

Welcome

CS771: Introduction to Machine Learning

Purushottam Kar

Add-Drop

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Add requests will be processed according to pre-declared policy
<http://tinyurl.com/ml19-20afaq>

All queries, requests, clarifications regarding add-drop will be handled **only over email**

Please do not approach me in person after class/in my office without prior appointment – I will not be able to respond to you in person



Course Details

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Name: CS771 Introduction to Machine Learning

Lectures: Mon, Wed, Fri, 6-7 PM L16

Course Team: wait for next slide

Course Website: <https://tinyurl.com/ml19-20aw>

Piazza Website: <https://tinyurl.com/ml19-20ap> (Enroll yourself!)

Office hours: uploaded on Piazza

<https://piazza.com/iitk.ac.in/firstsemester2019/cs771/staff>



Course Team

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Soumya Banerjee
(soumyab)

Incremental Learning,
Computer Vision, Machine
Learning



Amit Chandak (amitch)

Decremental Learning,
Bayesian Optimization,
Representational Learning
on Graphs



**Darshak Hasmukhbhai
Chhatbar (darshak)**

Preference Learning,
Extreme Classification,
Deep Learning



Debojyoti Dey (debojyot)

Optimization, Bayesian
machine learning, Markov
Chains, Dynamical systems

Course Team

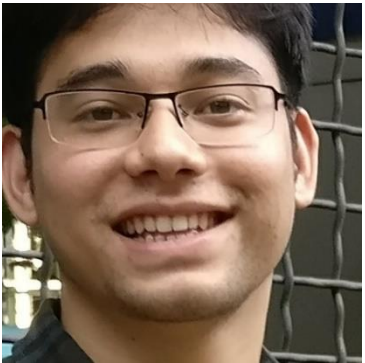
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Nitish Mangesh Kalan
(nitismk)
Reinforcement Learning,
Computer Vision



Jimmy Kumar (jimmy)
Extreme Classification,
Recommendation Systems,
Bayesian Inference



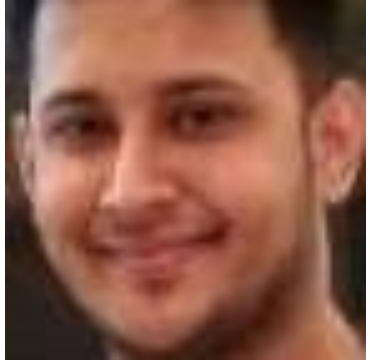
Neeraj Matiyali (neermat)
Computer Vision



Shailesh Vishweshwar
Nandkule (nandkule)
Recommendation Systems,
Reinforcement Learning

Course Team

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Avijit Roy (avijit)
Deep Learning, Computer Vision



Sidharth Singla (ssid)
Deep Learning, Computer Vision



Arvapalli Sai Susmitha (susmitha)
Computer Vision, Medical Imaging, Deep Learning



Gourav Takhar (tgourav)
Formal Methods of Verification in Security

Course Team

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Purushottam “Puru” Kar
(purushot)

ML in Education, Extreme
Classification, Robust
Learning

Auditors

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Please send an email to instructor to be included in mailing lists
(if already sent, do not send again)

Auditors will have access to several aspects of the course

- Lectures and lecture material

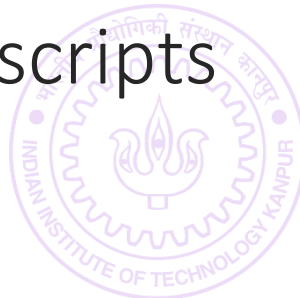
- Discussion forum activities

- Assignment, quiz and examination questions and solutions

We regret our inability to extend the following services

- Submit assignments and receive graded submissions

- Appear for quizzes, examinations and receive graded answer scripts



Grading Scheme

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Quizzes – 20%

Mini-projects – 30%

Mid-semester Exam – 20%

End-semester Exam – 30%



Quizzes – 20%

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Four (4) quizzes to be conducted – each worth 5%

Aug 14 (Wed), Aug 30 (Fri), Oct 16 (Wed), Nov 01 (Fri)

Quizzes will be held in a separate lecture hall (L20) – details later

Only registered students will be allowed to appear for quizzes

Syllabus for each quiz will cover roughly 6 lectures – short quiz

If you are regular with lectures, practice problems, then you should not have to prepare excessively for these quizzes



Mini-projects (assignments) – 30%

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About 4-5 mini projects to be done (weightages to be decided)

Replaces the single monolith project in previous offerings of CS771

Mini-projects to be done in groups of five (5) students each

Start forming your group today

Will ask you to submit group details once add-drop is over

Groups can only contain registered students (no auditors)

Will have 1-2 weeks to finish each mini-project

Submission will include code + report

Code should be in Python – start learning Python today

Report must be in LaTeX – start learning LaTeX today



Reference Material

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No single textbook for the course

Lecture slides, course notes will be uploaded onto course website

Reference material is already up on course material

Locally cached copies for some textbooks also available

Python Resources: several available – choose your favourite

www.geeksforgeeks.org/python-programming-language/

LaTeX resources: several available – choose your favourite

www.sharelatex.com/blog/latex-guides/beginners-tutorial.html

www.overleaf.com/learn/latex/Tutorials



Course Website

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Detailed syllabus for this course

Course calendar : schedule for holidays, exams, quizzes

Course policies: assessment, course drop, make-up

Use of unfair means

Course etiquettes



To Do for You

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Registered Students

Start forming groups of five (5) students – do not wait long

Auditors

Send the instructor an email (no need to send again if already sent)

Everybody

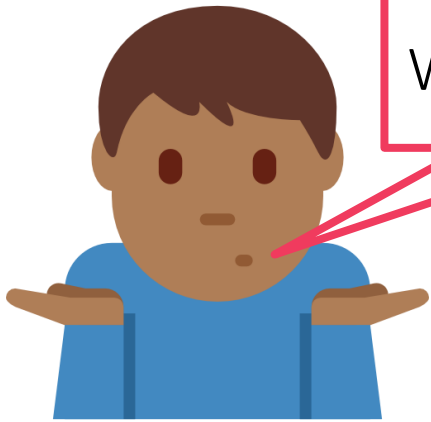
Register yourself on Piazza

Refresh your calculus, probability theory, linear algebra basics

Start learning Python and LaTeX

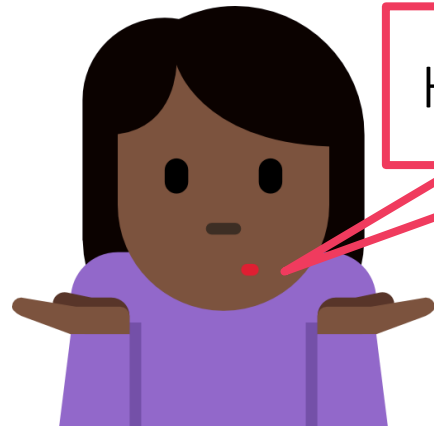
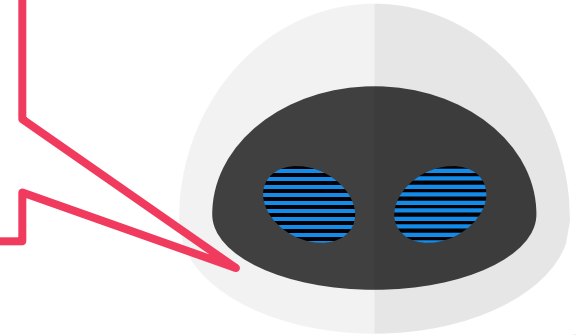


What is Machine Learning

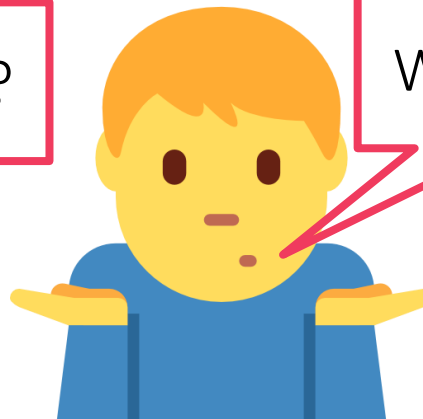


Why is it needed?

Hi, I am Ms. M and I will accompany you as you learn about ML



How is it done?



What is it?



Machine Learning

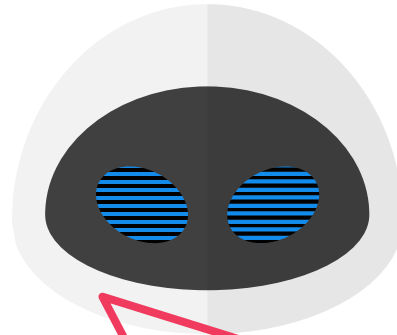
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“ The art and science of designing adaptive algorithms ”

A Non-adaptive Algorithm

Sorting: given n numbers, sort them in decreasing order of their value

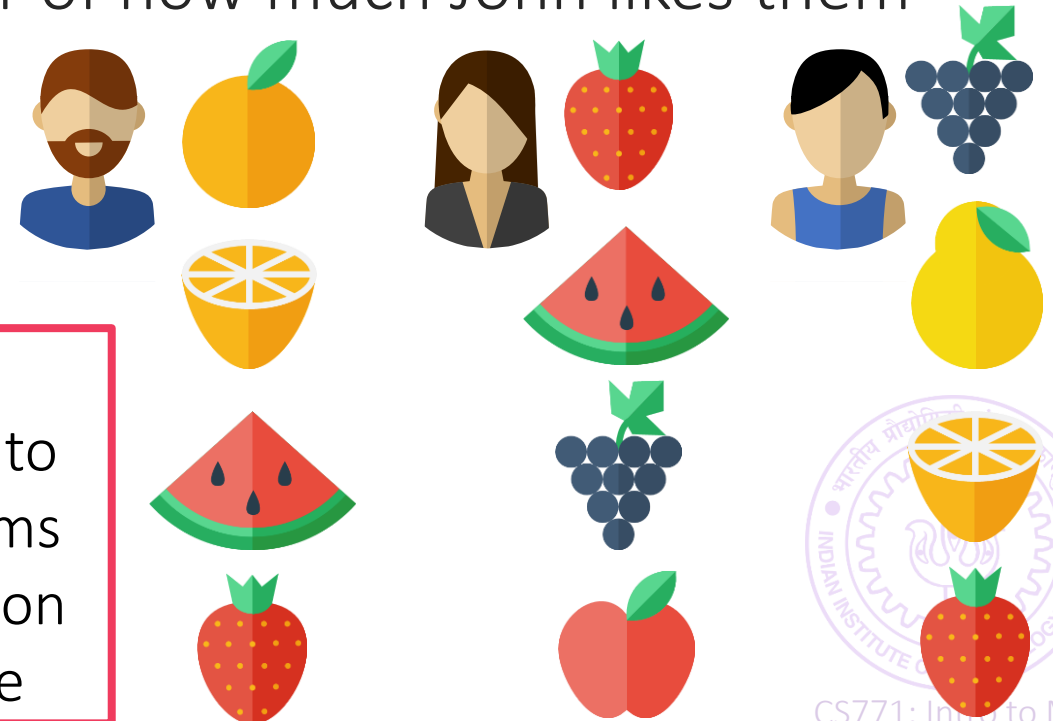
4	9	5	5
1	7	-6	4
5	5	4	1
9	4	-3	0
3	3	-2	-2
7	2	1	-3
2	1	0	-6



I can help you learn patterns that allow you to sort the same set of items differently for each person according to their taste

An Adaptive Algorithm

Recommendation: given a person John and n items, sort items in decreasing order of how much John likes them



Machine Learning

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“ The art and science of designing adaptive algorithms ”



Subject: [all] New Pizza Counter at New SAC
From: "DOSA" <dosa@iitk.ac.in>
Date: Wed, October 28, 2015 10:07 am
To: all@lists.iitk.ac.in
Cc: dosa@iitk.ac.in ([more](#))
Priority: Normal
Options: [View Full Header](#) | [View Printable Version](#) | [Download this as a file](#)

Subject: [all] Lost and Found
From: "DOSA" <dosa@iitk.ac.in>
Date: Wed, October 28, 2015 10:07 am
To: all@lists.iitk.ac.in
Cc: dosa@iitk.ac.in ([more](#))
Priority: Normal
Options: [View Full Header](#) | [View Printable Version](#) | [Download this as a file](#)

Machine Learning

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“ The art and science of designing adaptive algorithms ”



When to apply ML

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Complexity: no “closed form” solutions

Humans cannot specify simple rules to get solution

Detecting spelling mistakes not a good ML problem

A simple dictionary lookup (binary search) is enough

Presence of immense variety

Too many variants to be solved independently

Correcting spelling mistakes a very good ML problem

Need for automation

Scalability and speed are main criterion

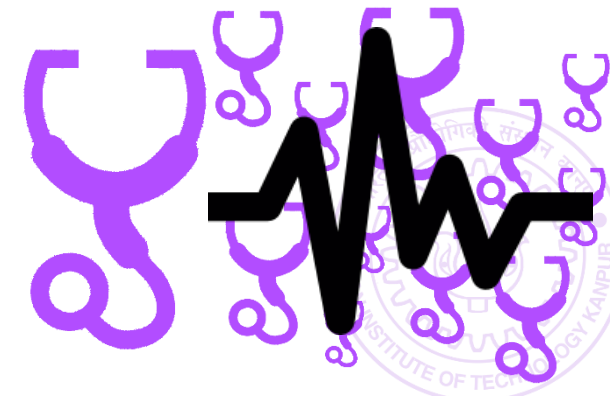
Do we need to automate medicine, driving?

~~machine~~

machine



machine



A few cool applications of ML

- ML + Programming Languages
- ML + Logic/Cognition
- ML + Image Processing
- ML + Video Processing



Program Correction with ML

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IITK offers a C programming course to ~1000 students each year

```
#include <stdio.h>
int main() {
    int a;
    scanf("%d", a);
    printf("ans=%d", a+10);
    return 0;
}
```

```
#include <stdio.h>
int main() {
    int a;
    scanf("%d", &a);
    printf("ans=%d", a+10);
    return 0;
}
```

Line-4, Column-9: warning: format '%d' expects argument of type 'int *', but argument 2 has type 'int'



Program Correction with ML

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IITK offers a C programming course to ~1000 students each year

```
#include <stdio.h>
int main() {
    int x, x1 ,d;
    d=(x-x1) (x-x1);
    return d;
}
```

```
#include <stdio.h>
int main() {
    int x, x1 ,d;
    d=(x-x1) * (x-x1);
    return d;
}
```

Line-4, Column-11: error: called object type 'int' is not a function or function pointer



Abstract Reasoning with ML

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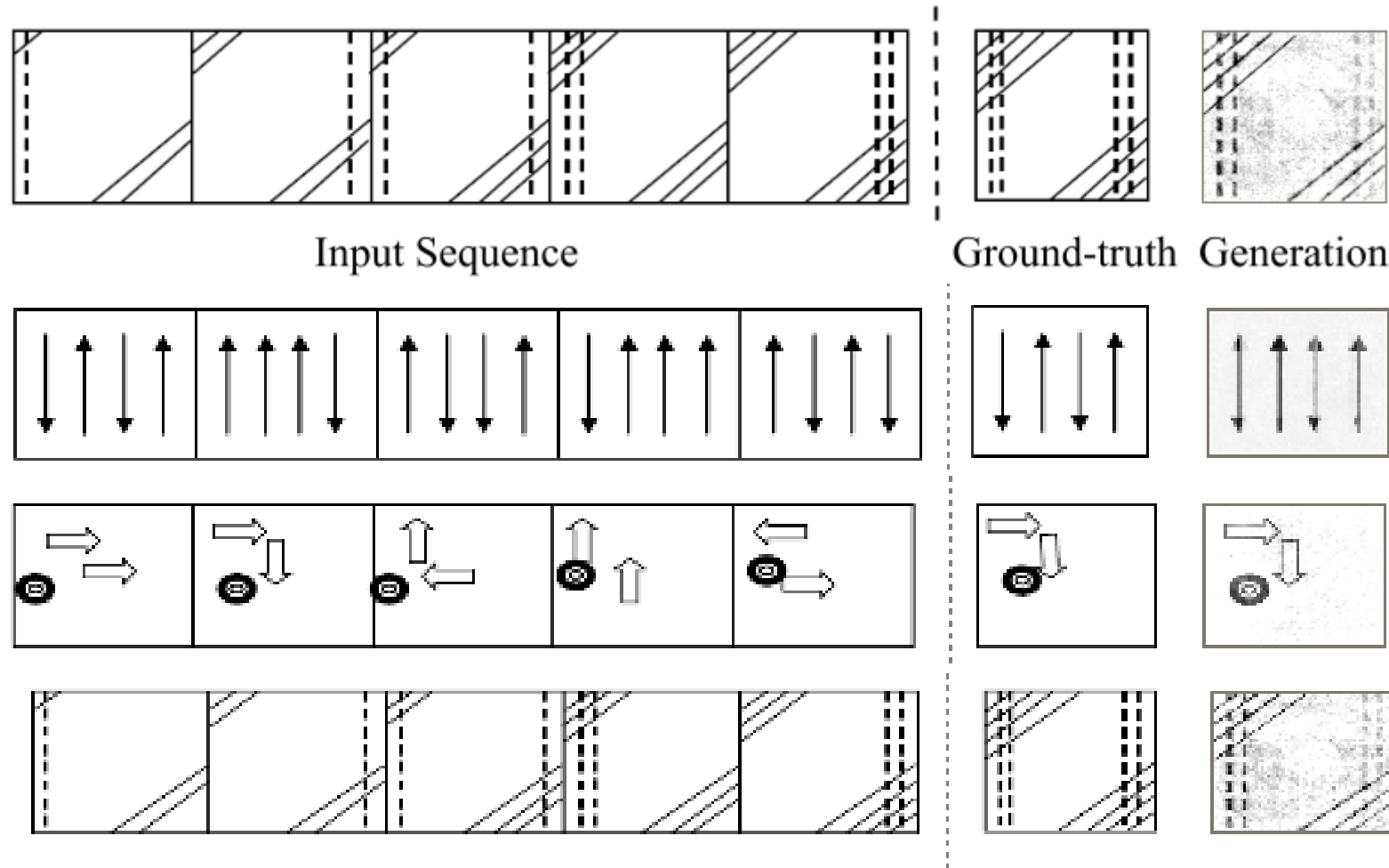
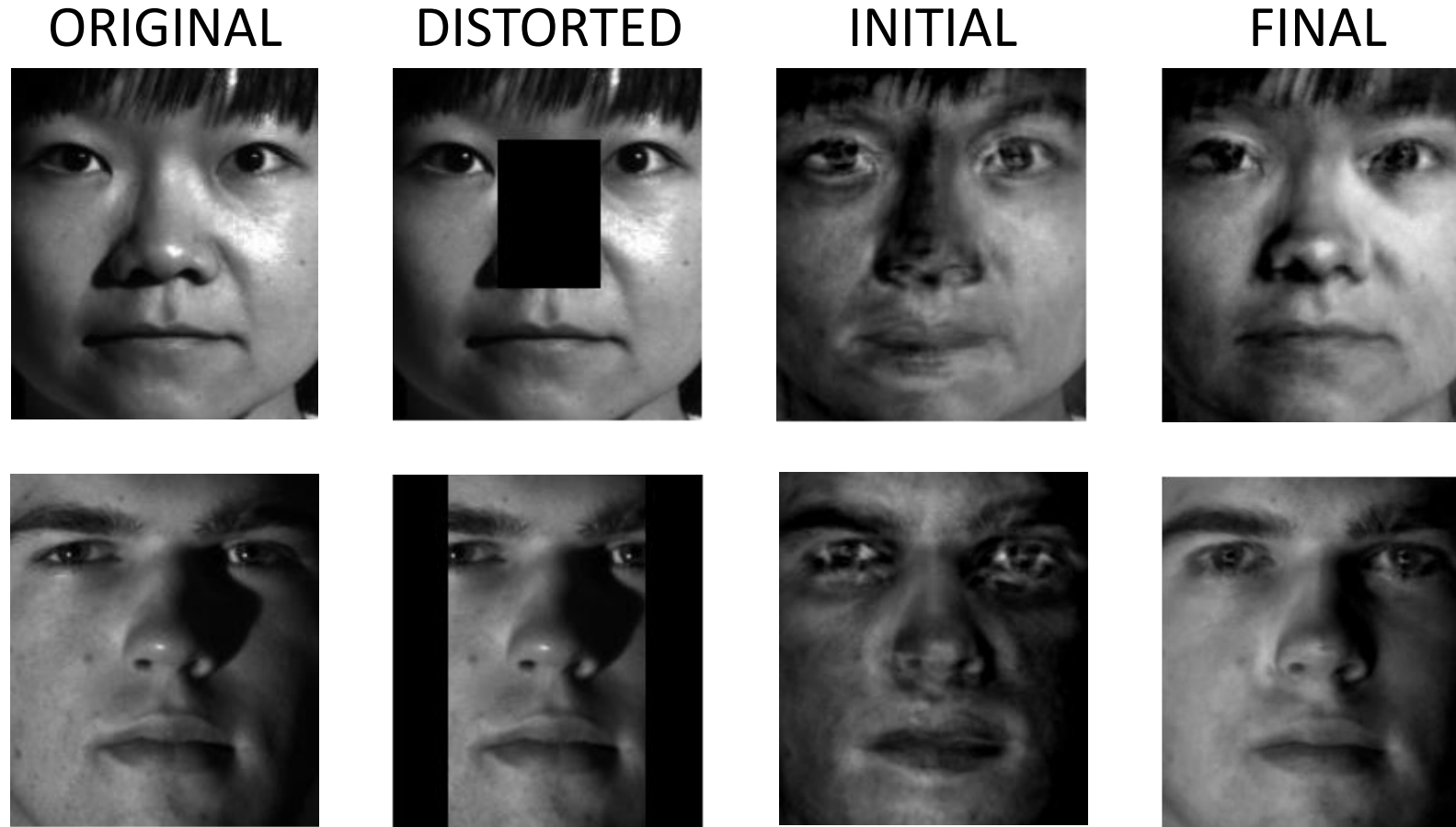


Image Reconstruction with ML

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Video Surveillance with ML

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