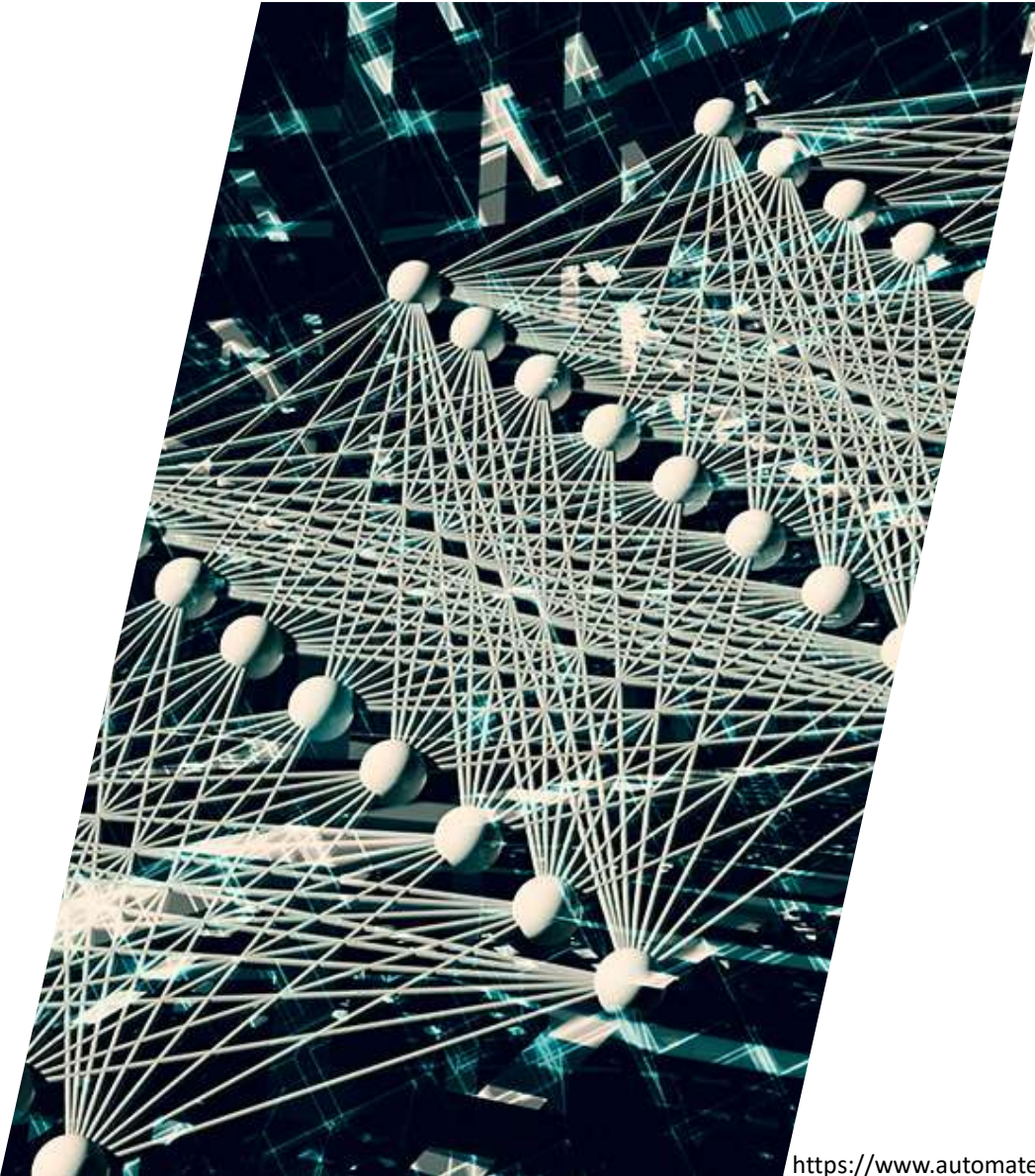


The background is a dark, textured surface featuring a complex, glowing network of white nodes and connecting lines, resembling a neural network or a molecular structure. The nodes are of varying sizes and are interconnected by thin, light-colored lines, creating a sense of depth and connectivity.

# CONVOLUTIONAL NEURAL NETWORK

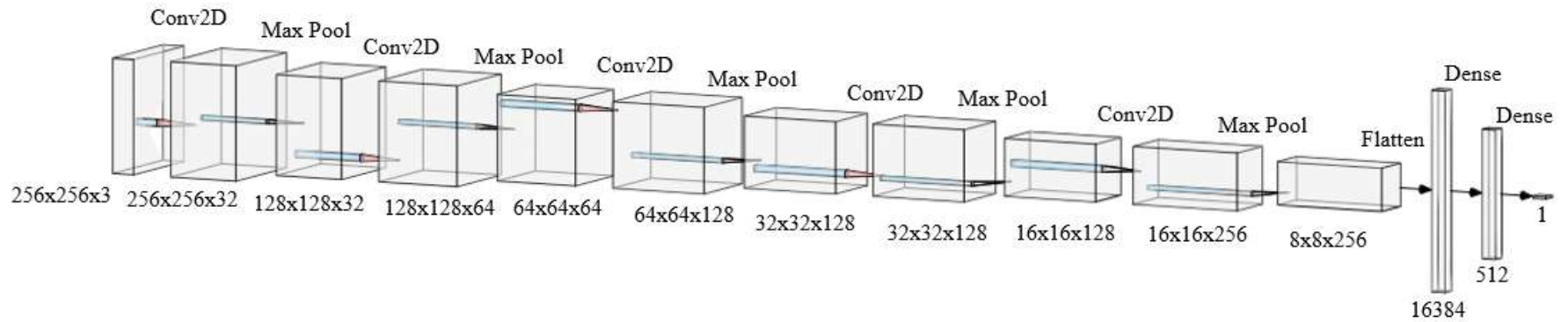
JOSH HENDERSON

2/13/2023



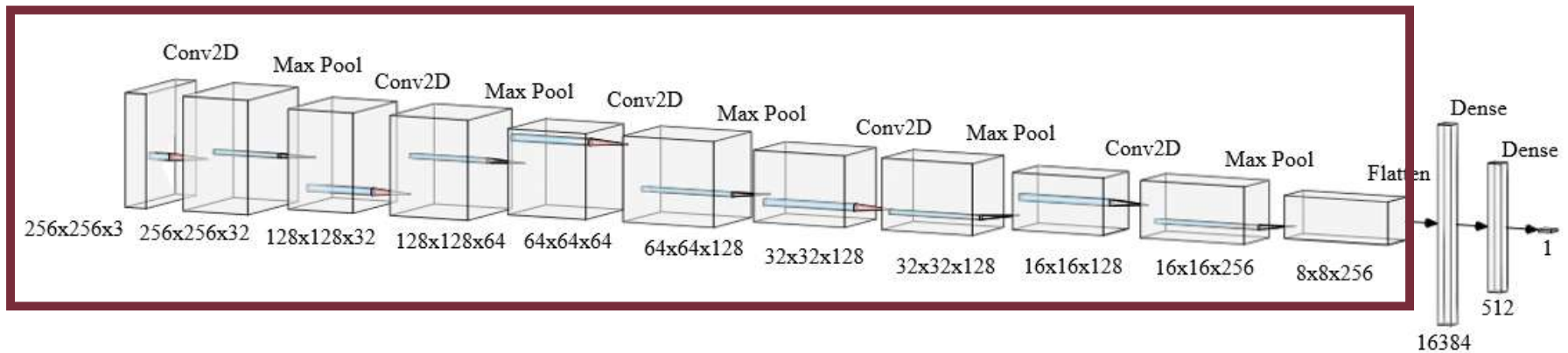
# OVERVIEW

- ❖ INTRODUCTION
- ❖ MODEL
- ❖ PROGRAMMING



## MODEL

- Convolution and Pooling (x5): feature extraction and condensation
  - Increasing in filters over time
- Flatten: forms data into a vector
- Dense
  - 1<sup>st</sup> layer:  $2^{14}$  nodes to  $2^9$  nodes (approx. 8.5m parameters)
  - 2<sup>nd</sup> layer: sigmoid activation gives prediction



## MODEL

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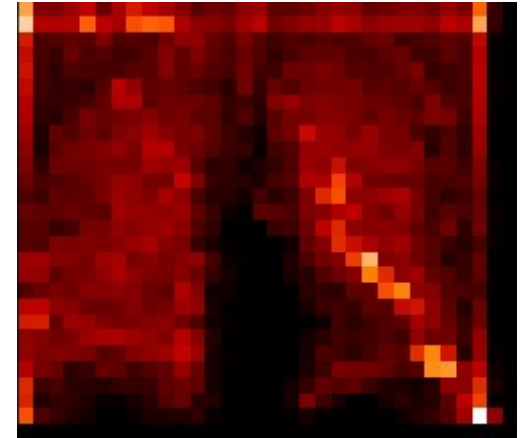
1 <sub>x1</sub>	1 <sub>x0</sub>	1 <sub>x1</sub>	0	0
0 <sub>x0</sub>	1 <sub>x1</sub>	1 <sub>x0</sub>	1	0
0 <sub>x1</sub>	0 <sub>x0</sub>	1 <sub>x1</sub>	1	1
0	0	1	1	0
0	1	1	0	0

Image

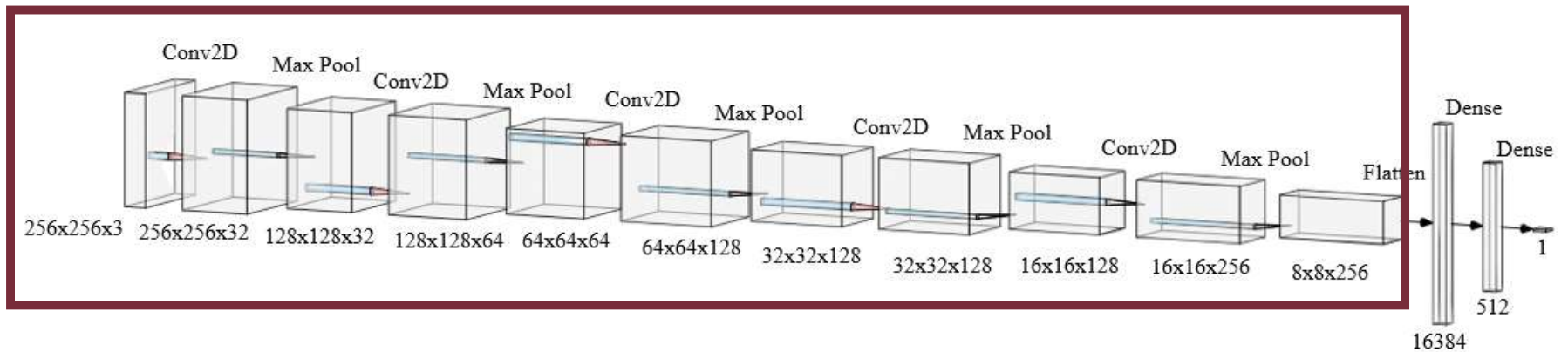
4		

Convolved  
Feature

# CONVOLUTION & POOLING

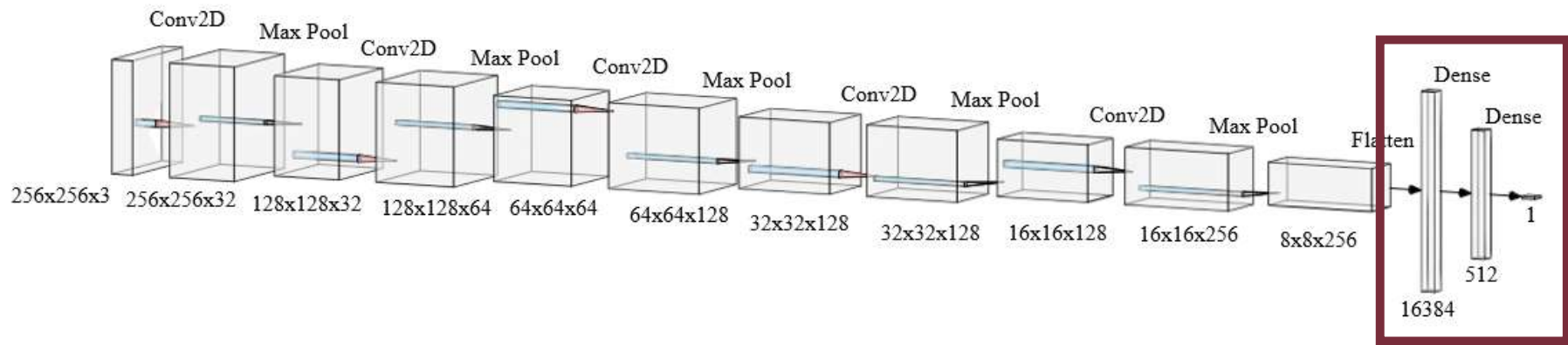


- Filters scan an image for features
- ReLU activation is applied
- Feature map is downsized



## MODEL

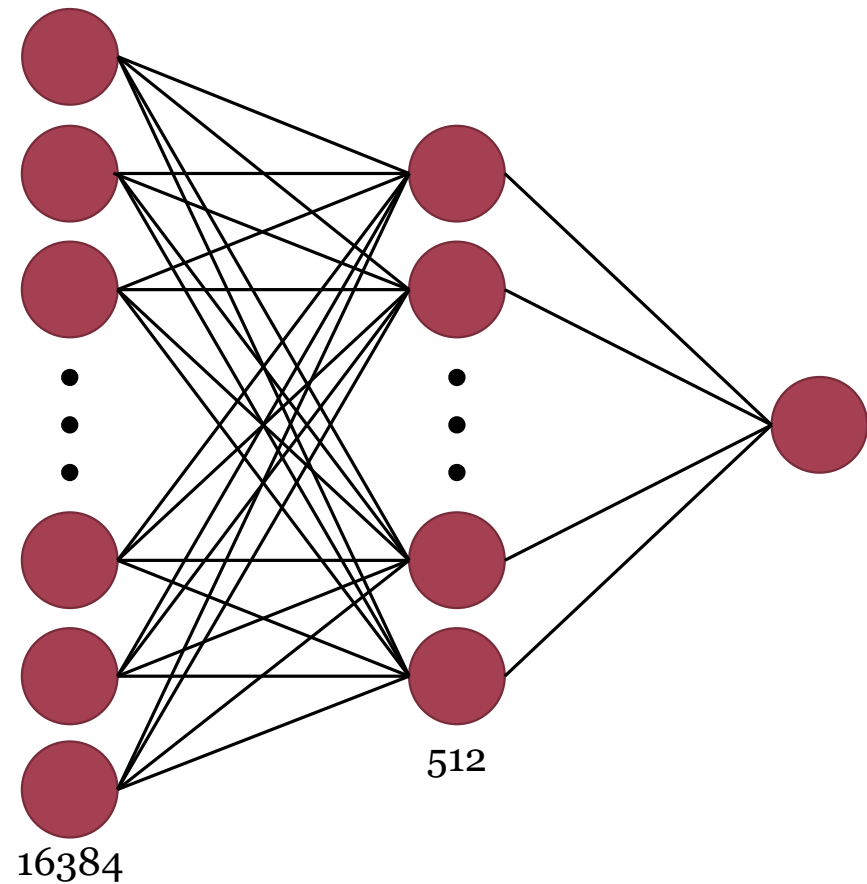
- Convolution and Pooling (x5): feature extraction and condensation
  - Increasing in filters over time
- Flatten: forms data into a vector
- Dense
  - 1<sup>st</sup> layer:  $2^{14}$  nodes to  $2^9$  nodes (approx. 8.5m parameters)
  - 2<sup>nd</sup> layer: sigmoid activation gives prediction



## MODEL

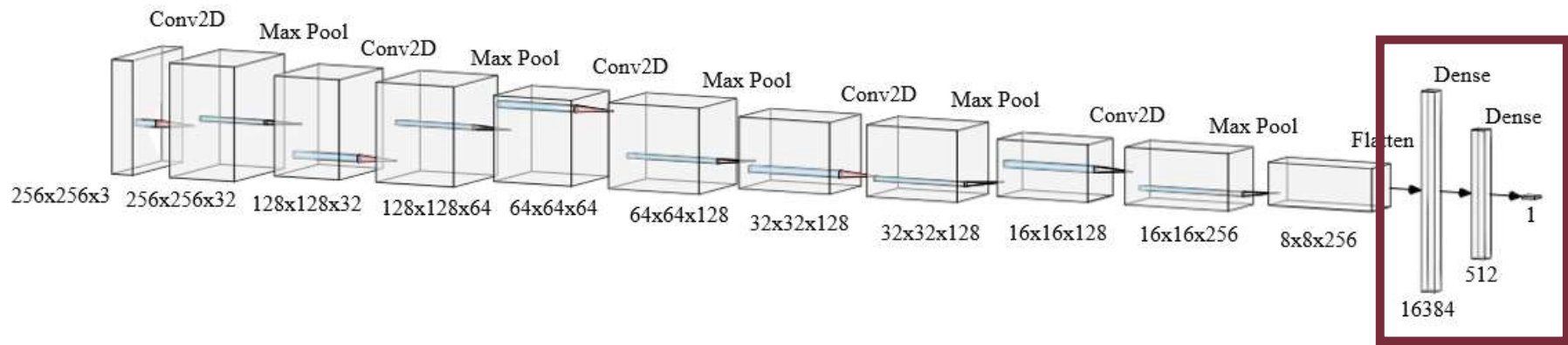
- Convolution and Pooling (x5): feature extraction and condensation
  - Increasing in filters over time
- Flatten: forms data into a vector
- Dense
  - 1<sup>st</sup> layer:  $2^{14}$  nodes to  $2^9$  nodes (approx. 8.5m parameters)
  - 2<sup>nd</sup> layer: sigmoid activation gives prediction

# DENSE LAYERS



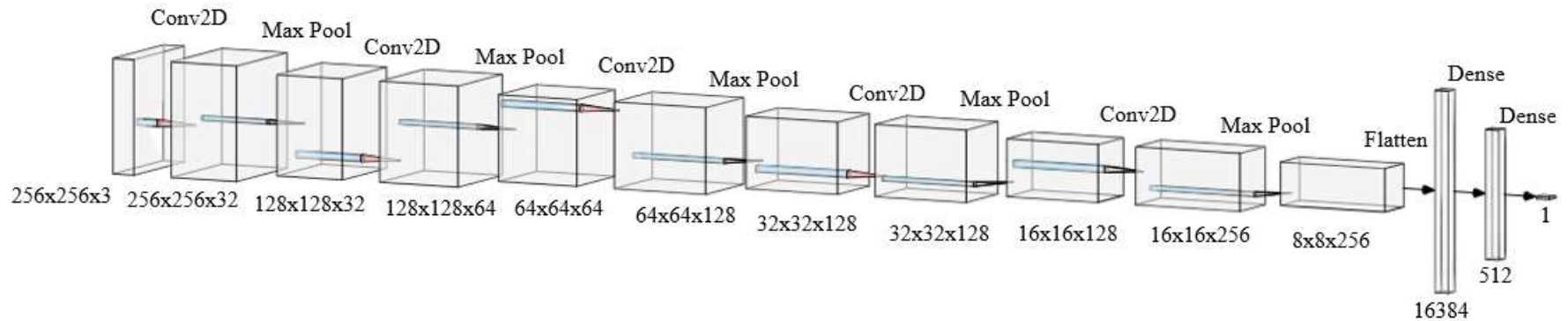
- Connections between every node
- 1<sup>st</sup> layer: Connections between features
- 2<sup>nd</sup> layer: Prediction (sigmoid activation)





## MODEL

- Convolution and Pooling (x5): feature extraction and condensation
  - Increasing in filters over time
- Flatten: forms data into a vector
- Dense
  - 1<sup>st</sup> layer:  $2^{14}$  nodes to  $2^9$  nodes (approx. 8.5m parameters)
  - 2<sup>nd</sup> layer: sigmoid activation gives prediction



## MODEL

- Convolution and Pooling (x5): feature extraction and condensation
  - Increasing in filters over time
- Flatten: forms data into a vector
- Dense
  - 1<sup>st</sup> layer:  $2^{14}$  nodes to  $2^9$  nodes (approx. 8.5m parameters)
  - 2<sup>nd</sup> layer: sigmoid activation gives prediction

# TIPS I LEARNED WHEN PROGRAMMING



## **Isolate Functions**

Data Loading  
Data Balancing  
Model Architecture  
Creation  
Interaction and Model  
Training



## **Design to Be**

Readable  
Adaptable  
Usable

The background is a dark, textured surface with a network of light-colored nodes and lines. The nodes are small circles of varying sizes, and the lines are thin, connecting the nodes in a complex, web-like pattern. The overall effect is a sense of connectivity and structure.

THANK YOU



## BASED ON PREVIOUS WORK IN:

HENDERSON, JOSHUA ELLIOT, "CONVOLUTIONAL NEURAL NETWORK FOR COVID-19 DETECTION IN CHEST X-RAYS" (2022). HONORS THESIS. 254. [HTTPS://RED.LIBRARY.USD.EDU/HONORS-THESIS/254](https://red.library.usd.edu/honors-thesis/254)

HENDERSON, J., SANTOSH, K. (2023). ANALYZING CHEST X-RAY TO DETECT THE EVIDENCE OF LUNG ABNORMALITY DUE TO INFECTIOUS DISEASE. IN: SANTOSH, K., GOYAL, A., AOUADA, D., MAKAR, A., CHIANG, Y.Y., SINGH, S.K. (EDS) RECENT TRENDS IN IMAGE PROCESSING AND PATTERN RECOGNITION. RTIP2R 2022. COMMUNICATIONS IN COMPUTER AND INFORMATION SCIENCE, VOL 1704. SPRINGER, CHAM. [HTTPS://DOI.ORG/10.1007/978-3-031-23599-3\\_6](https://doi.org/10.1007/978-3-031-23599-3_6)

## CONVOLUTIONAL NEURAL NETWORK

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