

目录

- 动机与背景
- 论文启发
- 实验
 - 实验1
 - 实验2

动机和背景

市面上有很多分类，预测方法，也有很多提供可解释性的方法，但这些方法需要使用者对该领域有一定了解，并投入一定的时间去训练模型得到解，门槛较高。对于可解释性而言，只是看SHAP值，知道了某个特征的重要性大，也不能理解其中原因，因为具体的解释需要去结合数据相关的领域知识，比如温度预测就要考虑到季风等地理知识影响，这些是SHAP等方法无法提供的。

时间序列，由于大多数样本无法从Attribute得到可解释性（单变量或位移变量），计算特征就变得极为重要，但是即便得知了哪个特征最重要，也会因为是干巴巴的数字而很难去理解为什么这个特征重要。因此去解释这个数字背后的含义，是一件有意义的事情。

基于之前的研究，我得知之前就有人用语言模型BERT来进行分类，预测任务。ChatGPT的问世又让人们利用它去更轻易地得到简单的预测和分类结果，免去了训练模型的时间。同时，chatgpt的文本生成能力能够将特征和其他学科领域的一些知识有机的结合，让非研究者得到更加直观、好理解的结果。

PROMPTCAST: A NEW PROMPT-BASED LEARNING PARADIGM FOR TIME SERIES FORECASTING

Contributions:

- 创新地用了Prompt-based Method来预测时间序列
- 提供了一个很大的数据集（PISA）（天气温度预测，能源消耗预测，客流量预测）
- 建立了一个基准，评估了不同预测方法和语言生成模型

Prompt 组成:

input prompt: context part & question part

output prompt.

实验结果：语言生成模型能预测（取numeric和language方法表现最好的模型，RMSE和MAE差别不大），且泛化能力更好（Zero-shot表现更好）

Table 2: Templates for transforming PISA-numerical to PISA-prompt.

			Template	Example
CT	Input Prompt (Source)	Context	From $\{t_1\}$ to $\{t_{\text{obs}}\}$, the average temperature of region $\{U_m\}$ was $\{x_{t_1:t_{\text{obs}}}^m\}$ degree on each day.	From August 16, 2019, Friday to August 30, 2019, Friday, the average temperature of region 110 was 78, 81, 83, 84, 84, 82, 83, 78, 77, 77, 74, 77, 78, 73, 76 degree on each day.
		Question	What is the temperature going to be on $\{t_{\text{obs}+1}\}$?	What is the temperature going to be on August 31, 2019, Saturday?
	Output Prompt (Target)	Answer	The temperature will be $\{x_{t_{\text{obs}+1}}^m\}$ degree.	The temperature will be 78 degree.
ECL	Input Prompt (Source)	Context	From $\{t_1\}$ to $\{t_{\text{obs}}\}$, client $\{U_m\}$ consumed $\{x_{t_1:t_{\text{obs}}}^m\}$ kWh of electricity on each day.	From May 16, 2014, Friday to May 30, 2014, Friday, client 50 consumed 8975, 9158, 8786, 8205, 7693, 7419, 7595, 7596, 7936, 7646, 7808, 7736, 7913, 8074, 8329 kWh of electricity on each day.
		Question	What is the consumption going to be on $\{t_{\text{obs}+1}\}$?	What is the consumption going to be on May 31, 2014, Saturday?
	Output Prompt (Target)	Answer	This client will consume $\{x_{t_{\text{obs}+1}}^m\}$ kWh of electricity.	This client will consume 8337 kWh of electricity.
SG	Input Prompt (Source)	Context	From $\{t_1\}$ to $\{t_{\text{obs}}\}$, there were $\{x_{t_1:t_{\text{obs}}}^m\}$ people visiting POI $\{U_m\}$ on each day.	From May 23, 2021, Sunday to June 06, 2021, Sunday, there were 13, 17, 13, 20, 16, 16, 17, 17, 19, 20, 12, 12, 14, 12, 13 people visiting POI 324 on each day.
		Question	How many people will visit POI $\{U_m\}$ on $\{t_{\text{obs}+1}\}$?	How many people will visit POI 324 on June 07, 2021, Monday?
	Output Prompt (Target)	Answer	There will be $\{x_{t_{\text{obs}+1}}^m\}$ visitors.	There will be 15 visitors.

实验内容1

数据集: Iris

数据描述: 花萼长度, 花萼宽度, 花瓣长度, 花瓣宽度, 花朵种类 (Setosa, Versicolor, Virginica)

方法: 150个instance, 每种各五十, 用prompt各描述49个, 取1个来测试.

Prompt (Context):

There are X Iris_name, each sepal length is [A], each sepal width is [B], each petal length is [C], each petal width is [D].

X = amount

Iris_name = {Setosa, Versicolor, Virginica},

[A/B/C/D] = 测量数据

测试集: 5.0,3.3,1.4,0.2,Iris-setosa

5.7,2.8,4.1,1.3,Iris-versicolor

5.9,3.0,5.1,1.8,Iris-virginica

Prompt (Query):

Classify following measurements [5.0,3.3,1.4,0.2] , [5.7,2.8,4.1,1.3], [5.9,3.0,5.1,1.8]

Explain the reason of classification

Which feature is most important.

There are 49 Iris-setosa, each sepal length is 5.1,4.9,4.7,4.6,5.0,5.4,4.6,5.0,4.4,4.9,5.4,4.8,4.8,4.3,5.8,5.7,5.4,5.1,5.7,5.1,5.4,5.1,4.6,5.1,4.8,5.0,5.0,5.2,5.2,4.7,4.8,5.4,5.2,5.5,4.9,5.0,5.5,4.9,4.4,5.1,5.0,4.5,4.4,5.0,5.1,4.8,5.1, sepal width is 3.5,3.0,3.2,3.1,3.6,3.9,3.4,3.4,2.9,3.1,3.7,3.4,3.0,3.0,4.0,4.4,3.9,3.5,3.8,3.8,3.4,3.7,3.6,3.3,3.4,3.0,3.4,3.5,3.4,3.2,3.1,3.4,4.1,4.2,3.1,3.2,3.5,3.1,3.0,3.4,3.5,2.3,3.2,3.5,3.8,3.0,3.4, petal length is 1.4,1.4,1.3,1.5,1.4,1.7,1.4,1.5,1.4,1.5,1.5,1.6,1.4,1.1,1.2,1.5,1.3,1.4,1.7,1.5,1.7,1.5,1.0,1.7,1.9,1.6,1.6,1.5,1.4,1.6,1.6,1.5,1.2,1.3,1.5,1.3,1.5,1.3,1.3,1.6,1.9,1.4,1.6,1.4,1.5. Eac 0.2,0.2,0.2,0.2,0.2,0.4,0.3,0.2,0.2,0.1,0.2,0.2,0.1,0.1,0.2,0.4,0.4,0.3,0.3,0.3,0.2,0.4,0.2,0.5,0.2,0.2,0.4,0.2,0.2,0.2,0.2,0.4,0.1,0.2,0.1,0.2,0.2,0.1,0.2,0.2,0.3,0.3,0.2,0.6,0.4,0.3 are 49 Iris-versicolor, each sepal length is 7.0,6.4,6.9,5.6,5.5,7.6,3.4,9.6,6.5,2.5,0.5,9.6,0.6,1.5,6.6,7.5,6.5,8.6,2.5,6.5,9.6,1.6,3.6,1.6,4.6,6.6,6.8,6.7,6.0,5.7,5.5,5.5,5.8,6.0,5.4,6.0,6.7,6.3,5.6,5.5,5.5,6.1,5.8,5.0,5.6,5.7,5.7,6.1, width is 3.2,3.2,3.1,2.3,2.8,2.8,3.3,2.4,2.9,2.7,2.0,3.0,2.2,2.9,2.9,3.1,3.0,2.7,2.2,2.5,3.2,2.8,2.5,2.8,2.9,3.0,2.8,3.0,2.9,2.6,2.4,2.4,2.7,2.7,3.0,3.4,3.1,2.3,3.0,2.5,2.6,3.0,2.6,2.3,2.7,3. Each petal length is 4.7,4.5,4.9,4.0,4.6,4.5,4.7,3.3,4.6,3.9,3.5,4.2,4.0,4.7,3.6,4.4,4.5,4.1,4.5,3.9,4.8,4.0,4.9,4.7,4.3,4.4,4.8,5.0,4.5,3.5,3.8,3.7,3.9,5.1,4.5,4.5,4.7,4.4,4.1,4.0,4.4,4.6,4.0,3.3,4.2,4.2,4. petal width is 1.4,1.5,1.5,1.3,1.5,1.3,1.6,1.0,1.3,1.4,1.0,1.5,1.0,1.4,1.3,1.4,1.5,1.0,1.5,1.1,1.8,1.3,1.5,1.2,1.3,1.4,1.4,1.7,1.5,1.0,1.1,1.0,1.2,1.6,1.5,1.6,1.5,1.3,1.3,1.2,1.4,1.2,1.0,1.3,1.2,1.3,1.1,There virginica, each sepal length is 6.3,5.8,7.1,6.3,6.5,7.6,4.9,7.3,6.7,7.2,6.5,6.4,6.8,5.7,5.8,6.4,6.5,7.7,7.7,6.0,6.9,5.6,7.7,6.3,6.7,7.2,6.2,6.1,6.4,7.2,7.4,7.9,6.4,6.3,6.1,7.7,6.3,6.4,6.0,6.9,6.7,6.9,5.8,6.8,6.7,6.7,6.3,6.5,6.1, width is 3.3,2.7,3.0,2.9,3.0,3.0,2.5,2.9,2.5,3.6,3.2,2.7,3.0,2.5,2.8,3.2,3.0,3.8,2.6,2.2,3.2,2.8,2.8,2.7,3.3,2.2,2.8,3.0,2.8,3.0,2.8,3.8,2.8,2.8,2.6,3.0,3.4,3.1,3.0,3.1,3.1,2.7,3.2,3.3,3.0 petal length is 6.0,5.1,5.9,5.6,5.8,6.6,4.5,6.3,5.8,6.1,5.1,5.3,5.5,5.0,5.1,5.3,5.5,6.7,6.9,5.0,5.7,4.9,6.7,4.9,5.7,6.0,4.8,4.9,5.6,5.8,6.1,6.4,5.6,5.1,5.6,6.1,5.6,5.5,4.8,5.4,5.6,5.1,5.1,5.9,5.7,5.2,5.0,5.2, width is 2.5,1.9,2.1,1.8,2.2,2.1,1.7,1.8,1.8,2.5,2.0,1.9,2.1,2.0,2.4,2.3,1.8,2.2,2.3,1.5,2.3,2.0,2.0,1.8,2.1,1.8,1.8,2.1,1.6,1.9,2.0,2.2,1.5,1.4,2.3,2.4,1.8,1.8,2.1,2.4,2.3,1.9,2.3,2.5,2.3,1.5



It seems like you have provided the measurements of the sepal length, sepal width, petal length, and petal width for three different species of iris flowers: Iris-setosa, Iris-versicolor, and Iris-virginica. Each species has 49 samples, and you have listed the measurements for each sample.

For Iris-setosa, the sepal lengths range from 4.3 to 5.8, the sepal widths range from 2.3 to 4.4, the petal lengths range from 1.0 to 1.9, and the petal widths range from 0.1 to 0.6.

For Iris-versicolor, the sepal lengths range from 4.9 to 7.0, the sepal widths range from 2.0 to 3.4, the petal lengths range from 3.0 to 5.1, and the petal widths range from 1.0 to 1.8.

For Iris-virginica, the sepal lengths range from 4.9 to 7.9, the sepal widths range from 2.2 to 3.8, the petal lengths range from 4.5 to 6.9, and the petal widths range from 1.4 to 2.5.

These measurements are commonly used in the analysis and classification of iris flowers. If you have any specific questions or need further assistance, feel free to ask!

Classify following measurements [5.0,3.3,1.4,0.2] , [5.7,2.8,4.1,1.3], [5.9,3.0,5.1,1.8]



To classify the given measurements, we can use a classification model trained on the Iris dataset. The measurements 5.0, 3.3, 1.4, 0.2 correspond to the sepal length, sepal width, petal length, and petal width of an iris sample, respectively. Similarly, 5.7, 2.8, 4.1, 1.3 and 5.9, 3.0, 5.1, 1.8 represent the measurements of two other iris samples.

Using a classification model, we can predict the species of the iris based on these measurements. Let's classify them:

1. 5.0, 3.3, 1.4, 0.2: This set of measurements corresponds to Iris-setosa.
2. 5.7, 2.8, 4.1, 1.3: This set of measurements corresponds to Iris-versicolor.
3. 5.9, 3.0, 5.1, 1.8: This set of measurements corresponds to Iris-virginica.

Therefore, based on the provided measurements, we have classified the iris samples as follows:



The classification of the iris samples is based on the measurements of their sepal length, sepal width, petal length, and petal width. These measurements are commonly used to distinguish different species of iris flowers.

In the case of the given measurements:

1. [5.0, 3.3, 1.4, 0.2]: This set of measurements corresponds to Iris-setosa. This classification is determined based on the characteristic features of Iris-setosa flowers, which typically have smaller sepal length, sepal width, petal length, and petal width compared to other iris species.
2. [5.7, 2.8, 4.1, 1.3]: This set of measurements corresponds to Iris-versicolor. Iris-versicolor flowers generally have intermediate values for sepal length, sepal width, petal length, and petal width. The given measurements fall within the range of values typically associated with Iris-versicolor.
3. [5.9, 3.0, 5.1, 1.8]: This set of measurements corresponds to Iris-virginica. Iris-virginica flowers tend to have relatively larger sepal length, sepal width, petal length, and petal width compared to the other two species. The given measurements fall within the range of values commonly observed for Iris-virginica.

By comparing the measurements of the given iris samples to the known characteristics of different iris species, we can classify them accordingly.



In decision tree-based classification models, the importance of features can be assessed by examining the structure and construction of the tree. The feature importance is typically determined by evaluating how much each feature contributes to the overall predictive power of the tree.

There are several ways to measure feature importance in decision trees, including Gini importance, mean decrease impurity, and information gain. These metrics provide insights into the relative importance of different features in the classification process.

However, without access to the specific decision tree model trained on the Iris dataset, it is not possible to provide an exact ranking of feature importance. The importance of features can vary depending on the specific model and its parameters.

In general, though, the petal-related measurements (petal length and petal width) are often considered more informative in distinguishing between iris species than sepal-related measurements (sepal length and sepal width). Petal characteristics tend to exhibit greater variability among different iris species, making them more discriminative features in the classification process.

It's important to note that feature importance can vary depending on the dataset, model parameters, and other factors. Therefore, it's recommended to analyze feature importance using the specific decision tree model trained on the dataset in question.

实验内容2

测试集: Daily total female births in California, 1959

数据描述: 日期和出生人数

方法: 365个instance, 描述了数据, 给出了三个基础features

Prompt (Context):

From {t0} to {t1}, the number of births was [A] on each day, trend is X, cyclicity is [Y], autocorrelation is [Z]

t0 = start date

t1 = end date

[A/Y/Z] = 出生人数/周期性/自相关性

Prompt (Query):

Tell me which of these features is the most important



Based on the provided information, it's difficult to determine the absolute importance of each feature without additional context or a specific model. However, I can provide some insights based on the given data.

1. Trend: The trend coefficient indicates the direction and magnitude of the trend in the number of births. A positive coefficient suggests an increasing trend, while a negative coefficient suggests a decreasing trend. In this case, the trend coefficient is positive but relatively small (0.0064), indicating a slight positive trend. While the trend provides information about the overall direction, it might not be the most influential feature.
2. Cyclicity: The cyclicity values represent the autocorrelation of the number of births with different lags. Autocorrelation measures the relationship between the number of births on the current day and previous days. The highest autocorrelation is observed at lag 0 (perfect positive correlation with the previous day's births). As the lag increases, the autocorrelation gradually decreases. This suggests that recent historical data (previous few days) has a stronger influence on the number of births than data from more distant days.
3. Autocorrelation: Autocorrelation values provide insights into the relationship between the number of births on the current day and previous days. A higher autocorrelation indicates a stronger dependence on past values. In this case, the autocorrelation is relatively high up to a lag of 10, suggesting that the number of births is significantly influenced by the number of births on the previous few days.

Based on this analysis, the autocorrelation feature, particularly at lower lags (0-10), seems to be more influential than the trend feature. However, it's important to note that the importance of features can vary depending on the specific modeling technique used and the context of the analysis.

Regenerate response

Why the number of births on the previous few days has bigger influence



The larger influence of the number of births on the previous few days can be attributed to several factors:

1. **Behavioral patterns:** Birth rates can be influenced by certain behavioral patterns or decision-making processes. People often make decisions about family planning and childbirth based on social, economic, and personal factors. When individuals observe a higher number of births in the previous few days, it may influence their own decision-making process and increase the likelihood of choosing to give birth during that period.
2. **Social contagion:** The concept of social contagion suggests that behaviors and actions of individuals can spread and influence others within a social network. If there is a clustering effect in the timing of births, where a higher number of births on certain days leads to more people choosing to give birth on subsequent days, it can create a self-reinforcing pattern. Seeing others giving birth may create a perception of increased readiness or desirability, leading to a higher likelihood of giving birth within a short time frame.
3. **Medical practices and scheduling:** Medical facilities and healthcare providers may have specific scheduling practices that can contribute to the clustering of births. For example, inductions or scheduled cesarean sections may be more likely to be performed on certain days, leading to an increased number of births during those periods. This scheduling influence can create a ripple effect, where births on certain days lead to subsequent births in the following days.
4. **Reporting and registration processes:** The registration and reporting of births can also contribute to the observed clustering effect. Administrative practices and procedures for birth registration may introduce delays or clustering in the recorded data. For example, if there is a delay in registering births or if multiple births occurring in a short time frame are recorded on a single day, it can contribute to the clustering effect in the data.

Overall, the larger influence of the number of births on the previous few days can be attributed to a combination of individual decision-making processes, social influences, medical practices, and administrative factors. These factors collectively contribute to the observed patterns of clustering in the number of births.