Syllabus

CSE 40537/60537 Biometrics

Daniel Moreira

Spring 2022

UNIVERSITY OF NOTRE DAME

Welcome

CSE 40537/60537 Biometrics

Daniel Moreira (Instructor)
Contact: dhenriq1@nd.edu, @dmoreira
Office: 182 Fitzpatrick Hall

Jason You (TA)
Contact: syou@nd.edu

Course Hours
Lectures: TUE and THR, 3:30 to 4:45 PM, 356A Fitzpatrick Hall
Office: Daniel - MON and WED, 5:00 to 6:00 PM (or by appointment), 313 Cushing Hall
Jason - WED and THR, 1:00 to 2:00 PM

Communication
Webpage: https://danielmoreira.github.io/teaching/biometrics-spr22/
Slack: https://nd-biometrics-spr22.slack.com

Webpage

Slack

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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 turn it off.
Please refer to https://danielmoreira.github.io/courses/biometrics-spr22/panopto.pdf for more details.

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Today you will…

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

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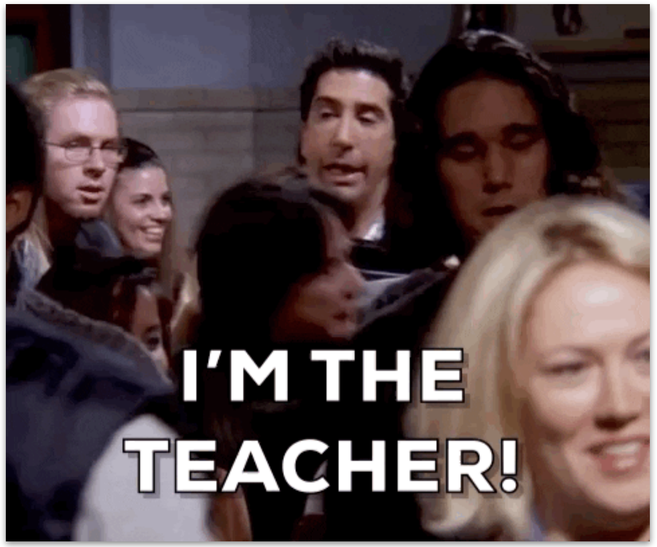
About me

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



University of Notre Dame
Assistant Research Professor
Joined in 2016 as a post-doctoral researcher

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

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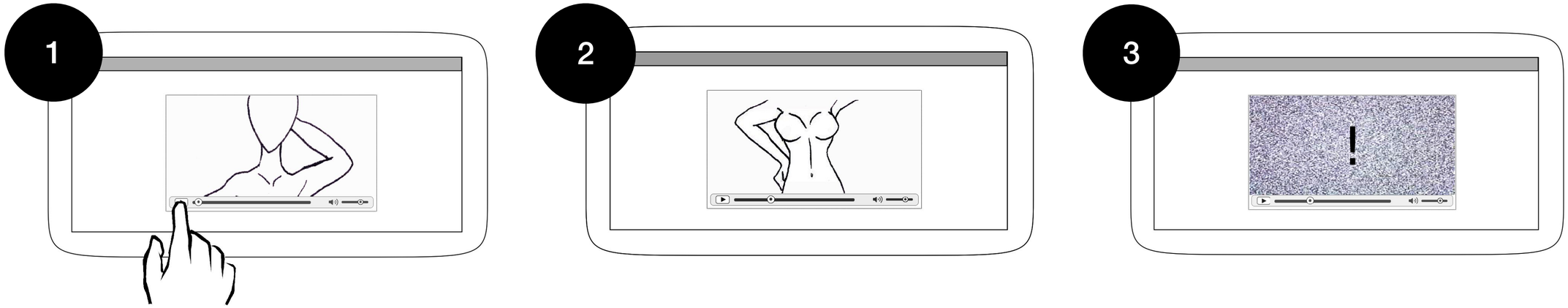
Sensitive-Video Analysis
https://danielmoreira.github.io/project/sma/

Can a computer localize sensitive scenes within a video timeline?



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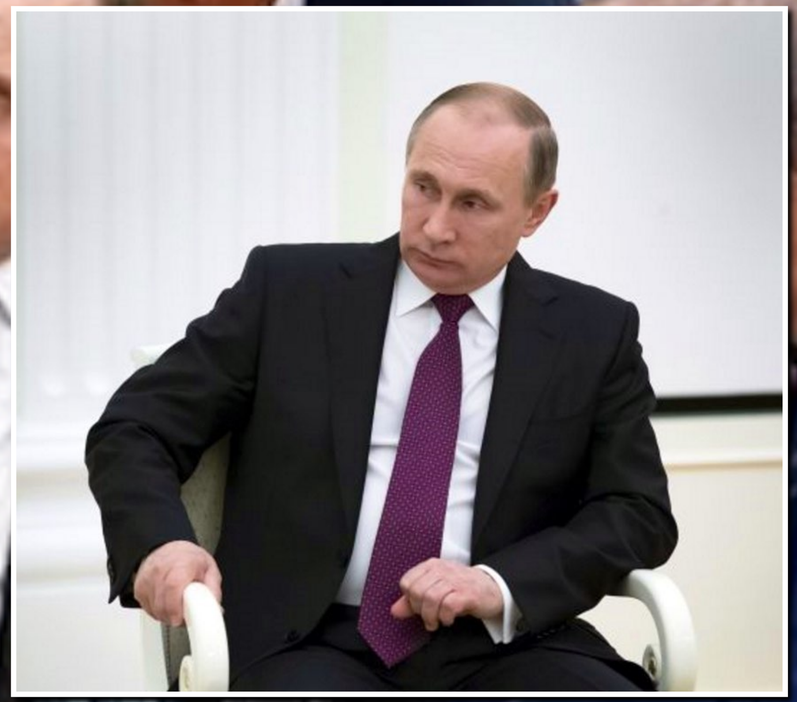
The Notorious B.I.G.
NY scene rapper
Media Forensics
https://danielmoreira.github.io/project/medifor/
Kurt Cobain
Grunge scene musician

rex

Russian Federation
Turkey

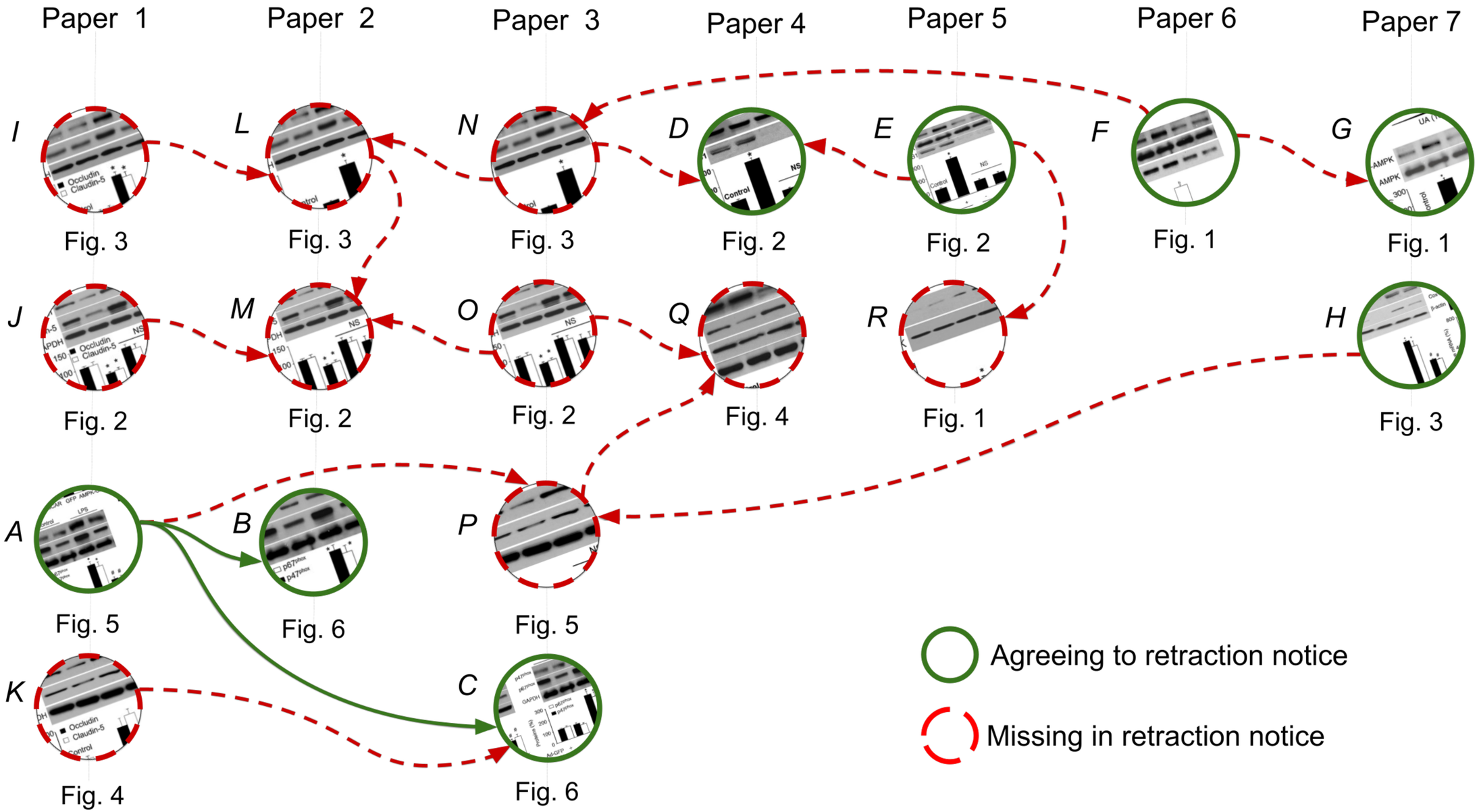


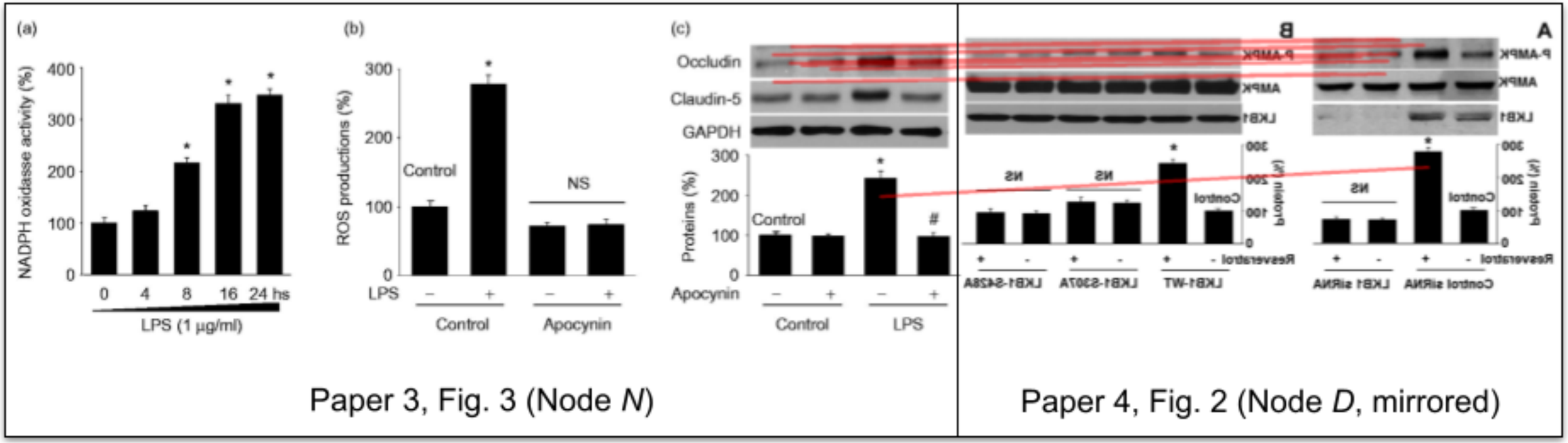
Russian Federation

Turkey

Scientific Integrity

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


Paper 1
Paper 2
Paper 3
Paper 4
Paper 5
Paper 6
Paper 7
I
L
N
D
E
F
G
Fig. 3
Fig. 3
Fig. 3
Fig. 2
Fig. 2
Fig. 1
Fig. 1
J
M
O
Q
R
H
Fig. 2
Fig. 2
Fig. 2
Fig. 4
Fig. 1
Fig. 3
A
B
P
Fig. 5
Fig. 6
Fig. 5
K
C
Fig. 4
Fig. 6
Agreeing to retraction notice
Missing in retraction notice



Paper 3, Fig. 3 (Node *N*)

Paper 4, Fig. 2 (Node *D*, mirrored)

DOI 10.3109/02699052.2015.1004746

DOI 10.3109/10641963.2015.1131288

Synthesis of Realistic Example Faces

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

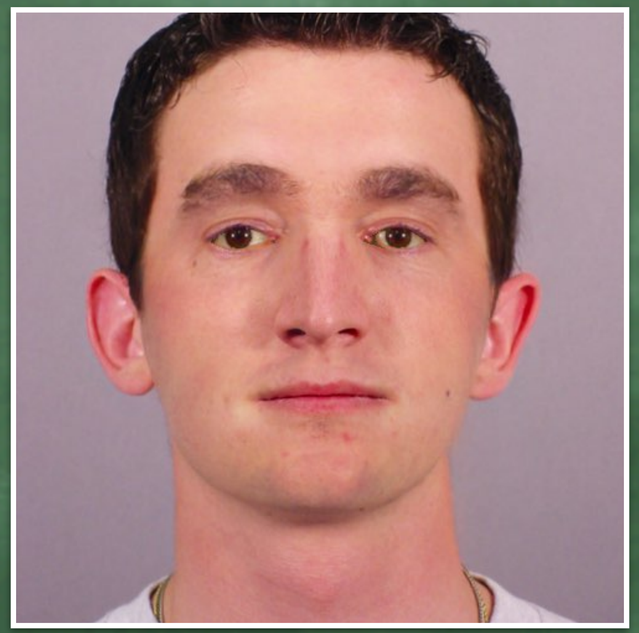
Does this person exist?

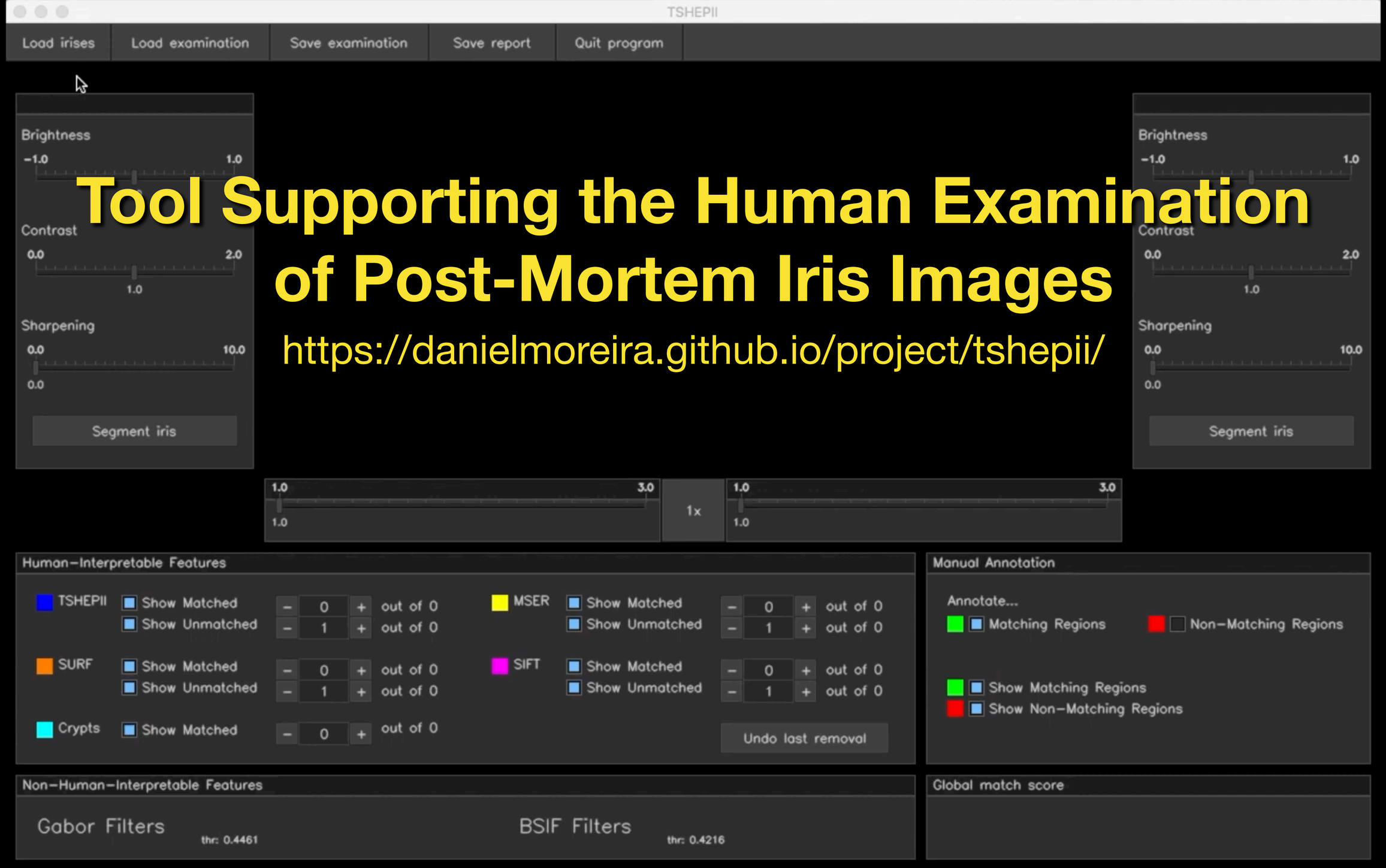
No
(nose and mouth replaced)

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
What is your program?
Can you code?
What is your preferred programming language?

Motivations
Why are you taking Biometrics?
What are your expectations for this course?

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

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What is Biometrics?

7 billion people

Who is this person?

Is this person Jane Doe?

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What is Biometrics?

7 billion people

Who is this person? *(Identification)*

Is this person Jane Doe? *(Verification)*

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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.

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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.

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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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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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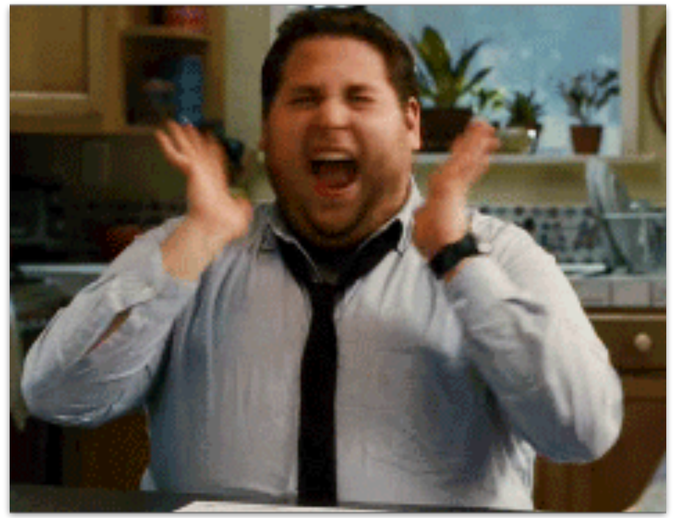
Course Overview

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

Work
4 assignments
1 presentation attack report
2 exams (midterm and final)



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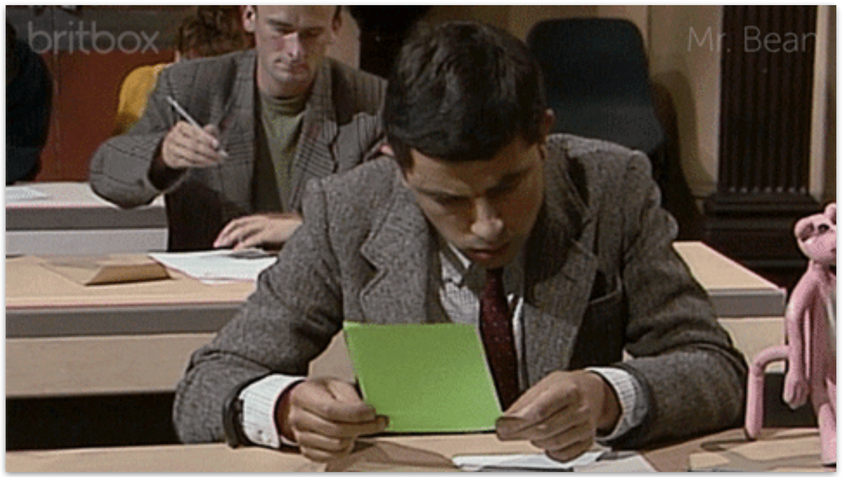
Course Overview

Grading
Total: 100 points
Each assignment: 10 points (x4)
Presentation attack report: 20 points
Midterm exam: 20 points
Final exam: 20 points
Late assignments: -1 point per day
Extra points: contribution, participation, collaboration



Concepts

A	[94, 100)	B+	[88, 89]	C+	[78, 79]	D	[60, 69]
A-	[90, 93]	B	[84, 87]	C	[74, 77]	F	[0, 59]
		B-	[80, 83]	C-	[70, 73]		

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

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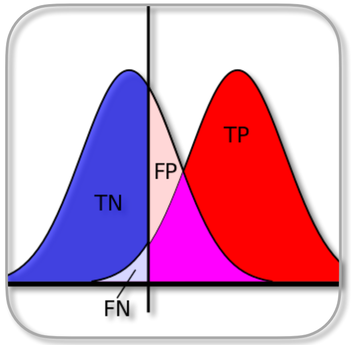
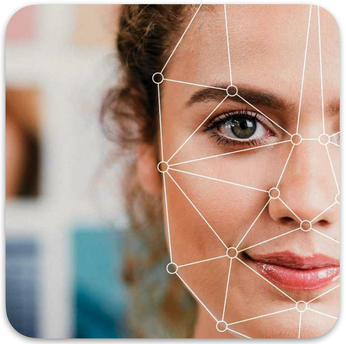
Course Overview

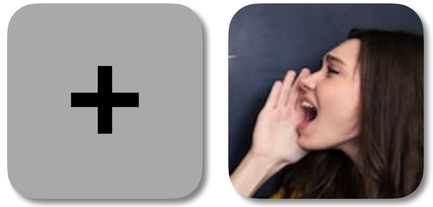
Content



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 prob & stats,
and data structures
Team work

Desired
Python, numpy, OpenCV

Not sure?
Please talk to me in private.

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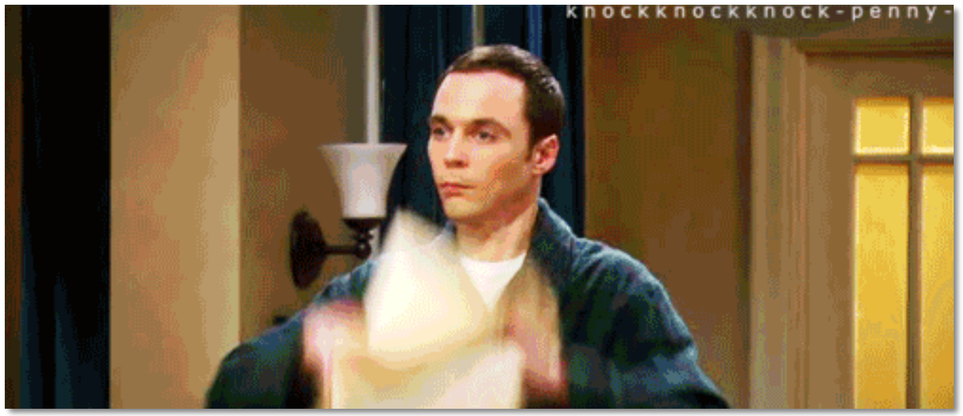
Course Overview

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

Slack
https://nd-biometrics-spr22.slack.com
Official communication, collaboration,
content sharing, and quick chat

Channels
 # general - Announcements and class-wide questions.

 # papers - Scientific papers comprising the state of the art in Biometrics. Contribute and get extra points!

 # on-the-news - News concerning Biometrics.
Contribute and get extra points!

 # random - Random stuff (a.k.a. your NFT memes).

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Course Overview

Individual Assignments
Practical programming tasks starting from code and datasets collected in class.

1. System performance
Release: 01/20
Deadline: 01/28

2. Fingerprint recognition
Release: 02/08
Deadline: 02/16

3. Iris recognition
Release: 03/01
Deadline: 03/18

4. Face recognition
Release: 03/29
Deadline: 04/08

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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.

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Course Overview

Presentation Attack Detection Report
Work in groups

Each group will work with 1 of 3 traits.
Planned traits: fingerprints, faces, irises.
Tasks: coding, attack, protection, report, and presentation.

Presentation Dates

Fingerprints	**Irises**	**Faces**	**Report Due Date**
04/05	04/07	04/12	04/22

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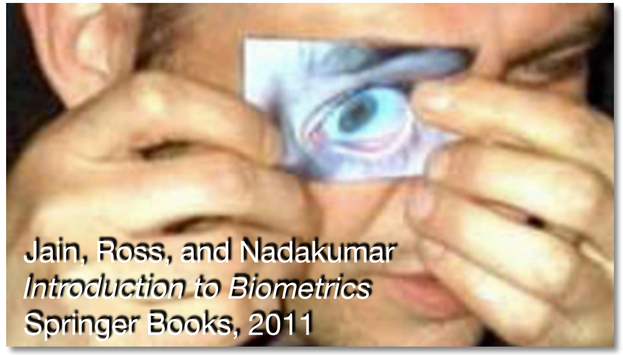

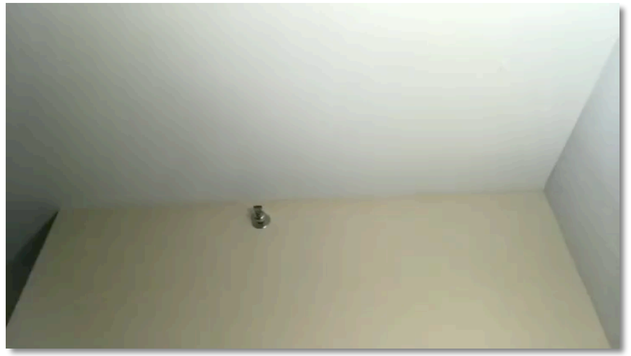

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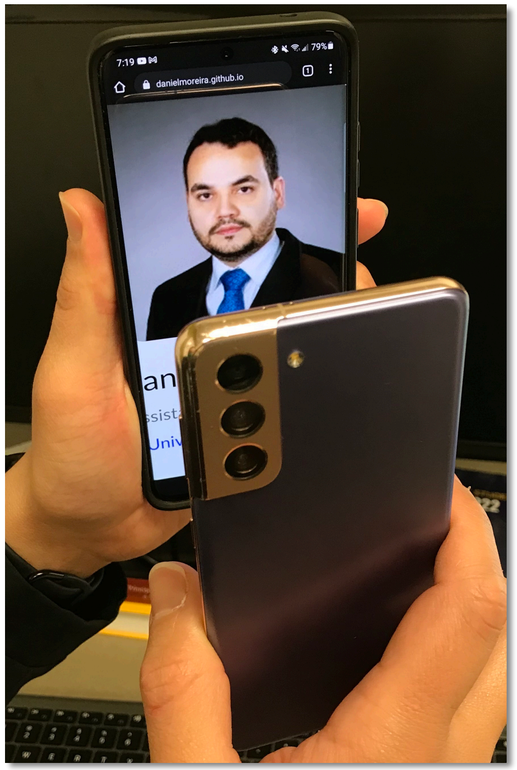

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Your next tasks

Relax
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 6-7 folks
Can’t find a group?
Please talk with me.

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