

FIRE DETECTION USING DEEP LEARNING

CECS 553 MACHINE VISION

MENTOR – Dr. BENYAMIN AHMADNIA

GROUP MEMBERS -

AISHWARYA BHAVSAR

ANDREW RAMIREZ



INTRODUCTION

- Having a fire detection system **can significantly reduce damages and maximize fire control efforts.**
- It is also one of the most fundamental steps you can take for **fire safety measures.**
- Even if you are sleeping or busy working, early fire detection **will warn you and help you respond** quickly so you'll be out of danger.
- **Saves life.**
- **Reduces loss of property.**
- **Shorten recovery time.**
- **For insurance discounts.**
- **Keep you code-compliant.**

PROBLEM STATEMENT

- Fires can start randomly, and they can spread quickly, causing major damage before they are noticed.
- Currently, we have fire alarm systems that detect the fire using **smoke sensors**. But they are inefficient, in terms of time and are sometimes are not properly installed. If the owner is away, they may not be around to hear the alarm.
- We need a detection system that can **identify the fire with accuracy** within seconds and notify the user to take further action.
- It can take **just 30 seconds for a small flame** to turn into a major blaze (Department of Homeland Security).
- The top three **causes of fires** in homes are
 - cooking,
 - heating equipment,
 - electrical malfunction.
- An average of **358,500** homes experience a structural fire each year (NFPA).
- More than **3,000 Americans** die in fires each year (FEMA).
- Every day, at least **one child dies** from a fire inside the home (Stanford Children's Hospital).
- Reference : <https://www.thezebra.com/resources/research/house-fire-statistics/>

FIRE STATISTICS

Fires	1,291,500 in 2019	-3.2% ↓ from 2010
Deaths	3,704 in 2019	+24.1% ↑ from 2010
Injuries	16,600 in 2019	-12.5% ↓ from 2010
\$ Loss	\$14.8 billion in 2019	+74.5% ↑ * from 2010
No Large \$	\$14.8 billion in 2019	+9.5% ↑ ** from 2010

PROPOSED SOLUTION

- Solution is early Fire Detection using real-time camera photos & neural networks.

Creating a customized CNN Architecture: **TensorFlow API Keras**

Use data augmentation techniques.

Create CNN Model.

Use activation functions for improving the accuracy.

REAL TIME TESTING: [Using OpenCV or PIL]

1. Take a real time video,

2. Cut it into frames.

3. Input the frames into the CNN Model.

4. Detect whether "Fire" or "No Fire"



RECENT WORK

- **DEEP LEARNING ALGORITHM FOR FIRE DETECTION**
<https://ieeexplore.ieee.org/document/9263456>
- **Early fire detection using deep learning & OpenCV**
<https://towardsdatascience.com/early-fire-detection-system-using-deep-learning-and-opencv-6cb60260d54a>
- <https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=8307064>
- <https://ieeexplore.ieee.org/document/9619342>

THANK YOU

