ROBOTICS CLUB

SCIENCE AND TECHNOLOGY COUNCIL
IIT KANPUR

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Winter Workshop

Machine Learning in Robotics

Courtesy: Professor Vipul Arora (EE698V Instructor)
ColdFusion (Youtube Channel)

How did it all begin?

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It all began with an image classification problem!

https://www.youtube.com/watch?v=IBe2o-cZncU

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Revision: Convolution of Images

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Neural Networks

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For learning any ML algorithm, you need to-

Appreciate the Algorithm

Understand the underlying Mathematics

Implement the Algorithm

Moore’s Law

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Case Study: AlexNet

[Krizhevsky et al. 2012]

Architecture:

CONV1

MAX POOL1

NORM1

CONV2

MAX POOL2

NORM2

CONV3

CONV4

CONV5

Max POOL3

FC6

FC7

FC8

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34% → 75% Shifting to Neural Networks

75% → 97% Optimization of the CNN

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Completely Automated Public Turing test to tell Computers and Humans Apart

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What language do you think in?

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In Programming, if you can think in C, you can code in any language.

(That's precisely why we are taught C in ESC101)

2. Syntax?

Extremely Intuitive!

Tools we will be using:

Jupyter Notebooks (Python3)
Google Colab Python Notebooks

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Libraries - Benefiting from Other people's Social Work:

Numpy
Matplotlib
cv2
keras
pytorch
scikitlearn

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Q. How can we create a 3x3 array of zeros in C?

Using numpy

```
In [12]: A = np.zeros((4,4))
         print(A)
```

```
[[0. 0. 0. 0.]
 [0. 0. 0. 0.]
 [0. 0. 0. 0.]
 [0. 0. 0. 0.]]
```

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Task: Create a 5x2 array of ones

Hint: Python is super-intuitive

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You'll find a function for all tasks in Python!

But you need to learn "The Art of Googling!"

Principal Component Analysis in Python

Principal Component Analysis

Principal component analysis (**PCA**) is a mathematical procedure that transforms a number of (possibly) correlated variables into a (smaller) number of uncorrelated variables called **principal components**. ... **Principal components analysis** is similar to another multivariate procedure called Factor **Analysis**.

Example:
What all data do I have about you?

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Name
Roll Number
Department
Gender
Specific Interests
Parent Hall

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This is a lot of data and there’s redundancy.
I want to make my life easy!

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What I want?

2 new sets of information-

Dim1

Dim2

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Implementation in Jupyter Notebooks using numpy and matplotlib

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