Syllabus

CSE 40537/60537 Biometrics

Daniel Moreira

Spring 2020

UNIVERSITY OF NOTRE DAME

Welcome

CSE 40537/60537 Biometrics

Daniel Moreira
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Course Hours
Lectures: TUE and THR, 5:05 to 6:20 PM, 125 DeBartolo Hall
Office: MON and WED, 2 to 4 PM (and by appointment), 150N Fitzpatrick Hall

Communication
Webpage: https://danielmoreira.github.io/teaching/biometrics-spr20/
Slack: https://cse-biometrics-spr20.slack.com

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Disclaimer

Panopto is ON
This course is being recorded.
Links with videos will be shared only with members of the course, ASAP.

Is everybody ok with it?
If a single student does not agree with it, I will ask to turn it off.
Please refer to https://danielmoreira.github.io/courses/biometrics-spr20/panopto.pdf for more details.

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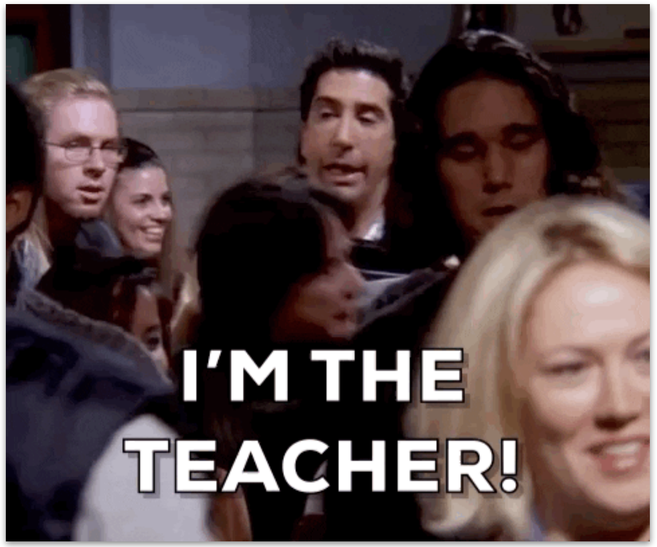
Today you will…

Get to know what is ahead of you
in the course.

About me

Computer Scientist
PhD from the University of Campinas (Brazil)
Theme: Sensitive-Video Analysis



University of Notre Dame
Post-doctoral researcher
Joined in 2016

Research
Computer Vision, Image Forensics, Machine Learning
Webpage: https://danielmoreira.github.io
(see next slides)

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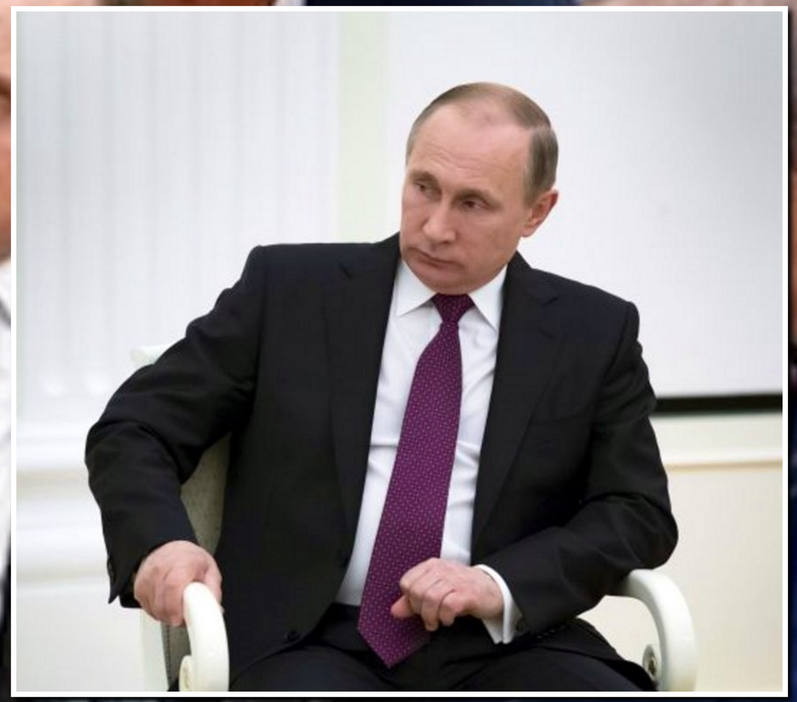
Sensitive-Video Analysis
https://danielmoreira.github.io/project/sma/


The Notorious B.I.G.
NY scene rapper
Media Forensics
https://danielmoreira.github.io/project/medifor/
Kurt Cobain
Grunge scene musician


rex


Russian Federation
Turkey



Russian Federation

Turkey

Synthesis of Realistic Example Faces

https://danielmoreira.github.io/project/srefv/

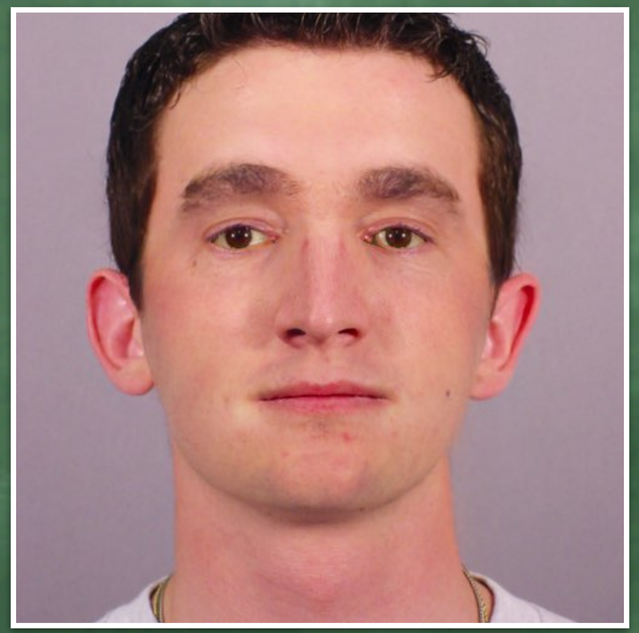
Does this person exist?

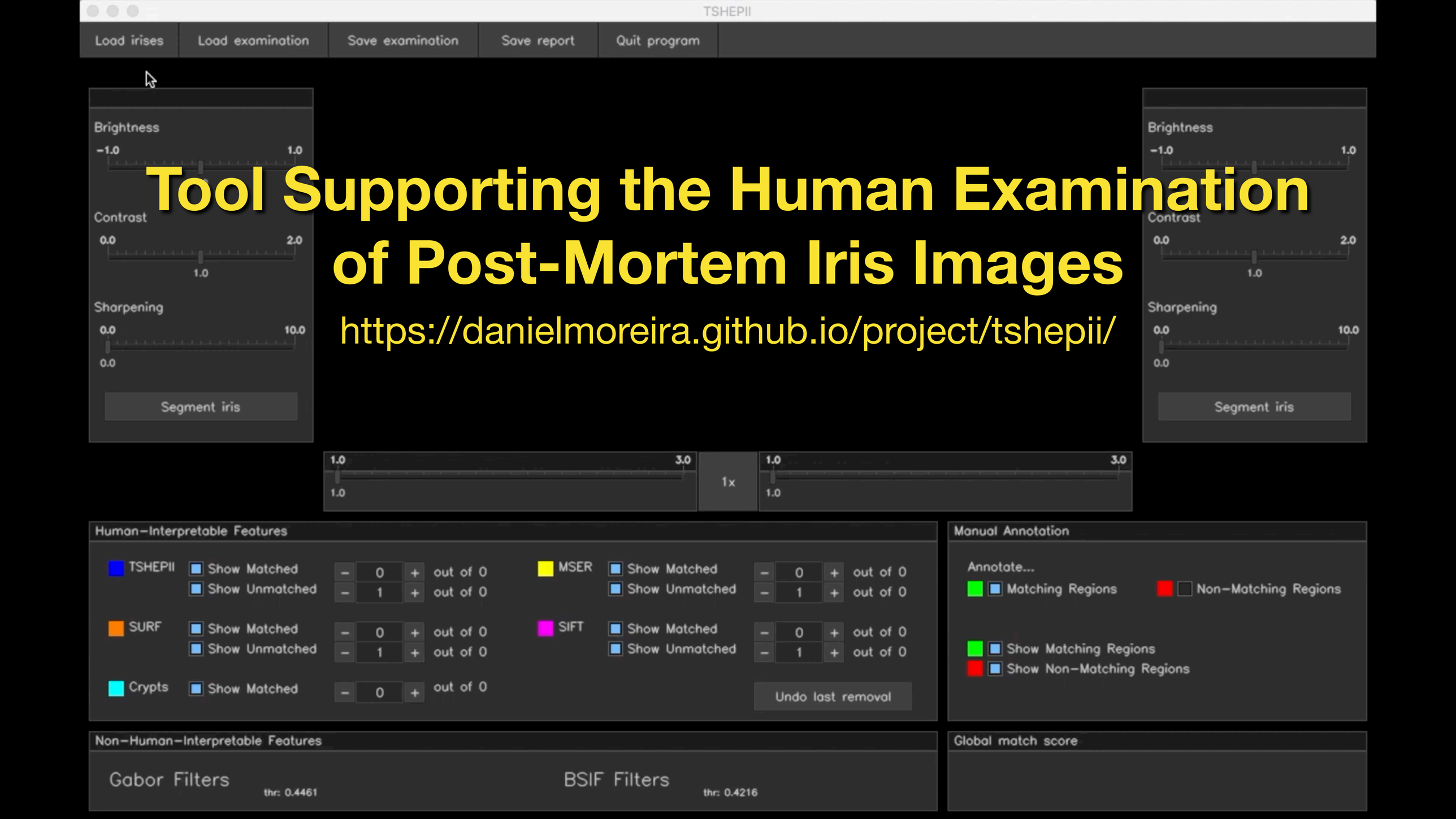
No
(nose and mouth replaced)

No
(eyes replaced)

Yes
(original)

No
(eyes, nose and mouth replaced)





Tool Supporting the Human Examination of Post-Mortem Iris Images

https://danielmoreira.github.io/project/tshepii/

How about you?

Background
Anybody outside the CSE department?
S’up undergrads? S’up grad students?
Can everybody program?
What programming languages do you use?

Motivations
What interests you about Biometrics?

Disabilities
Please reach me out in private ASAP.
We’ll make things work.

What is Biometrics?

7 billion people

Who is this person?

Is this person Jane Doe?

What is Biometrics?

7 billion people

Who is this person? *(Identification)*

Is this person Jane Doe? *(Verification)*

What is Biometrics?

7 billion people
Who is this person? *(Identification)*
Is this person Jane Doe? *(Verification)*

Biometrics aims at *identifying* or *verifying* the claimed identity of an individual based on their *physical*, *chemical* or *behavioral* traits.

What is Biometrics?

Identity verification through:

✓ A unique trait of yours.

physical

chemical

behavioral

✗ Not something you **have**.

✗ Not something you **know**.

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What is Biometrics?

In this course, we aim at **computer-aided Biometrics**.

We'll focus on **software solutions** rather than hardware.

But we'll get to use some **cool devices**, I promise.

Why use Biometrics?

Consumers prefer biometric authentication to traditional passwords, Visa says

Jan 6, 2020 | Chris Burt

CATEGORIES Biometrics News | Financial Services

Almost 70 percent of U.S. shoppers did not go through with an online purchase because they either forgot the password, couldn't log in or couldn't receive a one-time passcode, according to research conducted by Visa, while another report from Verizon found that as many as 80 percent of data breaches are caused by compromised and weak passwords.

https://www.biometricupdate.com/202001/consumers-prefer-biometric-authentication-to-traditional-passwords-visa-says

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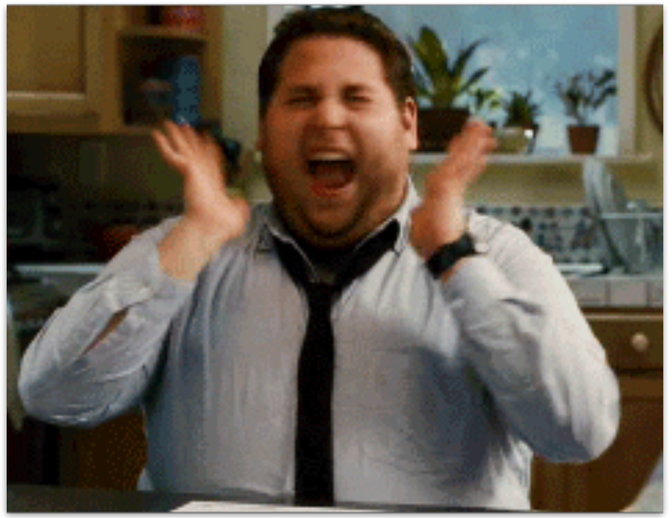
Course Overview

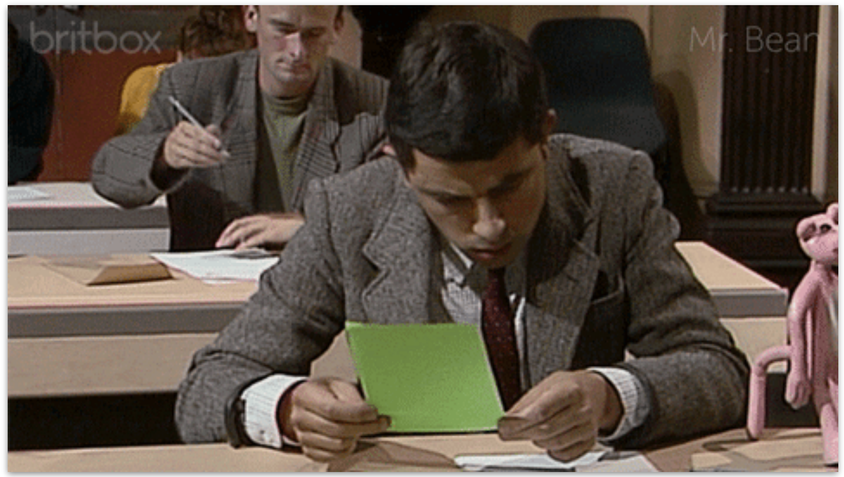
Structure
27 lectures
4 in-class coding days
3 in-class data-collection days
2 invited talks



Work
4 assignments
(each student will do 3 assignments:
1 as a *developer*, 1 as an *attacker*, 1 in a *response team*)
1 exam (final)

Course Overview

Grading
Total: 100 points
Each assignment: 25 points (x3)
Final exam: 25 points
Late assignments: -1 point per day
Extra points: interest, participation, collaboration, assignment video



Concepts
A: above 85 points
B: above 75 points
C: above 65 points
D: above 50 points
E: above 25 points
F: really?

Code of Honor
Break it and get an F.
Please refer to
https://honorcode.nd.edu/

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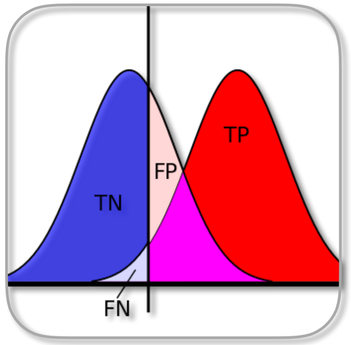
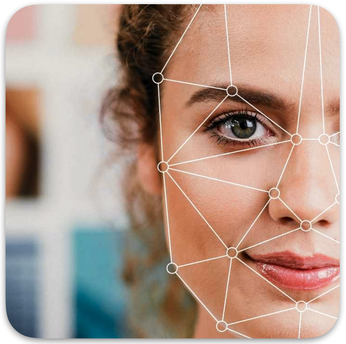
Course Overview

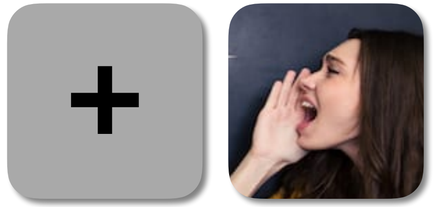
Content



Basics
Concepts
Metrics
Metric implementation



Core Traits (3)
Concepts
Baseline implementation
Data collection
Evaluation
Attacks
Assignments



Alternative Traits and Fusion
Concepts

Invited Talks (2)
State of the art
Future work

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Course Overview

Prerequisites

Essential
Programming, basic statistics,
and data structures
Team work

Desired
Python, numpy, OpenCV

Not sure?
Please talk to me in private.

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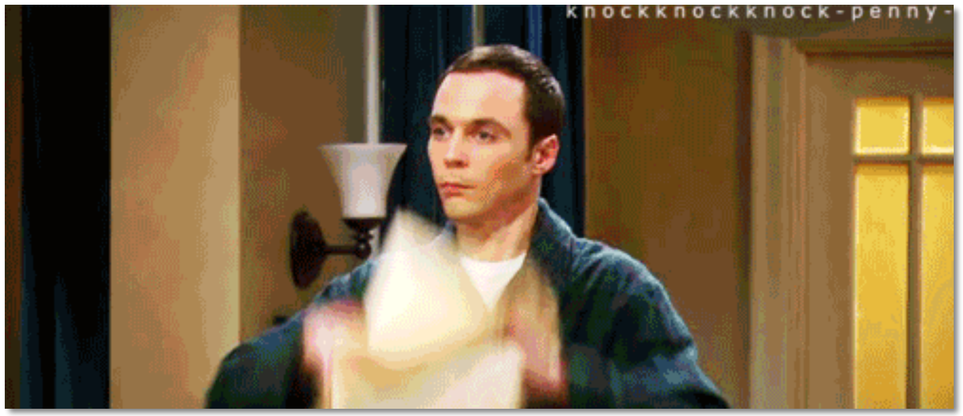
Course Overview

Bibliography



Jain, Ross, and Nandakumar
Introduction to Biometrics
Springer Books, 2011

Jain, Flynn, and Ross
Handbook of Biometrics
Springer Books, 2008

Papers will be posted in the ***#papers*** Slack channel.

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Course Overview

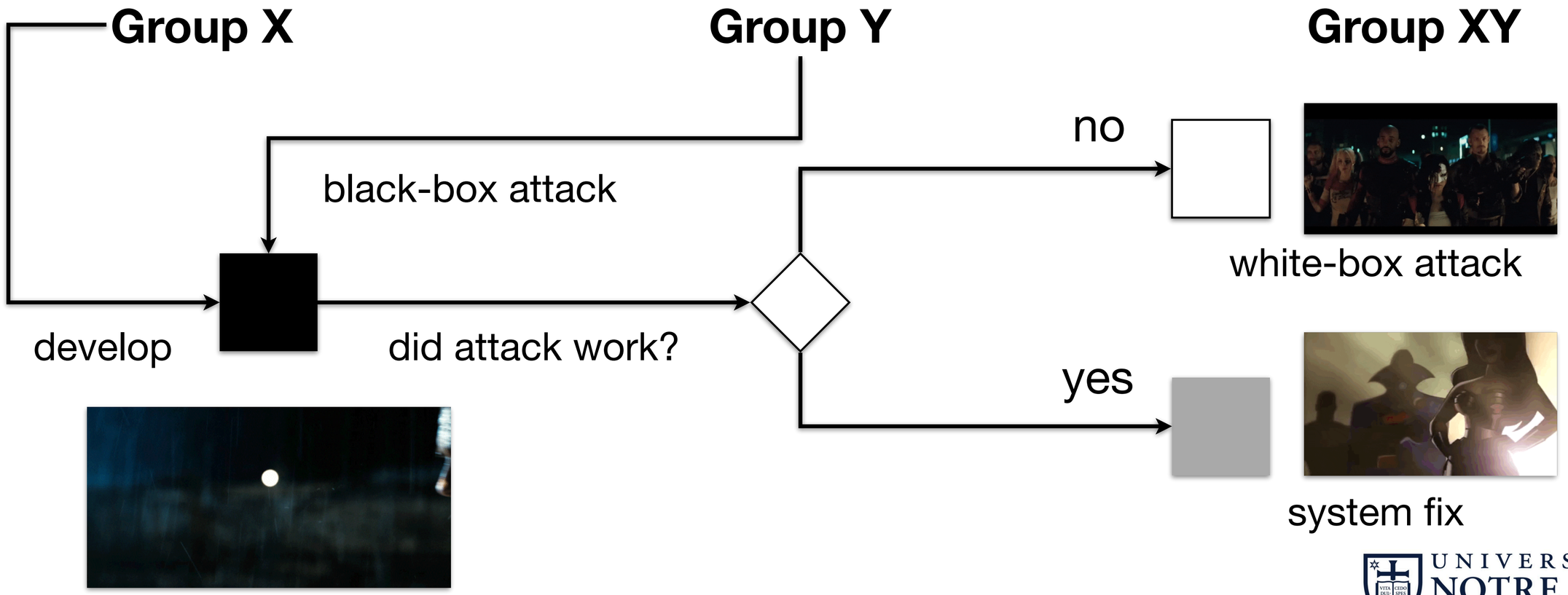
Assignments
Work in groups

Each group will work with 2 traits.
Planned traits: fingerprints, faces, irises

Each group will work on 3 assignments:
1. Development assignment (improve available trait baseline)
2. Attack assignment (perform black-box attack to one trait)
3. Response team assignment (see next slide)

Course Overview

Assignment Details



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Course Overview

Data Collection

We'll collect only **our own biometric** data (instructor's and students').
Our data **will only be used** for the purpose of the course.
Our data **will not be shared** with anybody outside the course.
Our data **will be deleted** after the course.

During assignments, folks in need of other publicly available biometric databases are welcome to contact me, so we can take care of privacy and copyright issues.

Your next tasks

Be happy
Any issues? Please come and talk to me.

Sign-in to our Slack
Please provide me your name and preferred e-mail
(paper sheets should be passing around).

Form groups of 2 folks
Be ready, assignment traits and dates
will be provided next class.

Upcoming Talk

Dr. Christoph Busch*
Hochschule Darmstadt (HDA), Germany
Norwegian University of Science and Technology (NTNU), Norway

Biometrics expert
Strong contributions to the standardization of Biometrics.

When and where?
148 Fitzpatrick Hall
Wednesday, Jan 15, 2020, at 4:00 p.m.

*Invited by the CSE department, not related to this course.

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Acknowledgments

This material is heavily based on
Dr. Adam Czajka's and Dr. Walter Scheirer's courses.
Thank you, professors, for kindly allowing me to use your material.

https://engineering.nd.edu/profiles/aczajka
https://www.wjscheirer.com/

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