# FIRE DETECTION USING DEEP LEARNING

**CECS 553 MACHINE VISION** 

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### 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

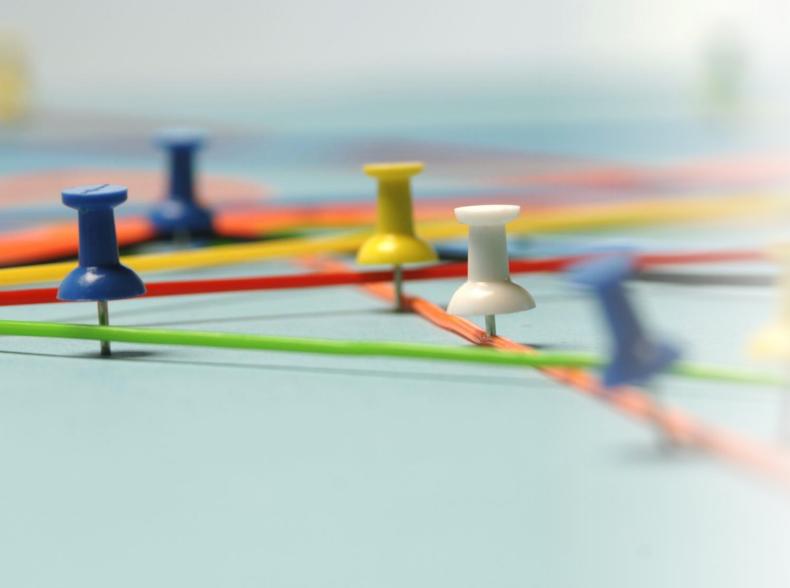
- Fires can start randomly, and they can spread quickly, causing major damage before they are noticed.
- Currently, we have fire alarm systems that detect the fire using smoke sensors. But they are inefficient, in terms of time and are sometimes are not properly installed. If the owner is away, they 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 : <a href="https://www.thezebra.com/resources/research/house-fire-statistics/">https://www.thezebra.com/resources/research/house-fire-statistics/</a>

## FIRE STATISTICS

Fires	1,291,500 in 2019	-3.2% from 2010	<b>4</b>
Deaths	<b>3,704</b> in 2019	+24.1% from 2010	1
Injuries	<b>16,600</b> in 2019	-12.5% from 2010	<b>\</b>
\$ Loss	\$14.8 billion in 2019	+74.5% * from 2010	1
No Large \$	\$14.8 billion in 2019	+9.5% ** from 2010	1

### 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/docu ment/9263456
- Early fire detection using deep learning & OpenCV https://towardsdatascience.com/e arly-fire-detection-system-usingdeep-learning-and-opencv-6cb60260d54a
- https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=8307064
- https://ieeexplore.ieee.org/docu ment/9619342

### **THANK YOU**