



# **UAS-DTU**

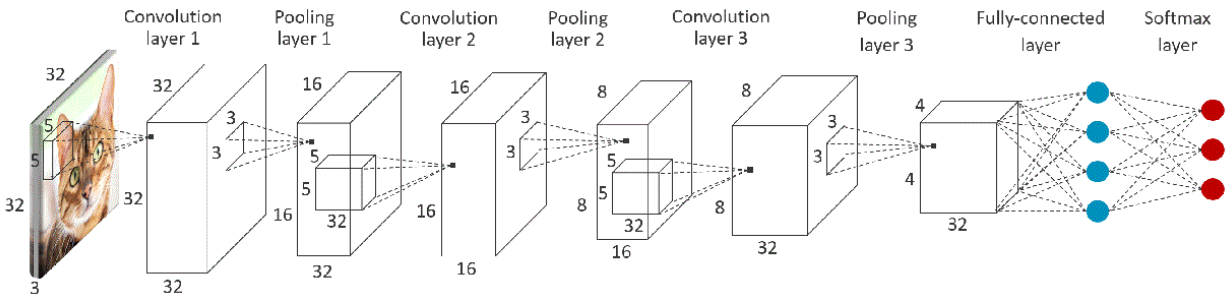
## **Unmanned Aerial Systems - Delhi Technological University**

### **ROUND 2: Technical Round Software Department**

#### **Background**

Convolutional Neural Networks (CNNs) are a game-changing development in the field of deep learning designed specifically for the processing of spatial and visual data. In order to accurately capture feature hierarchies, CNNs are built to replicate the human visual system. CNNs are excellent in classifying objects, scenes, or patterns with exceptional accuracy because they can extract meaningful patterns from unprocessed visual data. CNNs are ideal for tasks like object recognition, image classification, and even more challenging tasks like facial expression recognition or medical image diagnosis because they can automatically learn to recognize complex features and spatial relationships in images by combining convolutional layers, pooling layers, and fully connected layers.

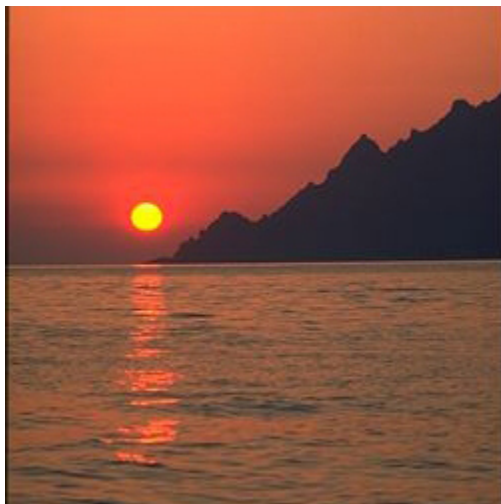
Deep learning models for classification are a subset of neural networks created to address issues where the objective is to categorize input data into predetermined groups or classes. The fields of image identification, natural language processing, and medical diagnostics have all been transformed by these models. Convolutional neural networks (CNNs) for image data. These models automatically extract the information required for precise categorization by learning intricate patterns and representations from enormous volumes of data.



For the purposes of this assignment consider a simple classification model to classify the given image into two classes: A) Forest fire B) Non-Forest Fire

To simplify the task we need you to build a software system which only classifies Forest Images into two categories Forest Fire or Non Forest Fire. We need you to try and implement one such CNN on your own. We will give you the step-by-step approach to do the same.

Example dataset:



No fire



Fire

## Task

1. [Optional] Install Ubuntu in your disk partition, refer to this link (<https://www.youtube.com/watch?v=-iSAyiicyQY>) for details on how to do this. Note that this task often takes time but we highly encourage you to use ubuntu once recruited so doing this might give a head start. But note that this is purely **optional** and you will not be evaluated on the basis of this
2. Learning and picking up new things is the key to work we do. Download and learn **python3**, get comfortable with basic data structures used in python3 (lists, dict, strings, etc). If you

know C++ this might not be a steep learning curve. Refer to the beautifully written documentation python has to offer <https://www.python.org/downloads/release/python-378/>. Also refer to youtube and blogs for learning quickly.

3. Study basic **Mathematics** (Linear Algebra, Calculus, Probability, Matrices and Determinants) and understand the basic principle behind neural networks. <http://www.deeplearningbook.org/> (reference link, read relevant chapters)
4. Build a **basic classifier** and train it on the **provided dataset** using any framework of your choice (TensorFlow, Pytorch etc.). Use documentation of the framework to understand how it works.  
Tensorflow - [https://www.tensorflow.org/api\\_docs](https://www.tensorflow.org/api_docs)  
PyTorch - <https://pytorch.org/docs/stable/index.html>
5. Maintain a logbook or write a short report of details showing on a google doc. Share this with your assigned mentor .
  - a. What did you do each day?:
  - b. What optimizations have you made to improve the performance of your classifier?
    - i. Error Analysis
    - ii. Identify areas of improvement
    - iii. Make changes
    - iv. Write it down
6. Write a simple **bash script** to evaluate the performance of your classifier on a test dataset. **(This is a must because it will directly be used for evaluation on a private dataset, make sure you write this)** For example:

```
bash evaluate.sh path_to_test_director
```

Outputs should get stored in a text file: outputs.txt

This task should be done mandatorily on **github** and should have a comprehensive readme. Please add your respective mentors as a collaborator in your github repository before starting off the assignment. (Highly recommended to push code to github)

Note that knowledge of version control is a good habit we would like to inculcate in you guys but its not necessary to do that right now (this step is not evaluated but will be appreciated)

**Feel free to use colab if you don't have a local GPU, or train on CPU**

**Google Colab**

#### Evaluation Criteria:

1. Your overall approach for understand the basics of python
2. Understanding of basic neural networks
3. Understanding and modifying open source code
4. Code writing skills (is the code clean, well commented)
5. Training/hyper parameter tuning and testing the model
6. skills in understanding and usage of new tools which are integral to the work that we are doing here.
7. Documentation
8. Scripting and automation: `bash`
9. Ability to think analytically and critically
10. Ability to do the error analysis appropriately
11. Most importantly grit and commitment!

**Task Deadline : 21st August 2022 (8:00 PM)**

#### Relevant Links:

- Dual boot Ubuntu 20 and Windows 10: <https://www.youtube.com/watch?v=-iSAyiicyQY>
- Python 3.7: <https://www.python.org/downloads/release/python-378/>
- Learn Python 3: <https://automatetheboringstuff.com/> (First 6 chapters are sufficient)
- Learn basics of GitHub : <https://docs.github.com/en/get-started/quickstart/hello-world>

#### Mentor Division

Please find your specific mentor and ask questions only to that mentor, it really helps our management if you stick to the person assigned. Please refrain from calling unnecessarily. Drop a text message or an email.

| NAME        | ROLL NUMBER      | MENTOR       |
|-------------|------------------|--------------|
| 2K22/BT/50  | Shivkumar Devane | Harshit Jain |
| 2K22/EN/02  | Aakshi Bhardwaj  |              |
| 2K22/CO/70  | Anshita Singh    |              |
| 2K22/IT/104 | Mohit Jindal     |              |

|             |                    |               |
|-------------|--------------------|---------------|
| 2K22/IT/152 | Shiva Wali         | Manav Chhabra |
| 2K22/CO/401 | Samarth Bhutani    |               |
| 2K22/IT/153 | Shivam Kumar Singh |               |

### Mentor Contact Details:

| Name          | Phone Number | Email Address                     |
|---------------|--------------|-----------------------------------|
| Harshit Jain  | 9582783963   | narenderjain110@gmail.com         |
| Manav Chhabra | 9833885697   | manavchhabra_co21b1_015@dtu.ac.in |

### End Note:

For those of you with a background in programming and knowledge of python we assume this task won't be very difficult for you. Similarly if someone's just starting off with python this may seem overwhelming and impossible. We need you to know **that's okay and your previous knowledge will not play a role in our selection.** We will make sure it's a level playing field for everyone, so in case you're just starting out we don't expect you to complete this task 100% but we expect 100% follow through and dedication from all. If you are able to complete this task earlier than stipulated time we will assign more things to you, the purpose of this task is to see your adaptability to new environments so we encourage you to ask doubts search the internet and find solutions and most importantly enjoy (you will most likely have a good looking project by the end of this recruitment)

We wish you all the best, and hope to work with you soon!