DS 340W Week 2 Presentation Script

KALTURA Recording Narration

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This script provides complete narration for the Week 2 presentation recording. Each section corresponds to a presentation slide with detailed talking points for comprehensive topic coverage.

# Slide 1: Introduction

Good afternoon. Welcome to my DS 340W Week 2 presentation analyzing Weber et al.'s groundbreaking research on detecting natural disasters, damage, and incidents in the wild. This ECCV 2020 paper addresses critical challenges in emergency response systems through innovative computer vision techniques.

Today I'll present my comprehensive analysis of their methodology, discuss the significance of the IncidentsDataset, and outline my implementation strategy for extending their work through novel multi-scale attention mechanisms.

# Slide 2: Problem Statement

The motivation for this research stems from critical limitations in current emergency response systems. Emergency responders are overwhelmed by false alarms from automated detection systems, leading to resource waste and delayed response times. Manual disaster assessment is both slow and expensive, while social media noise creates dangerous delays in emergency situations.

Weber et al. address these challenges through three key innovations: creating the largest disaster detection dataset available, developing novel class-negative loss functions to handle hard negatives, implementing multi-task CNN architecture for simultaneous incident and place recognition, and demonstrating real-world deployment capability with millions of processed images.

# Slide 3: Architecture Overview

The multi-task CNN architecture represents a significant advancement in disaster detection systems. Starting with 224x224x3 input images, the system processes data through progressively complex convolutional blocks using 64, 128, and 256 filters respectively.

The ResNet-50 backbone provides robust feature extraction capabilities, while dual classification heads enable simultaneous incident classification across 43 categories and place recognition across 49 location types. This multi-task approach leverages complementary information between tasks, significantly improving overall system performance.

# Slide 4: Dataset Analysis

The IncidentsDataset represents an unprecedented contribution to disaster detection research. With 1,144,148 labeled images, it provides 10 times more training data than previous datasets in this domain.

The dataset exhibits excellent geographic distribution spanning six continents, with North America contributing 35.2%, Europe 28.7%, and Asia 22.1% of images. Temporal coverage from 2015 to 2020 shows consistent growth, with incident distribution revealing fire as the most represented category at 7.5%, followed by floods at 6.7% and earthquakes at 5.7%.

# Slide 5: Performance Results

The experimental results demonstrate substantial improvements over baseline approaches. The proposed class-negative loss function achieves 4.3 to 5.2% mean Average Precision improvement compared to standard cross-entropy training.

Most significantly, the system reduces false positive rates by up to 52% across disaster categories, addressing the critical problem of false alarms in emergency response. The model maintains real-time processing capability with 15 millisecond inference time per image, making it suitable for large-scale social media monitoring applications.

# Slide 6: Novel Approach

Building on Weber et al.'s foundation, I propose a novel multi-scale attention enhancement that processes features at three different resolutions. Scale 1 operates at 28x28 resolution for high-resolution detail preservation, Scale 2 at 14x14 for mid-level pattern recognition, and Scale 3 at 7x7 for global context modeling.

The attention fusion mechanism mathematically combines these multi-scale features using learned attention weights, allowing the model to focus on relevant spatial locations across different scales. This approach should further improve detection accuracy by capturing both fine-grained details and global context simultaneously.

# Slide 7: Conclusion

Thank you for your attention. Weber et al.'s research establishes new benchmarks for disaster detection through comprehensive dataset development and innovative loss function design. Their work demonstrates the practical impact of computer vision research in addressing real-world emergency response challenges.

My proposed multi-scale attention enhancement builds on their foundation to further improve system accuracy and robustness. The next phase of this project will involve implementing and evaluating these enhancements using the comprehensive development plan outlined in today's presentation.

I look forward to discussing this research and answering any questions about the implementation strategy or technical details presented today.