Thesis Plan

Detecting and Assessing Pollution Events from Wildfires Using Remote Sensing and Meteorological Data: A Data Science Approach

Green Data Science

Main Phases

- Past Literature 0
- Introduction 1
- Data & Methodology 2
- Results & Discussion 3
- Conclusion 4

Ongoing Phases

Constructing of Thesis

Feedbacks

Final Touches

Thesis Goals

- Developing work at IPMA/ISA
- Now – January – see past work and data
- January – June – hands on
- June – September – final touches
- October - deliver

Timeline

0. Past Literature
1. Introduction

2. Data & Methodology

2. Data & Methodology

3. Results & Discussion

4. Conclusion

Have a draft

Go back and forth with draft

Go back and forth with draft

Achieve final version

Deliver

0 Past Literature

- **Goal**: Read and understand work done previously by reading the available contents. Conduct a thorough review of existing work in three main areas: air pollution, remote sensing, and data science applications.
- **Milestones**: Finalize Literature Review
- **Deliverables**: Document with relevant literature and others. Summary of current knowledge on wildfire pollution and transboundary impacts. Review of remote sensing tools (e.g., MODIS, SEVIRI, Sentinel) and data science methods. Identify knowledge gaps to justify your approach.
- **Timeline**: Until the end of 2024 and first 2 weeks of January

1 Introduction

- **Goal**: Finalize the introduction section by outlining the context, significance, and aims of the research.
- **Milestones**: Write Introduction and Objectives
- **Deliverables**: Background information - Contextualize the problem. Problem statement - Clearly articulate the gap in current solutions. Objectives and research questions - Refine measurable goals and hypotheses.
- **Timeline**: **Week 1–3. Starting mid January**

2 Data & Methodology

- **Goal**: Define data sources, preprocessing steps, and modeling techniques.
- **Milestones**: Data Understanding, Collection and Processing & Model Implementation
- **Deliverables**:
  - Data Collection: Obtain meteorological data (CAMS, WRF-Chem, station data). Acquire remote sensing data (FRE, FRP from MODIS, Sentinel).
  - Data Processing: Perform cleaning and preprocessing tasks (handling missing values, scaling). Integrate datasets for a unified analysis framework.
  - Model Development: Implement machine learning models (Random Forests, XGBoost, Neural Networks). Develop geospatial tools for spatial and temporal smoke dispersion mapping.
  - Evaluation: Validate models with performance metrics (accuracy, F1-score, AUC). Cross-validate against historical wildfire pollution events (e.g., Portugal's 2017 megafires).
- **Timeline**: Week 4-9. Starting mid February & March

3 Results & Discussion

- **Goal**: Analyze and interpret results from the implemented models and spatial-temporal analyses.
- **Milestones**: Spatial-Temporal Analysis & Results and Discussion
- **Deliverables**:
  - Model Performance: Present tables, graphs, and metrics of model results. Spatial-Temporal Analysis: Create maps showing pollution dispersion, patterns, and affected regions.
  - Discussion: Correlate FRP/FRE data with pollution levels. Evaluate model strengths, weaknesses, and their implications.
- **Timeline**: Week 10–13. Starting April

4 Conclusion

- **Goal**: Summarize findings, discuss implications, and propose future work.
- **Milestones**: Conclude pratical work
- **Deliverables**: Recap main findings and contributions. Discuss potential policy and real-world applications. Suggest areas for future research (e.g., incorporating health impact data).
- **Timeline**: **Week 14-15. Ending April & Starting May**

Constructing of Thesis Word

- **Goal**: Compile a detailed bibliography in a consistent format (e.g., APA or IEEE). Write progress of thesis.
- **Milestones**: Thesis ready for review (around 90%)
- **Deliverables**: Complete and properly formatted reference list. Structured thesis
- **Timeline**: **Ongoing; finalize in Week 16-17. Around end May to have a draft**

Final Touches

- Goal: Have thesis and thesis presentation as much complete as possible
- Milestones: Achieve 98% of thesis & get feedback
- Deliverables: Thesis for review
- Timeline: **Week 18-(?) -> back and ford sending thesis until complete**

Thank You

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