研究表明，地球的陆地-海洋平均温度及大气中CO2的浓度自工业革命以来一直处于上升趋势，全球变暖将对地球现有生态系统造成严重破坏，危及人类生存。定量分析影响大气中CO2浓度和陆地-海洋平均温度变化的原因，并预测其变化趋势，将有助于各国政府制定出合理的碳中和政策和目标。

为帮助解决这个问题，在第一问中，我们设计了3个模型用于预测未来80年的全球大气CO2浓度，分别是主成分分析+多元线性回归预测模型（模型1），扩展的STIRPAT预测模型（模型2）和基于微分方程的预测模型（模型3）。在模型1中，我们首先使用主成分分析对数据进行降维，再采用多元线性回归算法，建立了二氧化碳浓度与人口总量、GDP、石油天然气和煤炭能源的发电量、森林面积等10个变量的线性回归方程，对未来二氧化碳浓度的变化趋势做出了预测。

我们在STIRPAT模型基础上设计了第二个模型，为了简化建立模型所需数据量，采用逐步回归算法，对模型1中的10个变量进行筛选，得到了人口总量、石油天然气和煤炭能源的发电量百分比、可再生能源发电量这3个显著相关变量，由此建立了回归方程，并得到相应的预测结果。

模型3

在第二问中，我们认为影响陆-海温度的因素分为两大类，即自然因素-包括太阳自身活动周期、地球吸热能力等和人类活动所产生的温室气体-包括CO2,CH4,N2O。为此我们采用灰色关联分析算法对上述变量进行定性评估，得出温室气体对陆海温度影响最大的结论。通过定量分析计算，得到陆海温度变化预测曲线。

我们对提出的模型进行了详细的对比和讨论，并进行了敏感度分析。

⬆️最后一部分是错的

注意填补文章中我没有写明的数据呀！！

祝成功

Summary Sheet

Since the beginning of Industrial Revolution, the concentration of CO2 in the atmosphere, together with global temperature, has been on the rise. Past researches have proved that global warming will lead to irreversible damages to earth’s ecosystems, posing threat on human civilization. To take stronger control of economic fluctuations and to implement effective conservational policies, we are in urgent need for accurate predictions of CO2 levels and its relationship with global temperature.

In this paper, we built two sets of models in an effort to demonstrate our own perspectives and suggest proper responses. In Problem one, we first selected 10 factors that directly influence or reflect the changes in CO2 emission. Then, we developed three parallel models to predict the CO2 concentration, which are , respectively.

第一问结论不用改：Thus, we received three interpretations of the relationship between economy, energy consumption and urbanization and atmospheric CO2 levels. Accordingly, the CO2 concentration will not reach 685 ppm by 2050. The figures projected that in 2100, CO2 levels will hit ppm, ppm or ppm, respectively.

Upon answering Problem 2, to optimize the illustration of land-ocean temperature over the predicted future, we utilized ??? to smoothen the historical curve and ??? to simulate the periodically increasing temperature. The average land-ocean temperature is predicted to complete the 1.25C change in 2028, the 1.50C change in 2037 and the eventual 2C change in 2056 compared to the base period 1951-1980. We then divide the factors influencing land-ocean temperature into two categories: natural factors---specifically, solar radiation cycle and地球吸热能力---and artificial factors: greenhouse gases emitted artificially, including CO2, CH4 and N2O.

被删部分：In the light of simulated projections of factors and the assistance from PCA, available STIRPAT models and ODE, we related factors to the CO2 curve through reducing dimensions, filtrated factors on calculated weights and took human affection into consideration, respectively.

At the beginning of Problem 2 solution, we preprocessed the temperature records with Lowess Smoothing and analog the result to a quadratic function. To mimic the original data’s brief periodicity, we composited three sine functions to it and predicted