

Group 73 Progress Report: Wildfire Detection Classification Plan

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1 Introduction

Here, write a brief introduction to the problem you are solving. This can be adapted from your problem description and motivation from the original proposal. This should be around 0.25-0.5 pages.

Wildfires are becoming increasingly prevalent and devastating due to climate change []. This poses a growing threat to both human safety and the environment, causing billions of dollars in damages each year and severely affecting air quality and biodiversity [], [], []. Early detection of wildfires is crucial for effective response and mitigation efforts. However, detecting wildfires at an early stage can be challenging. Subtle indicators such as light smoke or small flames can be obscured by dense vegetation, clouds, or varying terrain, often making traditional monitoring methods unreliable [], []. In an attempt to address this issue, our project explores the use of Convolutional Neural Networks (CNNs) for automatic wildfire detection from images [], []. Our project formulates the task as a binary classification problem: given an RGB image of an area, the model identifies it as a “fire” or “no fire” scenario [].

2 Related Work

Here, talk about the related work you encountered for your approach. Cite at least 5 references. Refer to item 2. No one has done exactly your task? Write about the most similar thing you can find. This should be around 0.25-0.5 pages.

Advancements in wildfire research have led to the use of deep learning to enhance prediction, monitoring, and detection capabilities []. There are several existing solutions that use a combination of various CNN architectures and other neural networks for wildfire prediction. Popular models include **FirePred** and **WFNet**. *FirePred* is a hybrid multi-temporal CNN model for wildfire spread prediction and *WFNet* is a hierarchical CNN for

wildfire spread prediction [], []. However these models, like most renowned ones, focus on modeling wildfire spread and spatiotemporal dynamics rather than direct detection from visual data which our project addresses. For direct wildfire detection from images, the paper **Advanced Wildfire Detection Using Deep Learning Algorithms: A Comparative Study of CNN Variants** is a notable example []. This study evaluates models such as InceptionV3, Xception, and NASNetMobile on over 25,000 images, achieving accuracies above 98%. While this study focuses on benchmarking CNN architectures for accuracy, our project differs by optimizing image preprocessing and augmentation pipelines to balance accuracy with computational efficiency for real-time detection. There are however other CNN projects such as Malaria Detection using TensorFlow’s malaria dataset that resemble our project’s workflow more closely [], []. Similar to our approach, they emphasize image preprocessing, model training, and performance optimization for efficient binary classification.

3 Dataset

You should write about your dataset here, following the guidelines regarding item 1. This section may be 0.5-1 pages. Depending on your specific dataset, you may want to include subsections for the preprocessing, annotation, etc.

4 Features

Describe any features you used for your model, or how your data was input to your model. Are you doing feature engineering or feature selection? Are you learning embeddings? Is it all part of one neural network? Refer to item 2. This may range from 0.25 pages to 0.5 pages.

Since convolutional neural networks (CNNs) learn features automatically, our “feature engineering” focuses on transformations that enhance spa-



Figure 1: A figure with a caption that runs for more than one line. Example image is usually available through the mwe package without even mentioning it in the preamble.

tial learning rather than on hand-crafted variables.

5 Implementation

Describe your model and implementation here. Refer to item 4. This may take around a page.

6 Results and Evaluation

How are you evaluating your model? What results do you have so far? What are your baselines? Refer to item 5. This may take around 0.5 pages.

7 Feedback and Plans

Write about your plans for the remainder of the project. This should include a discussion of the feedback you received from your TA, and how you plan to improve your approach. Reflect on your implementation and areas for improvement. Refer to item 6. This may be around 0.5 pages.

8 Template Notes

You can remove this section or comment it out, as it only contains instructions for how to use this template. You may use subsections in your document as you find appropriate.

8.1 Tables and figures

See Table 1 for an example of a table and its caption. See Figure 1 for an example of a figure and its caption.

8.2 Citations

Table 1 shows the syntax supported by the style files. We encourage you to use the natbib styles. You can use the command `\citet` (cite in text) to get “author (year)” citations, like this citation to a paper by Gusfield (1997). You can use the

command `\citep` (cite in parentheses) to get “(author, year)” citations (Gusfield, 1997). You can use the command `\citealp` (alternative cite without parentheses) to get “author, year” citations, which is useful for using citations within parentheses (e.g. Gusfield, 1997).

8.3 References

Many websites where you can find academic papers also allow you to export a bib file for citation or bib formatted entry. Copy this into the custom.bib and you will be able to cite the paper in the L^AT_EX. You can remove the example entries.

8.4 Equations

An example equation is shown below:

$$A = \pi r^2 \quad (1)$$

Labels for equation numbers, sections, subsections, figures and tables are all defined with the `\label{label}` command and cross references to them are made with the `\ref{label}` command. This an example cross-reference to Equation 1. You can also write equations inline, like this: $A = \pi r^2$.

Team Contributions

Write in this section a few sentences describing the contributions of each team member. What did each member work on? Refer to item 7.

References

- Rie Kubota Ando and Tong Zhang. 2005. A framework for learning predictive structures from multiple tasks and unlabeled data. *Journal of Machine Learning Research*, 6:1817–1853.
- Galen Andrew and Jianfeng Gao. 2007. Scalable training of L1-regularized log-linear models. In *Proceedings of the 24th International Conference on Machine Learning*, pages 33–40.
- Dan Gusfield. 1997. *Algorithms on Strings, Trees and Sequences*. Cambridge University Press, Cambridge, UK.
- Mohammad Sadegh Rasooli and Joel R. Tetreault. 2015. *Yara parser: A fast and accurate dependency parser*. *Computing Research Repository*, arXiv:1503.06733. Version 2.

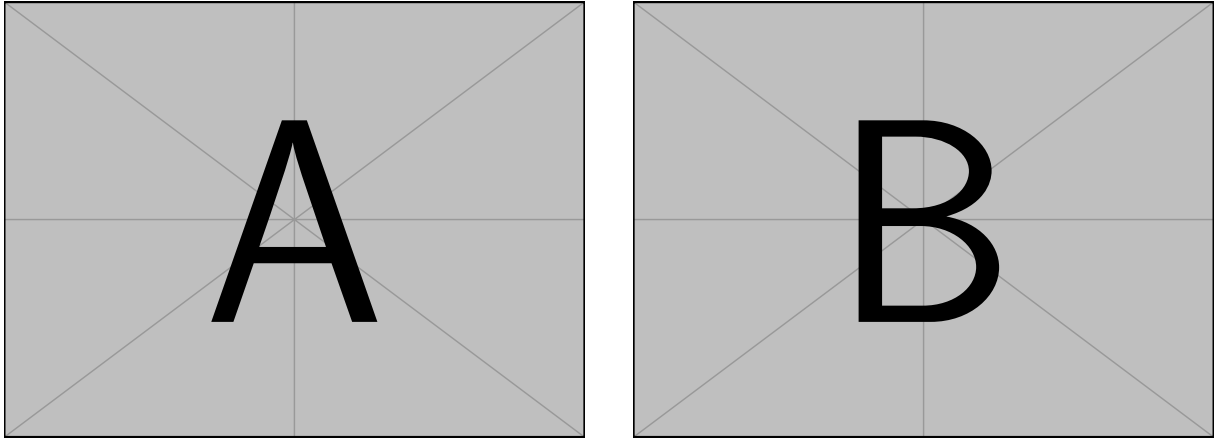


Figure 2: A minimal working example to demonstrate how to place two images side-by-side.

Output	natbib command	ACL only command
(Gusfield, 1997)	<code>\citep</code>	
Gusfield, 1997	<code>\citealp</code>	
Gusfield (1997)	<code>\citet</code>	
(1997)	<code>\citeyearpar</code>	
Gusfield's (1997)		<code>\citeposs</code>

Table 1: Citation commands supported by the style file.