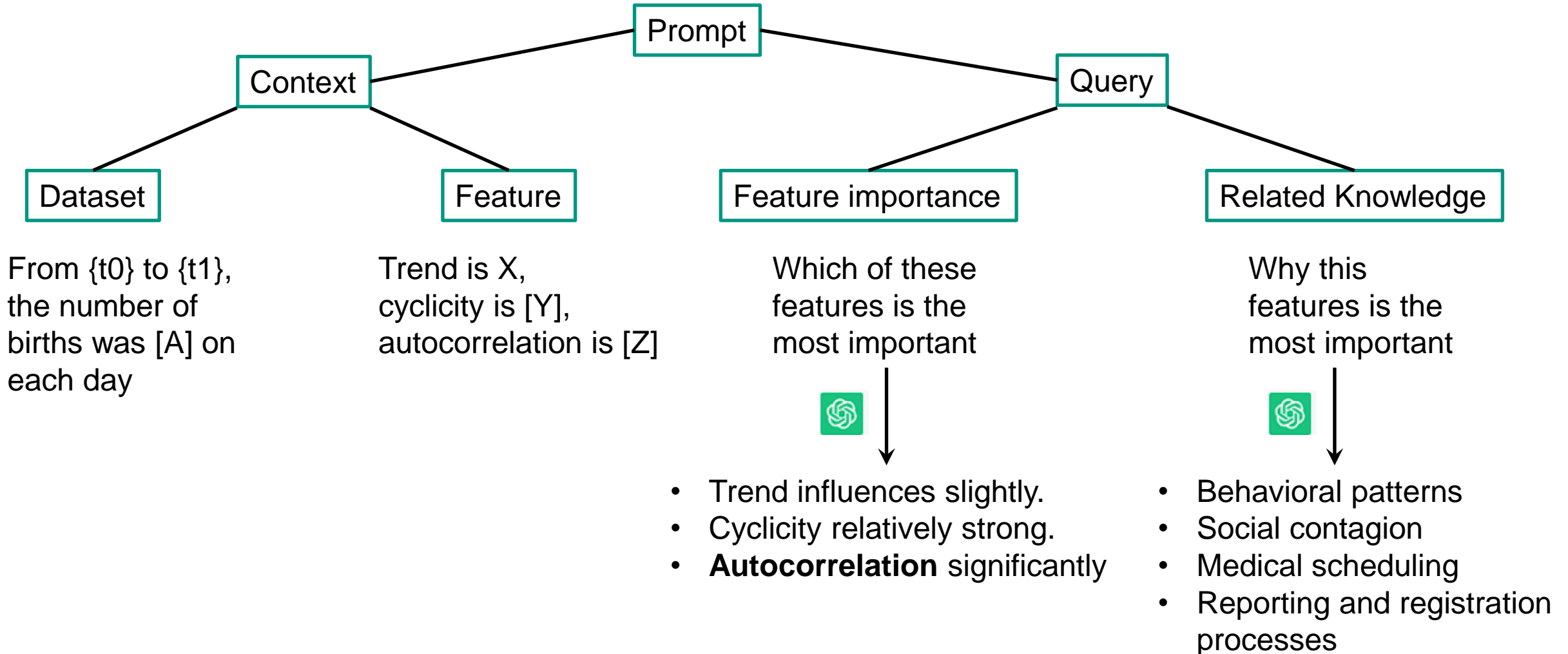 - Big advantage in zero-shot (RMSE: 70 vs 7)

- Casual inference
  - GPT can generate causal graphs in a high accuracy (about 70%)
  - Helpful in combining domain knowlegde to classification.

a) Possible directed arrow between X and Y. b) Evaluate the possibility of an arrow with GPT-3. c) Compare the GPT-3 prediction with the true structure.

PROMPTCAST: A NEW PROMPT-BASED LEARNING PARADIGM FOR TIME SERIES FORECASTING, Hao Xue, Flora D. Salim, https://arxiv.org/abs/2210.08964
Can Large Language Models Build Causal Graphs?, Stephanie Long, Tibor Schuster, Alexandre Piché, https://arxiv.org/abs/2303.05279

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A preliminary experiment

Daily total female births in California in 1959

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                          ┌──────────┐
                          │  Prompt  │
                          └──────────┘
                    ┌──────────┐      ┌──────────┐
                    │ Context  │      │  Query   │
                    └──────────┘      └──────────┘
        ┌──────────┐      ┌──────────┐      ┌──────────────────┐      ┌───────────────────┐
        │ Dataset  │      │ Feature  │      │Feature importance│      │ Related Knowledge │
        └──────────┘      └──────────┘      └──────────────────┘      └───────────────────┘
```

From {t0} to {t1}, the number of births was [A] on each day

Trend is X, cyclicity is [Y], autocorrelation is [Z]

Which of these features is the most important

Why this features is the most important

- Trend influences slightly.
- Cyclicity relatively strong.
- **Autocorrelation** significantly

- Behavioral patterns
- Social contagion
- Medical scheduling
- Reporting and registration processes

Methodology

General pipeline

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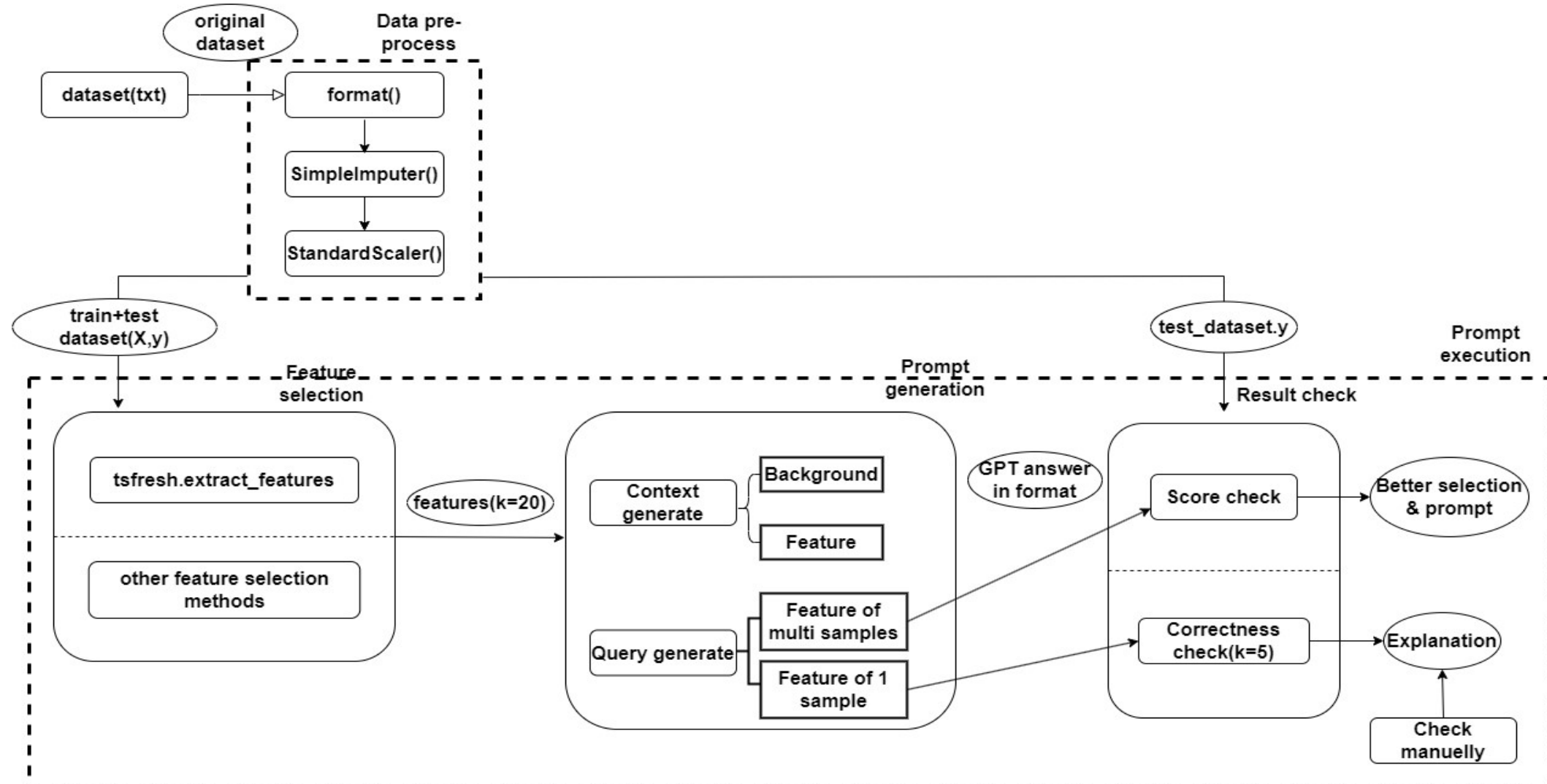
Evaluation

- Research object: Time-series datasets about human activity recognition
  - 1 basic movement (pick up, shake...) & 2 advanced (basketball, brush teeth...)
  - Intuitively understandable explanation

- Target:
  - Stable desired answer
    - Better prompt, avoiding incorrect answer or unwished format

  - Prove to be reliable
    - Correct casual inference
    - Good consistency
    - Modify original data to strongly affect feature

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