AIR QUALITY PROJECT

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# INTRODUCTION

For this assignment, you and your team will play the role of German Data Scientists analyzing recent air quality data sent to you by the European Environment Agency (EEA). Your team is one of many focusing on German Air Quality, and so the EEA has offered many potential questions to answer using your data.

Over the next few weeks, you will take time to select and investigate the location from which your data was collected. You will then learn coding skills which will help you to analyze and visualize your data, while devising a research question to investigate.

Finally, the EEA has asked you to communicate your results to the other research teams at an upcoming air quality conference, and also create a piece of media that will inform a targeted audience about the results of your research.

***Your final assignment for the project is to create, submit, and present, as a team, your class presentation and additional media piece of your choice.*** Below, you can find more information from the EEA on what they are looking for from the data they’ve obtained, and more about what your conference presentation and media piece can look like.

# POTENTIAL TOPICS

*Dear Data Scientists,*

*Thank you for your interest in researching developments in the air quality of Germany. It is always important to monitor the air quality surrounding any human population to best inform governments of issues, and protect citizens from disease or death as a result of pollution.*

*We have compiled 21 different data sets for your teams using our air quality monitoring sites in several German cities and towns in conjunction with meteorological data compiled by the National Oceanic and Atmospheric Administration (NOAA). The data sets span from the beginning 2014 to the end of 2021 and contain crucial variables for analyzing air quality. A full list of the dataset sites, and more details about the variables in each file, can be found in a separate file.*

*We hope that, with this data, you will be able to enlighten the EEA on one of the following topics:*

* *Compare and contrast air quality data between two sites in the same region around the same time.* 
  + *What does this tell you about where the greatest source of pollution is in this area, and where the greatest impacts of pollution might be felt?*
  + *How could this data inform you or your audience about the most problematic sources of pollution in this area and what to do about them?*
* *Compare and contrast air quality data in one location at times before and during the pandemic.* 
  + *What does this tell you about the pollution in that area and the effect of the pandemic on the area?*
  + *How could this data inform you or your audience about the impact of the pandemic in general?*
* *Choose a single location with data on at least three different pollutants.* 
  + *Which of these pollutants would you evaluate to be the worst in this area?*
  + *Where is its most likely source?*
  + *Are any pollutants linked together (coming from the same source, potentially? What is the Best Available Control Technology (BACT) to deal with it?*
  + *How could this data inform you or your audience about how to best deal with the most problematic pollutants in this area?*
* *Choose a site and find the corresponding local, state, or national/international policies on air quality.* 
  + *Compare and contrast the regulations and the actual data. How well does the region meet the regulations set for it?*
  + *What improvements (if any) could be made to better meet the regulations if needed?*
  + *If you don’t see any problems now, could you predict any problems in the future through trend analysis?*
  + *How could this data inform you or your audience about the effectiveness of the regulations and the most important next steps to take?*
* *[Another topic and investigation of your choice]*

*You should make sure to confirm your site and topic with your supervisor before proceeding too deeply into the data, as not doing so could lead to confusion and difficulty extracting results from your research.*

*Thank you again for your time and dedication to keeping the air clean and safe for German residents.*

*Best wishes,*

*Andrew Roznere*

*Senior Data Analyst*

*Central Monitoring Services*

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[Data Site Summaries](https://docs.google.com/document/u/0/d/1W-yBXywA8l1spVZvjopcNaf81vyafxNlkEs3bSGpB3s/edit) and [Data Sets](https://drive.google.com/drive/folders/1r3bdxO0Vmb0te9DwudKtH8LIcymKXJYr?usp=sharing)

# CONFERENCE PRESENTATION

Goal: to share your research findings with your peers using the results of site investigation, visualization techniques produced by the openair software, and comparison or other analysis

Produce a presentation of about **8-10 minutes** in length to share with the class. Note that this means your audience for this presentation is your peers, who have a similar knowledge base of air quality to you and your team. This presentation is due **[DATE (in two weeks)]**

The presentation will contain sections that will largely follow the sections of a general research paper, but condensed for a presentation format. Here is a recommended outline:

**Background**

* Establish motivation for your research**:** Answer questions like: “Why does air quality matter here? What are some health implications of pollutants you focused on? What are the impacts on society, property, and other components of your city or site?” Provide evidence with citations as necessary.
* Describe your pollutant(s) and their “path”: Consider the sources, transformations, sinks, and impacts.This is a place to demonstrate your new knowledge about your pollutant! A flowchart may be particularly useful here
* End by clearly stating your research question: what did you investigate and compare? Why did you choose that question for this area, or why did you choose those pollutants specifically?

**Methods**

* Provide information about your site:Answer questions like: “What was the physical location of the sampling site? What major sources of pollutants are nearby? Who runs the site? What is the general environment - urban? Rural? Suburban? Industrial?” Include source citations as appropriate.
* Communicate a narrative of how you analyzed the data: Describe your software tools, types of plots, used, and any other models or equations you applied. This may also be a space to show off your new coding skills and understanding of air quality visualization techniques!

**Results/Discussion**

* This is your opportunity to impress your peers with the graphical representation of your data analysis and your interpretation of those results. Always discuss the figures and tables you include and the significance of the results it conveys!
* Follow the general structure: a) introduce the figure, b) describe what is in the figure, c) point out the key trends in the figure, and d) provide interpretation about what those trends mean from both a scientific perspective and an impact (on the system or citizens) perspective.
* Aim to use several figures and/or tables of different types. As you’re planning your presentation, consider how your slides and project will create a cohesive story for your audience. Take your audience through that story step by step!

**Conclusion**

* Provide next steps as a result of your findings. Answer questions like: “What should your peers take away from your presentation? Who should this information be communicated to next to most effectively solve issues (this is the audience for your media piece)? What further research could be done on this dataset to obtain more information, or what other data needs to be collected to obtain more information?”
* Share what piece of targeted media you plan to create and why you chose that audience and piece of media (see below).
* End on a slide allowing your audience of peers to ask you some questions about your research!

**Appendices**

* Provide image and source citations linked to the numbers of the slides you used these on. A list of other works referenced, like the openair manual, might also be useful.Pick any format you like (IEEE, MLA, ACS, etc.,) and use that format consistently throughout for citations as well as in the works cited list. Ask if you have questions on how to do this.
* Provide any supplementary information if you wish: perhaps you had additional figures that didn’t fit in the report, but that you still made and want to showcase. Any bonus information that didn’t fit in your presentation can go here

# TARGETED MEDIA

Goal: to share your research findings with a specific audience using a method that would best communicate your ideas to them.

As modern scientists, scientific storytelling is crucial to making an impact. How will you tell others about what you have found in a way that they can understand? This additional media piece is due **[DATE (at end of term)]**

First choose an audience that you think needs to hear the results of your research. You may choose a policymaker or government representative near your site who is able to take action by changing regulations. You may instead choose the average citizen near your site who needs to change their behaviors to reduce pollution. Or perhaps you need other scientists to see your research so they can continue it.

It may further be helpful to research your audience once you choose it: How does your audience most commonly get their news and information? How much science and data visualization do they understand? What technical concepts would they understand that you can communicate. What kinds of appeals would work best to convince them of your argument? If you are writing to a policymaker, which policymaker in particular will you address, and why them?

Then, create a piece of alternative media that communicates your research to your audience. This is a broad category of possible products, and while it will likely follow some of the outline of your class presentation, it will probably not be as in depth and scientifically complex. Here are a few ideas:

* Create a **paper media campaign** to be put up outside a bus stop or in another location to share the results of your research, and provide some resources that your audience can use. This must include at least a **poster, a pamphlet, and a 1-minute written elevator pitch**. You might also consider making a social media account (like an instagram) to link from your paper media
* Create a **digital media campaign** to communicate the results of your research in an educational and accessible way, using graphics and multiple pages. This must include at least a **website and an advertisement** that you might post on another website.You might also consider making a social media account (like an instagram) to promote your website and link content between the two.
* Create a **video or tv commercial** telling your audience about your air quality issue and what they should do about it. This should be about 3-5 minutes in length, and can take any of several forms including a slideshow with narration or a mini-documentary.
* Create a **radio or podcast news segment** in which an interviewer asks a researcher about what you have discovered, or the story of the research is otherwise conveyed. This should be about 5-10 minutes in length.
* Some other supplementary media of sufficient length

You will share your media with your peers at the end of the term in the form of a gala event and screening festival. You should be able to defend why you chose the audience that you did, and why you chose the piece of media that you did to communicate with that audience. You should also have a way to display all your work digitally or on paper.

Paper or Digital campaigns should be artistically cohesive and can utilize fake contact information (email and phone number, etc.), but if you use fake info, you shouldn’t publish that to social media. Audio/Video production can be highly scripted, and does not need to be technically impressive to communicate a point effectively. You might consider finding examples of what you want to create and draw inspiration from them, and your TAs or professor Taylor can find some of these if you aren’t sure where to start.

Finally, you may consider whether you want to make the project in English or German. If you feel that your group has sufficient language skills to create the media in German, this would be an excellent exercise!

# GRADING RUBRICS

Presentation

| **Category** | **Full Marks** | **Partial Marks** | **Low Marks** | **Score** |
| --- | --- | --- | --- | --- |
| Background - The presentation establishes a need for the research (with citations), the pollutants researched, and ends with a clear question to answer | 3 | 2 | 1 | /3 |
| Methods - The presentation describes the area researched including population and potential sources, and describes the methods of analysis of data | 4 | 3 | 2 | /4 |
| Results - The presentation uses figures produced by openair to show analysis of data, and these figures are introduced, explained, made relevant, and connected back to the question | 5 | 4 | 2 | /5 |
| Conclusions - The presentation ends by providing next steps and further questions, and who the information should be communicated to next as well as how (with what media piece) | 4 | 3 | 2 | /4 |
| Figures and Citations - figures are labeled with numbers and are legible to the audience, citations are included for additional images and research | 2 | 1 | 0 | /2 |
| Overall Quality - The presentation has few or no grammatical errors, and is generally neat and clean. Style and formatting meet the needs of the presentation | 2 | 1 | 0 | /2 |
| **TOTAL** | — | — | — | /20 |

Supplementary Media

| **Category** | **Full Marks** | **Partial Marks** | **Low Marks** | **Score** |
| --- | --- | --- | --- | --- |
| Audience - The media piece is targeted to a specific audience for a clear reason, and this media piece caters to that audience’s needs and habits | 5 | 4 | 2 | /5 |
| Background - The media piece describes the research undertaken including the area, pollutants, and data researched | 2 | 1 | 0 | /2 |
| Content - The media piece delivers the findings from this research in a condensed and understandable format | 5 | 4 | 2 | /5 |
| Conclusions - The media piece conveys the next steps, specifically, actions that the audience should take, as well as raising new questions, if relevant | 2 | 1 | 0 | /2 |
| Creativity - art and animations or embellishments are included in the media piece as appropriate | 2 | 1 | 0 | /2 |
| Overall Quality - The media piece has few or no grammatical errors, and is generally neat and clean. Style and formatting meet the needs of the piece | 4 | 3 | 2 | /4 |
| **TOTAL** | — | — | — | /20 |

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# SUPPLEMENTARY INFORMATION

* Locations in Berlin to print a poster: <https://www.nomadenberlin.com/blog2/copy-shops-in-berlin>
* How to write a paper in a scientific journal style and format: [link](https://drive.google.com/file/d/1sO5AR9XOhx0lgMaOi6iSXA-XfViNAHs9/view?usp=sharing)