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Assessment Brief: Coursework 2023-24

Assessment Details

Course Title:	Theory and Applications of Data Analytics
Course Code:	LDSCI7236
Course Leader:	Ioannis Kypraios
Level:	7
First or Second Sitting:	First Sitting
Assessment Title:	Weather Monitoring in UK
Assessment Number:	AE1
Assessment Type:	Coding Assignment
Restrictions on Time/Length:	Code and 2500 word explanation
Individual/Group:	Individual
Assessment Weighting:	50%
Issue Date:	15 January 2024
Hand in Deadline:	01 March 2024
Planned Feedback Deadline:	28 calendar days after hand in deadline
File format accepted:	.ipynb, .zip
Mode of Submission:	Online
Anonymous Marking:	Yes

Assessment Task

Aims & Objectives

The assignment aims to give you practical experience in the design and

implementation of a real-world data analytics application. You should be able to:

1. Pre-process data. Read multiple datasets programmatically into memory and combine them.

2. Analyse data. Query the data – that is, create different aggregated data views – to identify trends and visualise your results.

You are encouraged to work in pairs (or groups), but you must differentiate from your colleague(s) and submit your own solution.

Problem

The Meteorological (MET) Office has been monitoring UK weather since 1854 across 36 stations. These historic station weather data, available at: https://www.metoffice.gov.uk/research/climate/maps-and-data/historic-station-data consists of the following variables:

- Mean daily maximum temperature (tmax)
- Mean daily minimum temperature (tmin)
- Days of air frost (af)
- Total rainfall (rain)
- Total sunshine duration (sun)

In this assignment, you will analyse the MET historic data to investigate weather change over time. Please follow the instructions below:

1. **Data Collection, Pre-processing and Handling (30 marks):** Download the MET historic data from all 36 weather stations in the UK. Select a monitoring time period when your data from all your selected weather stations have been consistently recorded. Clean the data from any special symbols, e.g. '*' or '#'. Visualise and handle missing data, for example by replacing any missing values with a zero or the mean values from all stations for that year.
2. **Average Temperature Change (15 marks):** Calculate for each station the average temperature change to date as a percentage increase or decrease. Determine the station with the greatest and lowest average temperature changes and visualise the results over time using an appropriate plot.
3. **Station Rankings (15 marks):** Rank the stations in descending order based on the highest temperature. Summarise the temperature distribution in an appropriate plot, including measures of central tendency and variance, for the top-k stations.
4. **Surprising Results (20 marks):** Identify any surprising or unexpected results in the temperature data. For example, has any station reported an unusually larger number of higher temperatures in any given year? Discuss the limitations of these findings in the context of climate change.
5. **Comparison with Other Sources (20 marks):** Compare the similarities or differences between the annual average temperature in the UK, as reported by the MET Office, and the world annual average temperature data from other sources such as NASA, the National Oceanic and Atmospheric Administration (NOAA), or the World Meteorological Organization (WMO). Discuss the implications and reliability of comparing data from different sources.

Specification

1. Where requested a (sub)problem solution **should** be accompanied by:

   a. An explanation of the data view(s) you find appropriate to answer the problem's question(s).

   b. An explanation of the (order of) operations on the (raw or intermediate) data that are required to lead to a particular data view.
   c. At least one visualisation.

As a rule of thumb, your notebook's text cells should explain what you want to achieve with your implementation; your inline code comments, on the other hand, should explain how you achieve it.

1. Every visualisation must be accompanied by a discussion of the data view illustrated.
2. You must provide appropriate references to any external resources you used or consulted. This excludes references to standard Python library functions. Use links where appropriate. Reference appropriately all the sources you have used in your implementation and discussion parts.
3. Discuss the challenges you encountered during the development of the application, the solutions you implemented, and the lessons you learned from the project. Reflect on the effectiveness of the techniques used and propose potential improvements for future iterations.
4. You must include a brief section (task 5 and task 6 above) where you reflect on the ethical implications of your data use, the scientific integrity of your design, potential unintended consequences of your analysis, and the human and social context of data analytics more broadly. Your reflections should be ~1-2 paragraphs.
5. You must explore your data beyond the scope of the project brief and uncover hidden information. This could involve various analyses and visualisations that go beyond the provided tasks.

Submission

For this assignment:

● Prepare a single Jupyter Notebook file that includes all the code, text, printed outputs, and data visualisations.
● The notebook should be developed using Python 3 within a Jupyter environment, with well-commented code and appropriately structured text cells resembling a blog format.
● Avoid including personal name details in the notebook or its filename/directory.
● Remember to restart the kernel, thoroughly check the notebook for errors, and provide a working link to the dataset used in the analysis.
● Ensure that all code runs smoothly, and create a compelling narrative by integrating analysis, visualisations, and reflections.
● Your submission may include auxiliary Python files (*.py), where you packaged, e.g., some common functions and imported them in your notebook. In this case, submit a .zip file with all documents included.
● Do not include any dataset files in your submission.

Assessment Criteria

>70: There was evidence of the ability to perform all programming tasks correctly. The demonstration of the methods was excellent, coherent, well documented, and clearly explained.

60-69: There was evidence of ability to perform some programming tasks correctly. The demonstration of the methods is good, coherent, and reasonably detailed and explained.

50-59: There was evidence of ability to perform some programming tasks correctly, but the demonstration of the methods was limited, incoherent, not adequately documented and vaguely explained.

<49: Failure to solve the programming task in assignment. Methods were completely incorrect or absent.

Marking

The University uses two common assessment marking schemes – one for undergraduate and one for postgraduate – to mark all taught programmes leading to an award from the University.

More detailed information on the common assessment marking scheme and the criteria can be found in the Course Syllabus, available on the University's VLE.

Learning Outcomes

On successful completion of the course, students should be able to:

Knowledge and Understanding

K1d Demonstrate a comprehensive understanding and knowledge of data science concepts and master their implementation in data analytic applications.

K2d Demonstrate critical awareness of feasible operations and transformation on data, and their relationships in current data processing pipelines.

K3d Demonstrate a degree of originality in plotting and visualising data in an effective manner.

K4d Critically review and identify key capabilities and limitations in data science practices, and propose directions for further innovation.

Subject-Specific Skills

S1d   Critically evaluate basic data science concepts in their application for solving complex data problems.

S2d   Critically evaluate the requirements and limitations of data transformations techniques to the chosen dataset.

S3d   Demonstrate the ability to identify and implement efficient data science techniques to the area of application and produce clear and concise and well documented code.

S4d   Identify appropriate data science practices within a professional, legal and ethical framework for addressing data management and use, security, equality, diversity and inclusion (EDI) and sustainability issues.

Transferable Skills

T1d   Demonstrate initiative in leading and participating in teams for delivering data science projects in a timely manner and according to specification.

T2d   Consistently display an excellent level of technical proficiency in written English and command of scholarly terminology, so as to be able to deal with complex issues in a sophisticated and systematic way.

T3d   Demonstrate initiative in working independently, effectively, and to deadlines.

T4d   Communicate effectively to both technical and non-technical audiences through oral presentations, software demonstrations, and written reports.

Accessing Feedback

Students can expect to receive feedback on all summative coursework within 28 calendar days of the submission deadline. The 28 calendar day deadline does not apply to work submitted late. Feedback can be accessed through the Turnitin assessment link on the course page. Further instructions on submitting an assessment and accessing feedback can be found on the University's VLE.

Late Submissions

Students are reminded to submit their assessment in the correct format and ahead of the published deadline. Deadlines are strict and Canvas uploads made remotely might not be immediate, we therefore strongly recommend that students upload their work to Canvas in good time before the deadline. If assessments are submitted late without approved Extenuating Circumstances, there are penalties:

- For assessments submitted up to two days late: any mark of 40% or higher will be capped at 40% for undergraduate students. Any mark of 50% or higher will be capped at 50% for postgraduate students. Any mark below 40% for undergraduate students and below 50% for postgraduate students, will stand.
- Students who do not submit their assessment within two days, and have no approved extenuating circumstances, are deemed not to have submitted and to have failed that assessment element. The mark recorded will be 0%.
- Late penalties are calculated differently for some types of portfolios. Please read the Assessment Brief of your portfolio carefully.

For further information, please refer to [AQF7 Part C in the Academic Handbook](#).

Extenuating Circumstances

The University's Extenuating Circumstances (ECs) procedure is in place if there are genuine circumstances that may prevent a student submitting an assessment. If the EC application is successful, there will be no academic penalty for missing the published submission deadline.

Students are normally expected to apply for ECs in advance of the assessment deadline. Students may apply for consideration of ECs retrospectively if they can provide evidence that they could not have done so in advance of the deadline. All applications for ECs must be supported by independent evidence.

Students are reminded that the ECs procedure covers only short-term issues (within 21 days leading to the submission deadline) and that if they experience longer-term matters that impact on learning then they must contact [Student Support and Development](#) for advice.

Under the Extenuating Circumstances Policy, students may defer an assessed element on only one occasion and may request an extension on a maximum of two occasions.

For further information, please refer to the [Extenuating Circumstances Policy](#) in the Academic Handbook.

Academic Misconduct

Any submission must be a student's own work and, where facts or ideas have been used from other sources, these sources must be appropriately referenced. The Academic Misconduct Policy includes the definitions of all practices that will be deemed to constitute academic misconduct. This includes the use of artificial intelligence (AI) where not expressly permitted within the assessment brief, or in a manner other than specified. Students should check this policy before submitting

their work. Students suspected of committing Academic Misconduct will face action under the Policy. Where students are found to have committed an offence they will be subject to sanction, which may include failing an assessment, failing a course or being dismissed from the University depending upon the severity of the offence committed. For further information, please refer to the [Academic Misconduct Policy](#) in the Academic Handbook.

Version History

Title: Assessment Brief Template					
Approved by: The Quality Team					
Version number	Date approved	Date published	Owner	Location	Proposed next review date
4.0	March 2023	March 2023	Registrar	VLE/ Faculty Resources Page	March 2024
3.0	August 2022	August 2022	Registrar	VLE, Faculty Resources Page	July 2023
2.3	December 2021	December 2021	Registrar	VLE	August 2022
2.2	August 2021	August 2021	Registrar	VLE	August 2022
2.1	September 2020	September 2020	Registrar	VLE	August 2021
2.0	September 2020	September 2020	Registrar	VLE	August 2021
1.0	August 2019	August 2019	Registrar	VLE	August 2020
Referenced documents	AQF7 Academic Regulations for Taught Awards; Extenuating Circumstances Policy; Academic Misconduct Policy; Course Syllabus				
External Reference Point(s)	UK Quality Code Theme: Assessment				