

Thesis Opportunities AY25/26

Giacomo Boracchi, Politecnico di Milano, DEIB

<https://boracchi.faculty.polimi.it/>

Updated on February 2026

The Team

We are 3 faculties, 11 PhD students, 1 research assistant... and 20+ MSc students!



Giacomo Boracchi

Luca Magri

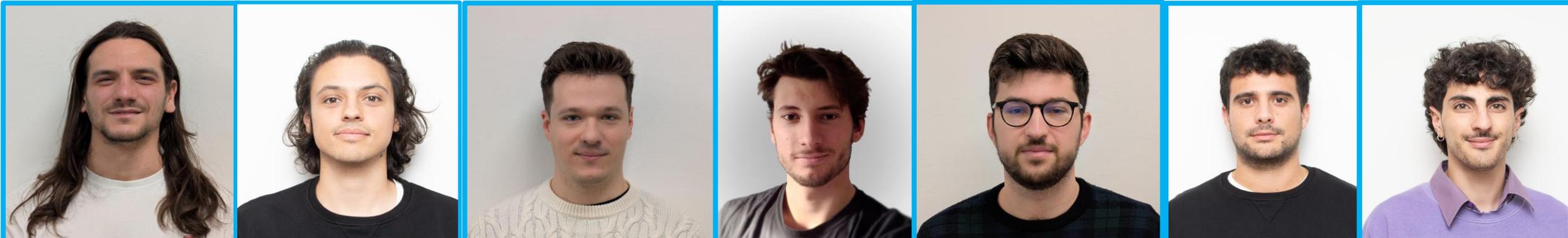
Federica Arrigoni

Michele Craighero

Edoardo Peretti

Roberto Basla

*Rakshith
Madhavan*



Andrea Ferraris

Diego Martin

Luca Alessandrini

Andrea Marelli

Carlo Sgaravatti

Stefano Bertolasi

Angelo Iacoella

Computer Vision Research

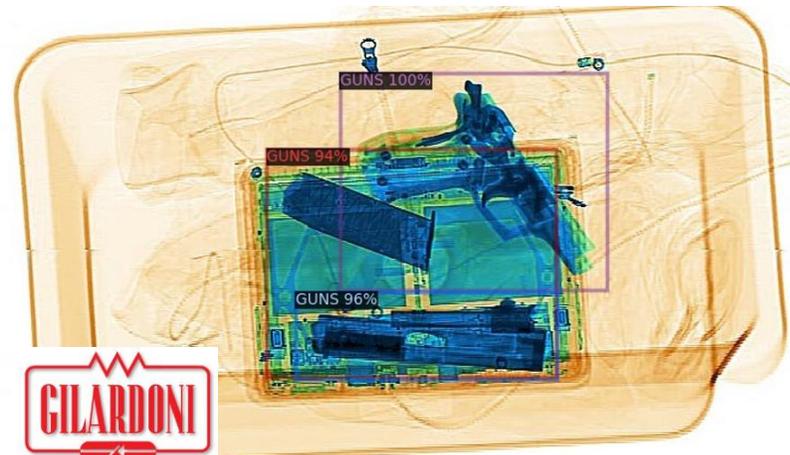
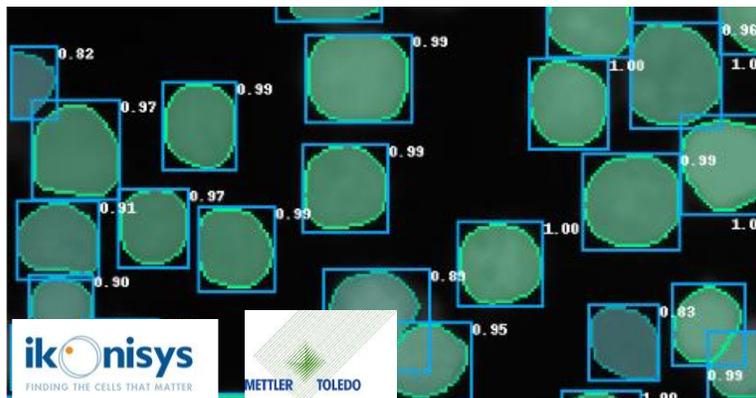
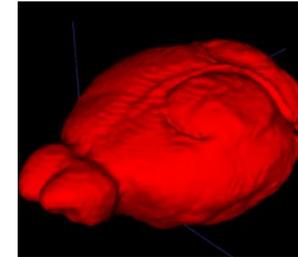
Giacomo Boracchi, Luca Magri, Federica Arrigoni



3 faculties
11 PhD students

Research themes and relevant projects:

- **Deep Learning for Visual Recognition:** Object Detection and Segmentation (CCD, SPAD, X-ray, 2D/3D Medical, Aerial Images), Anomaly Detection (images, signals), Learning under limited supervision.



PERIVALLON

with Prof. Piero Fraternali

Computer Vision Research

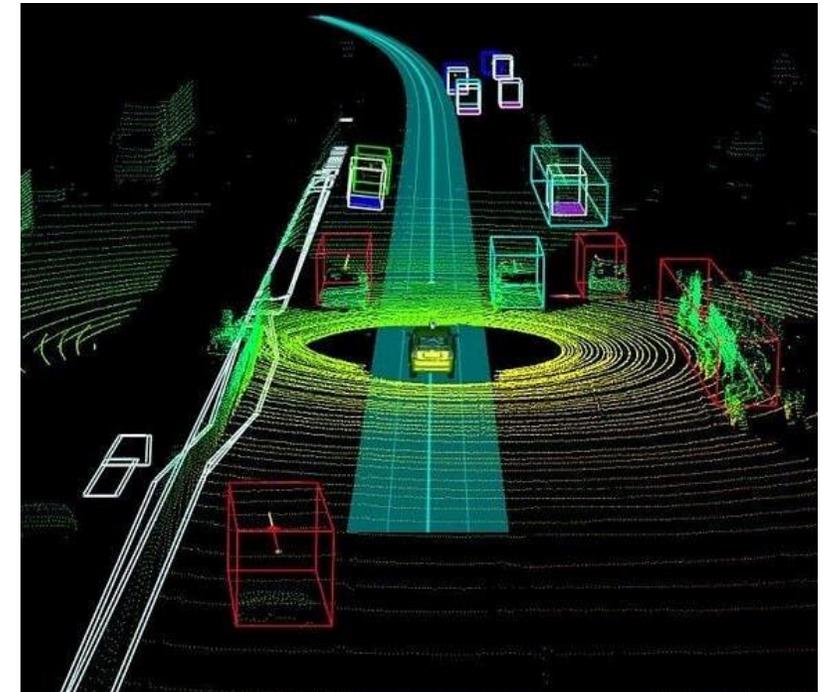
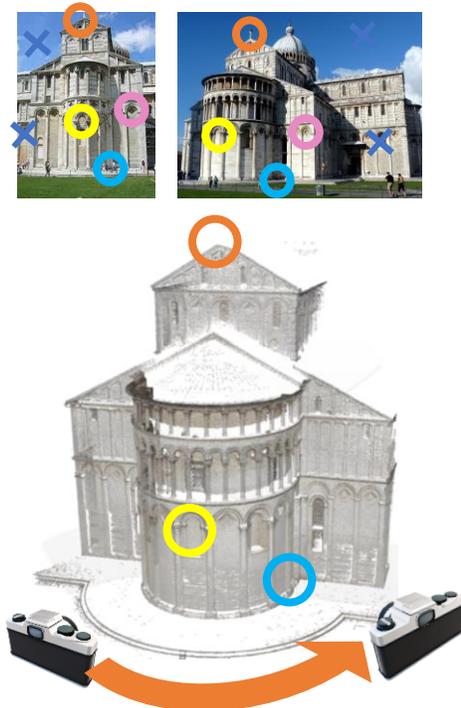
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Computer Vision Research

Giacomo Boracchi, Luca Magri, Federica Arrigoni

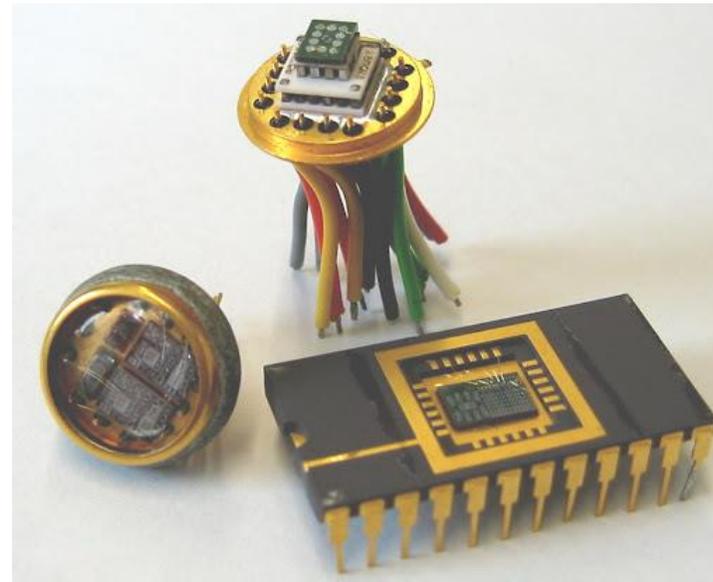
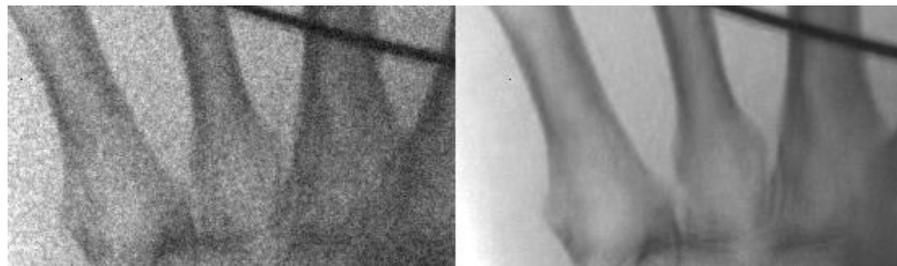
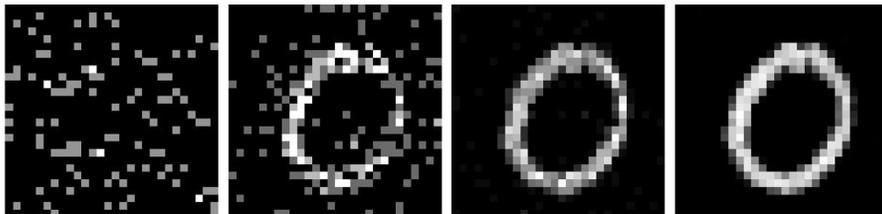


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- **Image/Signal Processing and Analysis:** Image Enhancement and Restoration (X-ray, CCD, SPAD), Change and Outlier Detection (Optical fiber signals)

5 mlux: mean count 0.13 40 mlux: mean count 0.37 320 mlux: mean count 2.28 2560 mlux: mean count 17.44



Computer Vision Research

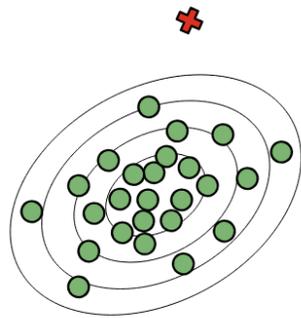
Giacomo Boracchi, Luca Magri, Federica Arrigoni



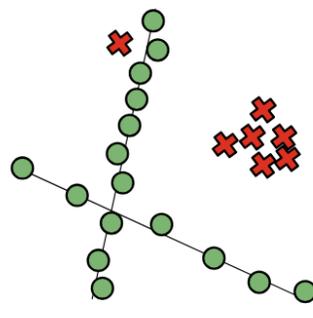
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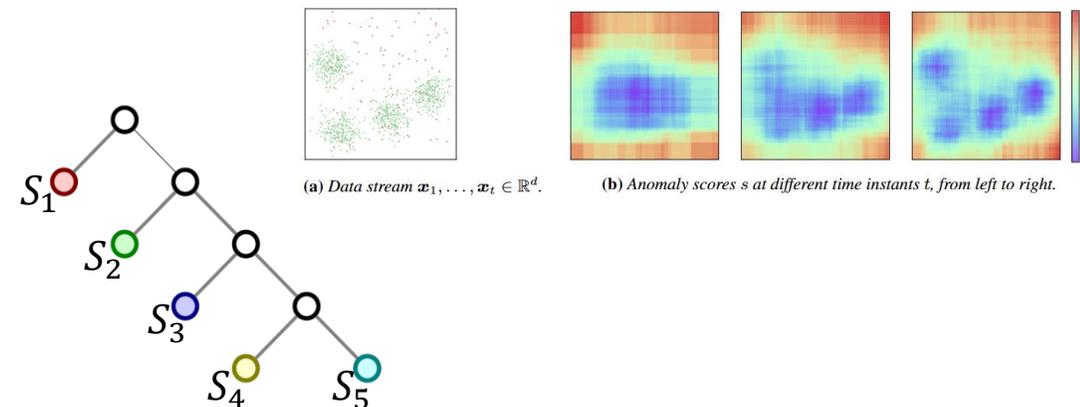
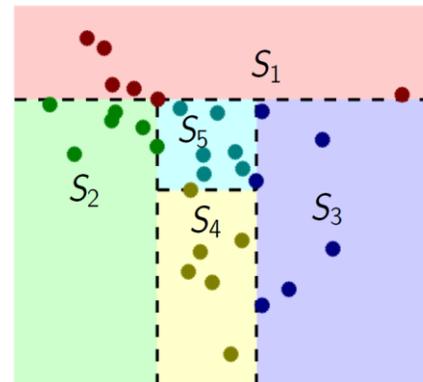
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- **Change and Anomaly Detection:** Design of change-detection tests for high-dimensional data (QuantTree), Sequential Monitoring, Datastream Mining, Anomaly Detection (tree based methods).



(a) Density.



(b) Structure.



(a) Data stream $\mathbf{x}_1, \dots, \mathbf{x}_t \in \mathbb{R}^d$.

(b) Anomaly scores s at different time instants t , from left to right.

Research collaborations



ISTITUTO DI RICERCHE FARMACOLOGICHE MARIO NEGRI · IRCCS



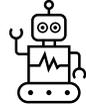
Research collaborations



**ISTITUTO DI RICERCHE
FARMACOLOGICHE
MARIO NEGRI · IRCCS**



Our Industrial Reach



Industry 4.0



Medical

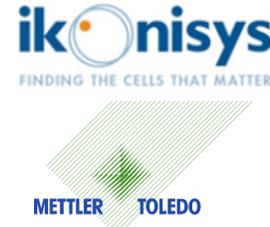


Security



Environmental

Deep Learning for
Visual Recognition



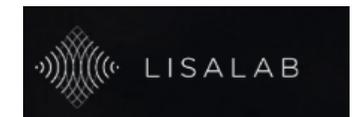
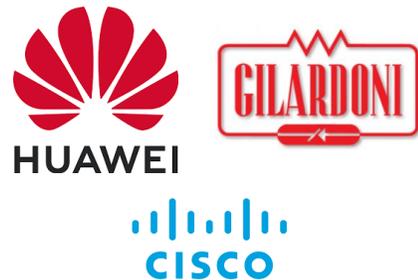
EssilorLuxottica



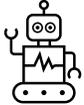
Computer Vision and
Pattern Recognition



Image Processing
and Analysis



Our Industrial Reach



Industry 4.0



Medical



Security



Environmental

Deep Learning for Visual Recognition



Computer Vision and Pattern Recognition



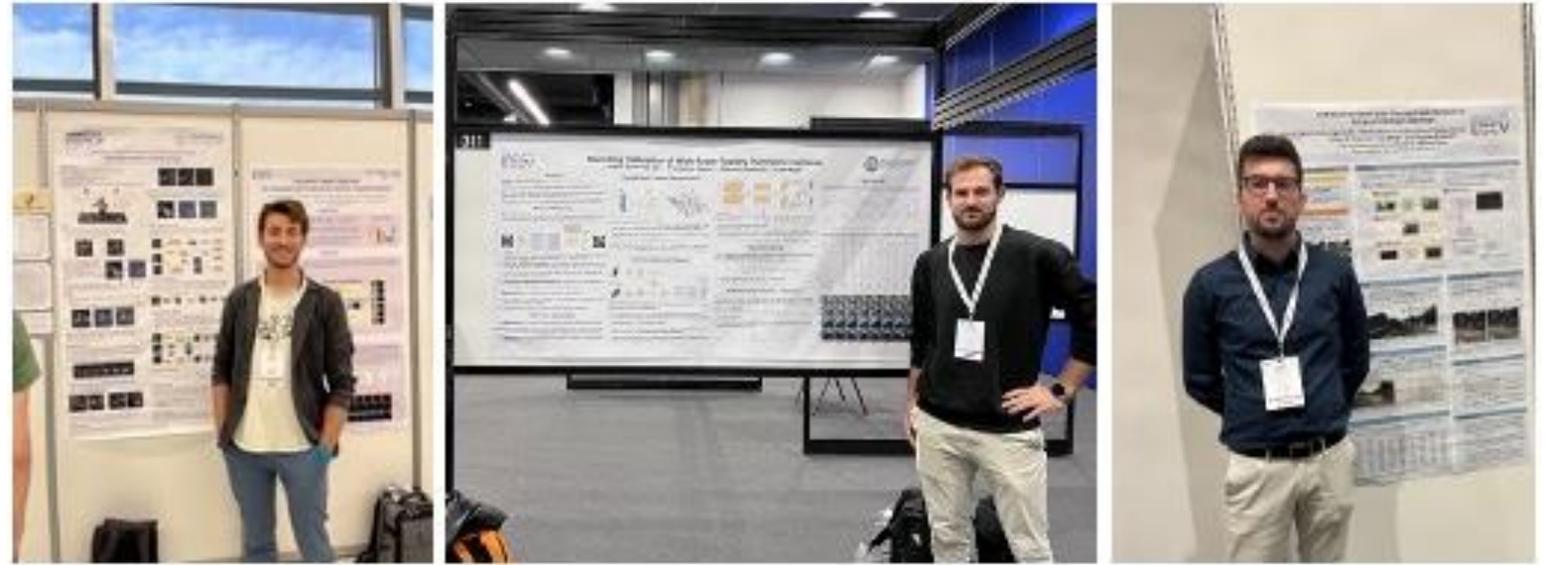
Image Processing and Analysis



Thesis Types

3 Thesis Types

1. Academic Thesis
2. Thesis on projects
3. Internships



In all the cases:

- we do **research** (when possible, we aim at a publication!)
- we shoot at a **full thesis** (up to 7 points, the range is [-1,7])



Academic Thesis

- Explore a **new** research challenges,
- Investigate new brave ideas, **together with a PhD student of ours**

What you'll do:

i) brainstorm, ii) read papers, iii) discuss with us, iv) implement codes, v) run experiments, vi) analyze results.

Iterate this procedure multiple times.



Thesis on Research Projects

As before, in addition you'll

- Be directly **involved in all the project activities**, including meetings, research planning, reporting, presentations to **partners**.
- Business trip to the company
- Need to grant 100% commitment



Choosing the right thesis



Pick a topic that excites you!

You'll be working on it for quite a while, passion will keep you going!

- Expect 9-12 months of work
- Show enthusiasm and commitment
- Be talented and dependable
- Let us know if you want to pursue a PhD after your thesis

Pick a topic that excites you!

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It's normal not to have everything clear from the start
Uncertainty is part of research, it's how discovery begins!



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Uncertainty is part of research, it's how discovery begins!

- Thesis is an **opportunity** to learn a new topic
- Read a lot of papers
- Implement lot of ideas
- Be **rigorous** in analyzing results
- Study the **problem**, not just develop code
- Develop solid **expertises and skills**

The thesis journey is like moving through a jungle

You clear the path step by step.

There's no single route, everyone should find their own way!



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To be successful

- Have a big sense of initiative
- Be creative
- Put a constant effort on the thesis work
- It's an iterative process: study-implement-validate-discuss

You are not alone

Thesis work: you are part of a team!

Thesis choice: We'll help you choosing choose the thesis that best fits your background and expertise! That's a win-win condition



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- You will be supervised by us /co-supervised by a PhD student
- Receive feedback from your nicely prepared updates
- In-person meeting to brainstorm with us
- You are welcome to take part of our Lab life
- We offer general guidance on «how to address thesis work» see:
<https://magrilu.github.io/tht/>

Thesis and exams

- Start your thesis only when you are ready: if you still have too many exams, **consider joining the next thesis presentation** instead.
- Once you begin, you are expected to stay **engaged and constantly work at your thesis**.
- **You cannot completely disappear**, even though you can agree some short pause / slow down due to: Lectures, Exam sessions, Work obligations, Other major commitments...
- **Be sure you can dedicate the time and energies your thesis deserves.**



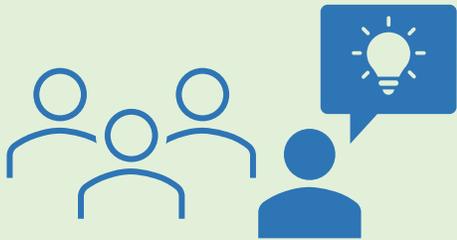
The legend of the phantom student with too many exams left, disappeared and reappeared just a few days before the deadline claiming to graduate

Applying for a Thesis

What to do

1. Now

Come and talk to us!



2. Before

Read some material related to the topics you are interested in.

Write us if you need further information / materials



3. Application

Fill in the form!
Select your first options.

Deadline: 27/2



4. After

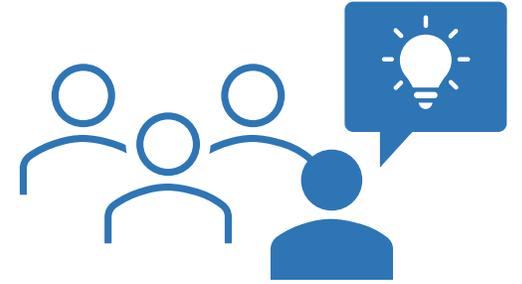
We'll get in touch with you, and start the assignment process



1. NOW

Check the thesis titles at this

<https://boracchi.faculty.polimi.it/ThesisOpportunities.html>



Thesis and Stage Opportunities February 2026: list

- **List and Description of Thesis Opportunities**
- Thesis will be presented in **February 23rd 2026 in Room G1 at 14:00**
- **Form to apply for a thesis, February 2026 call.**
- *Thesis "How To", some guidelines*
- *Thesis Hall of fame, some example of thesis in our group*

Come and talk to us to know about the thesis opportunities you are interested in:

- This is very important **for you:**
you'll make a more informed application to the thesis.
- This is very important **for us:**
we might already have an idea on who is the right champion for the thesis!
- Remember to introduce yourself!



2. Before applying



- **Read** some material related to the thesis topic
- **Write** us if you need further information / materials

Remember the **correct mindset**:

- **Don't worry** if there is some background missing. This is standard and it's easy to catch up, studying materials we provide. Let us know what your background is, we will consider whether you are suited or not.
- Nobody knows everything about their thesis before starting. **This is not like the exam session.**
- ... but consider you'll need to know everything about your thesis before graduating 😊.
- Therefore, you need to be **interested** your topic, and **like the people** you'll work with!
- Consider this might be your first (only) research experience.



3. Application

Fill in the form <https://forms.gle/4uEoV7duJoA3X2Dz7>

(also linked in my homepage)

specifying

- Which thesis are you interested in and which are «**first options**»
- What is **your background**, which courses you have passed that are inherent to the thesis you selected.
- Any **information you deem relevant** for working on that specific thesis.
- Successful **projects** and your **programming expertise**.
- A short **motivation** paragraph.



Application

Are these thesis your "first option"? By first option we mean that if you get assigned a "first option" thesis, you do not have to consider any other thesis opportunity and you like to accept this. *

- Yes, any thesis I have selected is a first option for me
- Yes, but only for the thesis I have entered as a first, not the second or third
- Yes, but only for the thesis I have entered as a first or second, not the third
- No, I need to check other opportunities before making my decision
- Help me in choosing the right thesis



Application



First option:

- This means it's your top-choice thesis.
- If assigned, you're ready to start and don't need to explore other options.
- For us, it's a plus, and we prioritize first options.

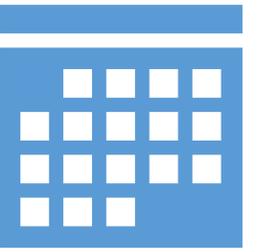
Need to check other opportunities:

- This is perfectly legitimate. It's important for us to know if you're considering other options.

Help me find a thesis:

- This means you're unsure and request our assistance in finding the best thesis that aligns with your interests and background.

3. Deadline



We will start meeting students and assigning thesis on a rolling-basis

- We will start contacting candidates since next week.
- You will receive an email from us to schedule a meeting (possibly in person, but if not possible online).
- You are welcome to write us email for enquiring

We plan closing the form on the 2nd of March

4. After the application



We'll get in touch with you to

- have a meeting
- and (shortly) assign a thesis proposal

We will start from students entering “first options” and having an excellent match with our expectation.

We will organize a “kick-off meeting” for all the new students during the first week of October, but you are encouraged to start working at your thesis with your advisor before that date.

Have a look at our “Thesis hall of fame”



You can find executive summaries and thesis slides of students that graduated with us

... that webpage is still growing!

Thesis Hall of Fame

Here you can find some particularly worthy theses, some of which have been then evolved into papers published at Workshops, Conferences and Journals.

- ★ Francesco Azzoni, *Deep Monocular Autocalibration of Radially Symmetric Wide-Angle Cameras*. [executive summary](#), [slides](#), published at ECCV 2024.
 - ★ Andrea Marelli, *Temporal consistent CAMs for weakly supervised video segmentation in Waste Sorting*. [executive summary](#), [slides](#), published at the Industrial Vision Workshop hosted at ECCV 2024.
 - ★ Carlo Sgaravatti, *A Multimodal Hybrid Late-Cascade Fusion Network for Enhanced 3D Object Detection*. [thesis article](#), [slides](#), published at the Industrial Vision Workshop hosted at ECCV 2024.
 - ★ Olmo Michelangelo Notarianni, *Change Detection in Multivariate data streams: Online Analysis with Kernel-QuantTree*. [executive summary](#), [slides](#), published at the Advanced Analytics and Learning on Temporal Data Workshop at ECML 2024.
 - ★ Fiore Amarù, Michele Alziati, *Ensemble clustering via synchronized relabelling*. [executive summary](#), [slides](#), published at Pattern Recognition Letters, August 2024.
 - ★ Matteo Farina, *Quantum Multi-Model Fitting*. [poster](#), published at CVPR 2023.
 - ★ Andrea Porfiri Dal Cin, *Synchronization of Group-labelled Multi-graphs*. [slides](#), published at ICCV 2022.
- Other theses to have a look at:
- ★ Alessandrini, *Desc-V Desupervision in Camouflaged Videos*. [executive summary](#), [slides](#).

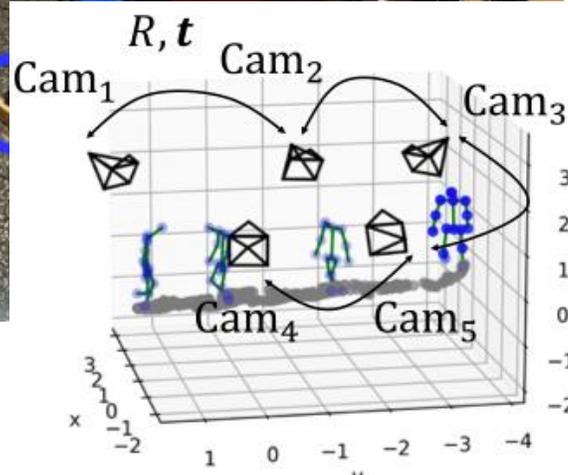
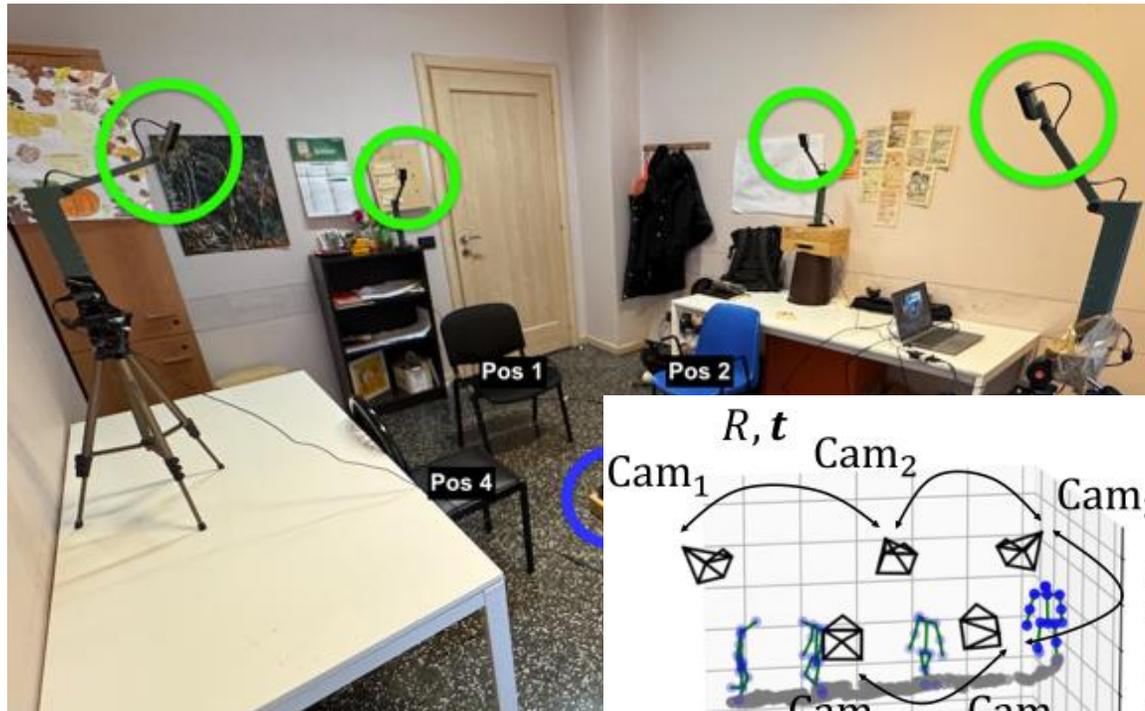
<https://magrilu.github.io/thof/>

Thesis list

Computer Vision: 3D reconstruction

DL9. Skeleton based Multiview calibration

DL10. Reconstruction in warehouse environments

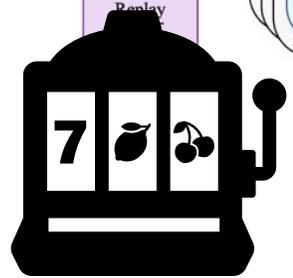
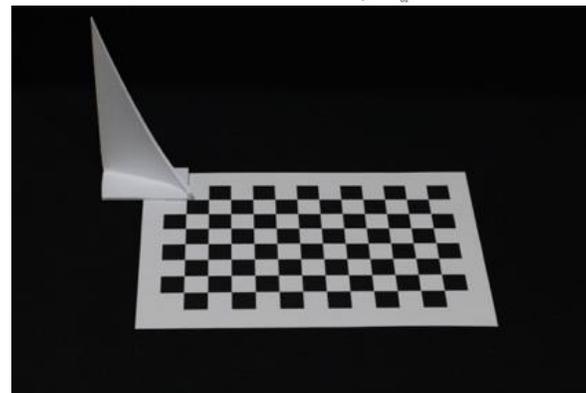
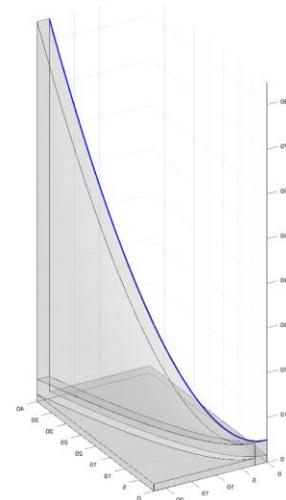
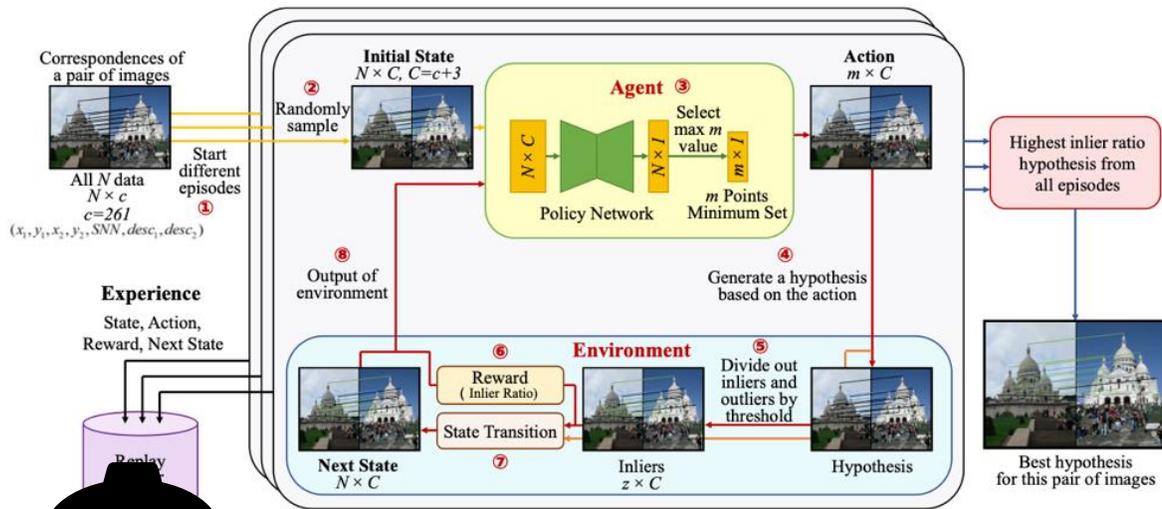


Computer Vision: 3D reconstruction



G3. Online learning enhanced robust fitting

G4. Advanced 3D reconstruction for sailing applications

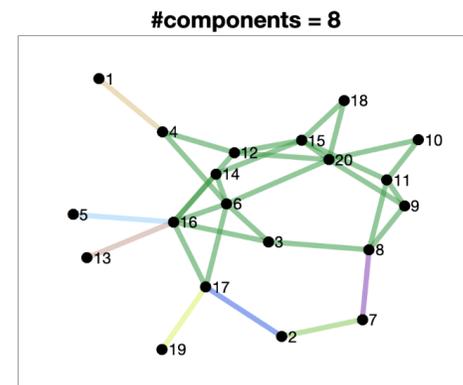
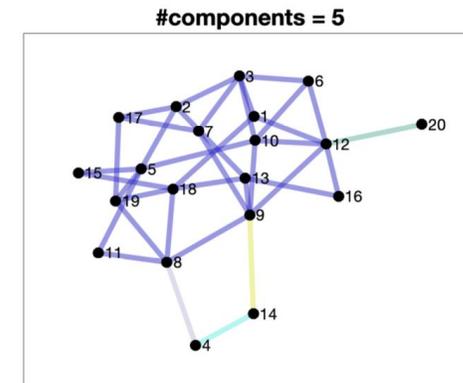
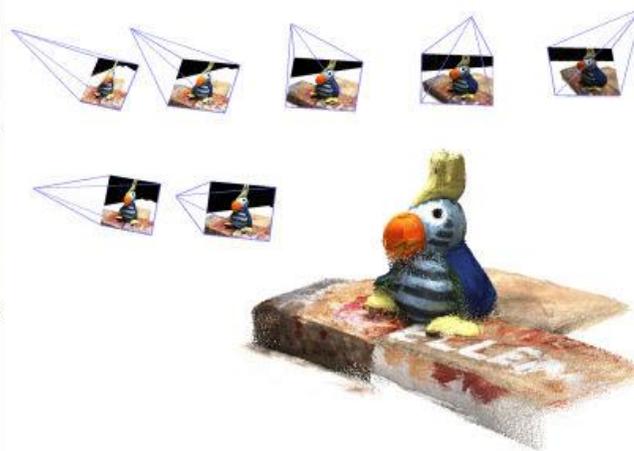
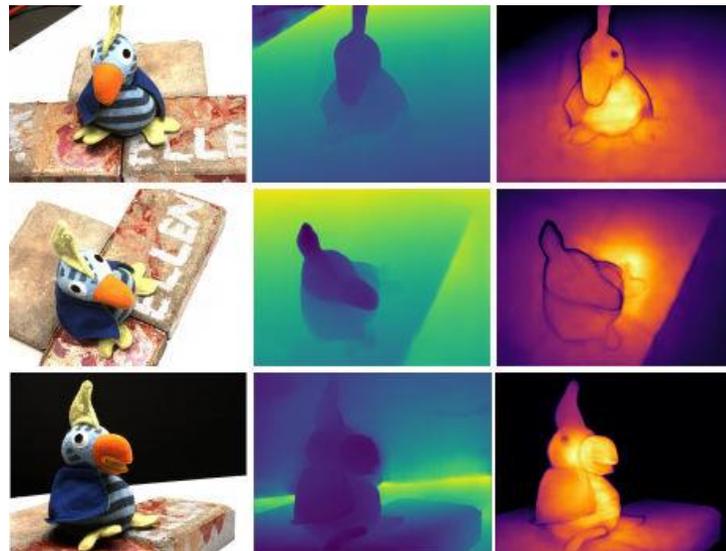
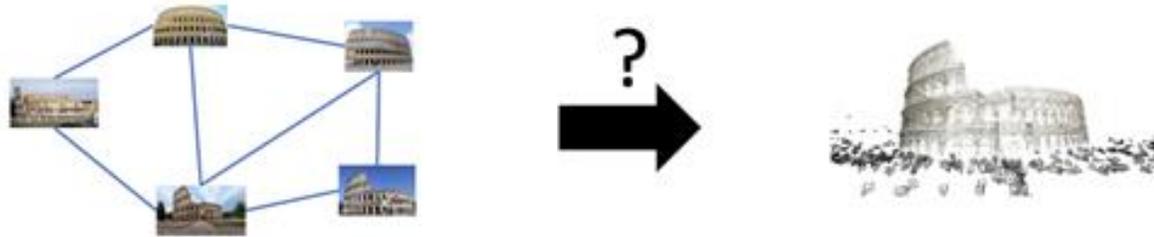


Computer Vision: 3D reconstruction



G2. Good graphs vs bad graphs in 3D reconstruction

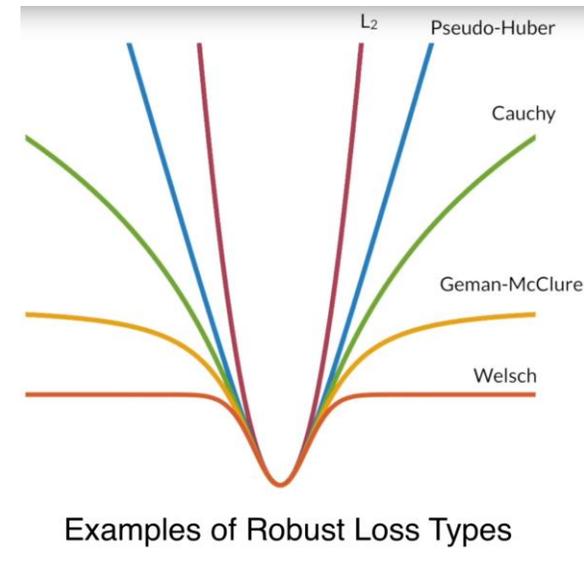
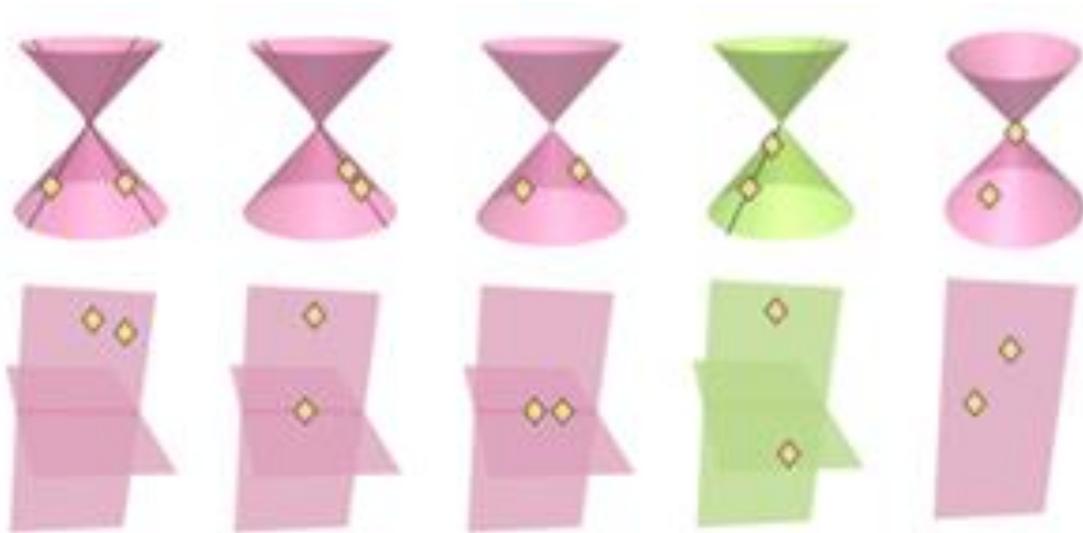
DL2. VGGT: structure from motion revisited



Computer Vision: 3D reconstruction

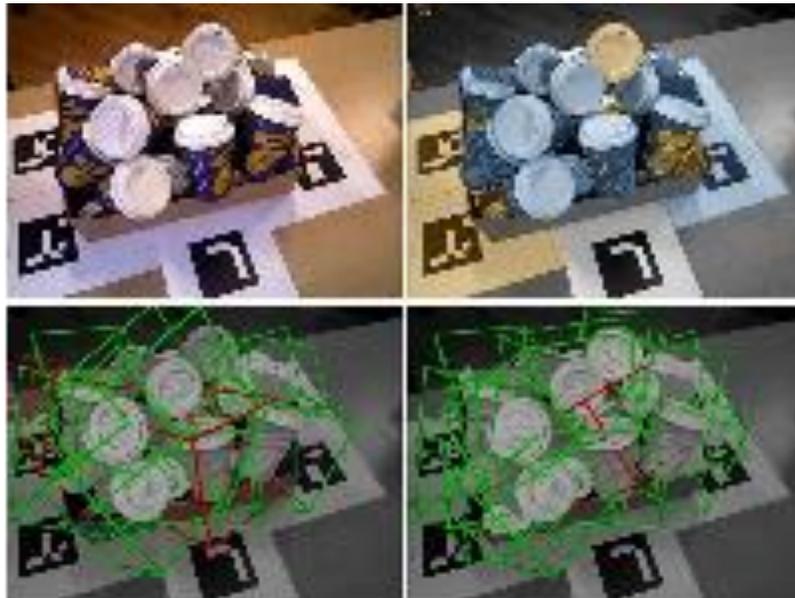
G1. Degenerate Configurations in calibrated Two-view Reconstruction

G5. Robustness in Geometric Problems



Computer Vision: Object Pose Estimation

DL1. Object pose estimation in cluttered, challenging scenarios

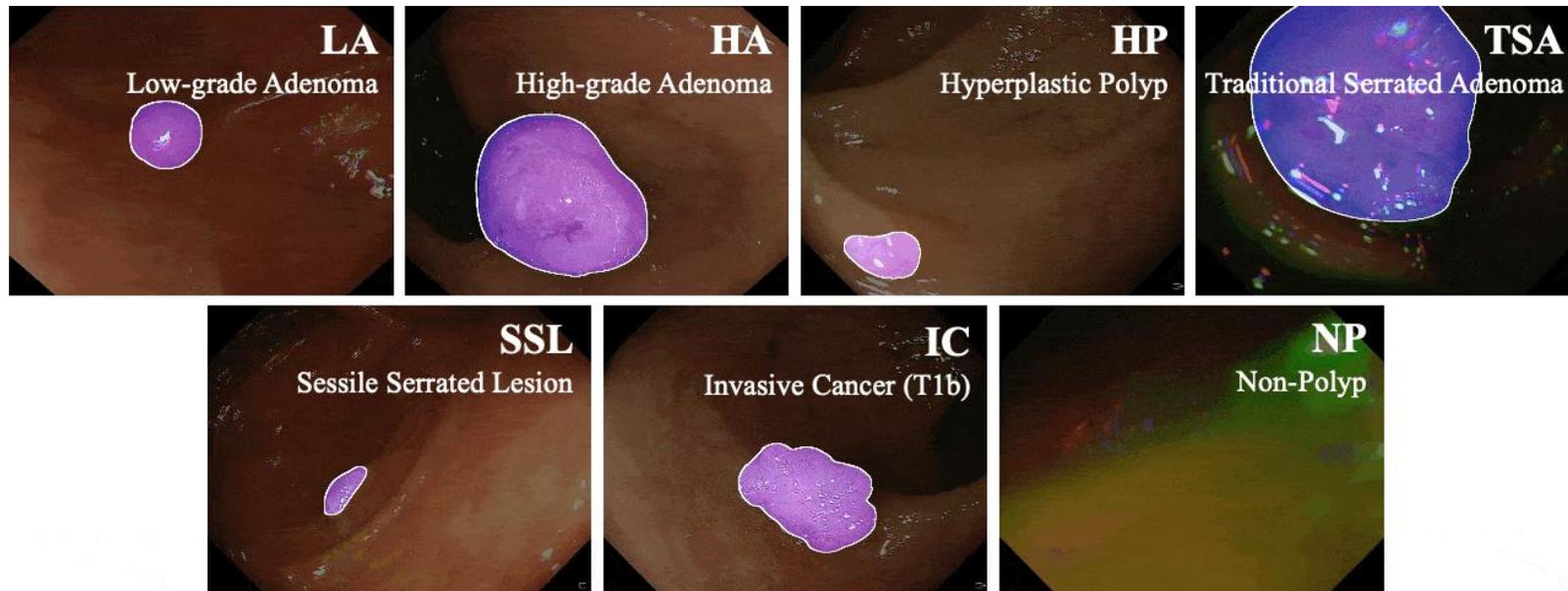


Computer Vision: Video segmentation



DL3. (Self-)Supervised Object Segmentation in Medical Videos

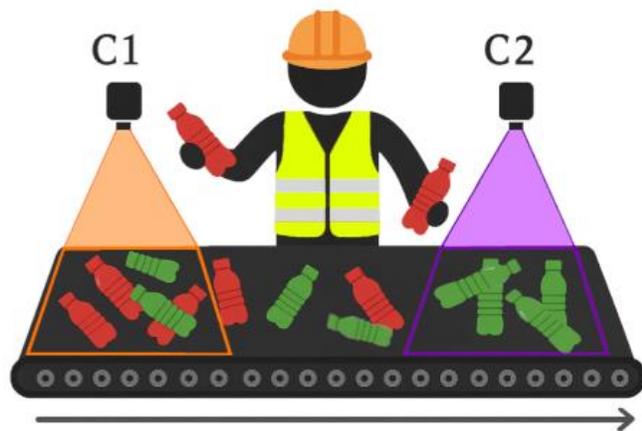
Development of a computer-aided detection system for colonoscopy and a publicly accessible large colonoscopy video database (with video).



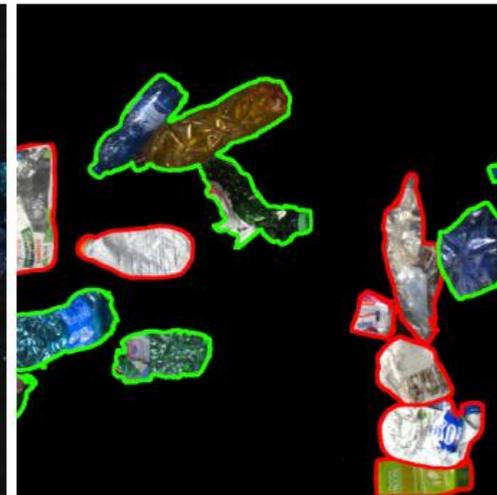
Computer Vision: Video segmentation

DL4. Self-Supervised Object Re-Identification in Industrial Quality Control

Industrial waste streams are highly dynamic, with human operators constantly altering the scene between *before* and *after* states. This thesis tackles unsupervised object re-identification in such chaotic environments by developing a robust feature matching pipeline capable of tracking items across these disruptions and lifting 2D matches into pose-invariant 3D representations. To train the system without manual annotations, the research will leverage intrinsic temporal coherence, foundation models like SAM and DINO, and generative anomaly detection.



Before



Keep - Remove

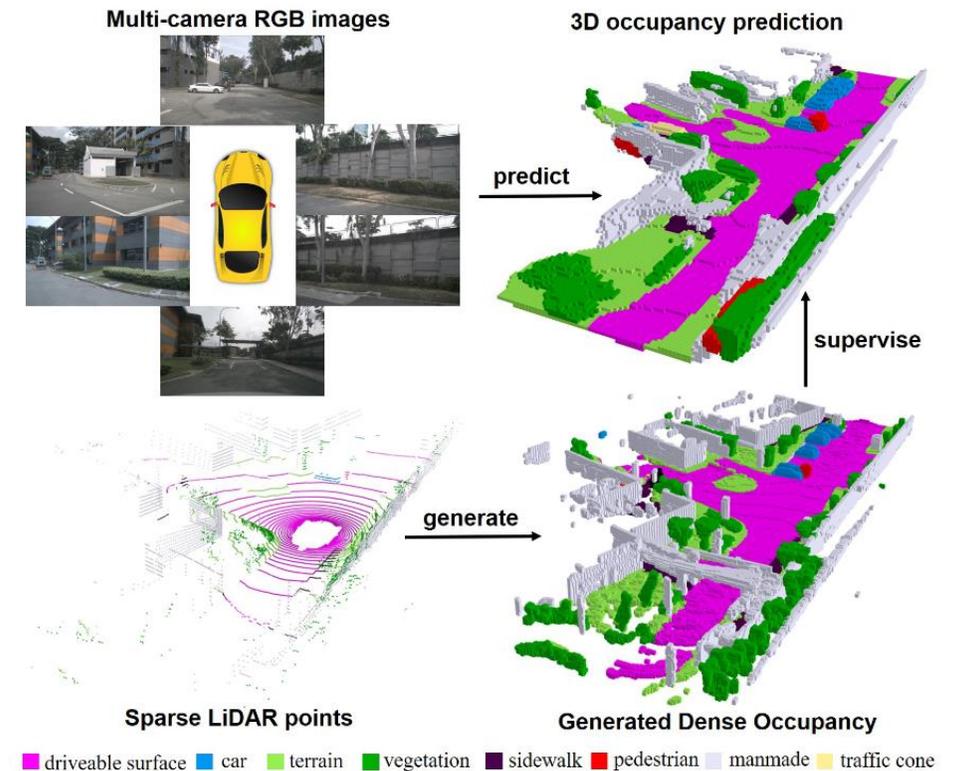
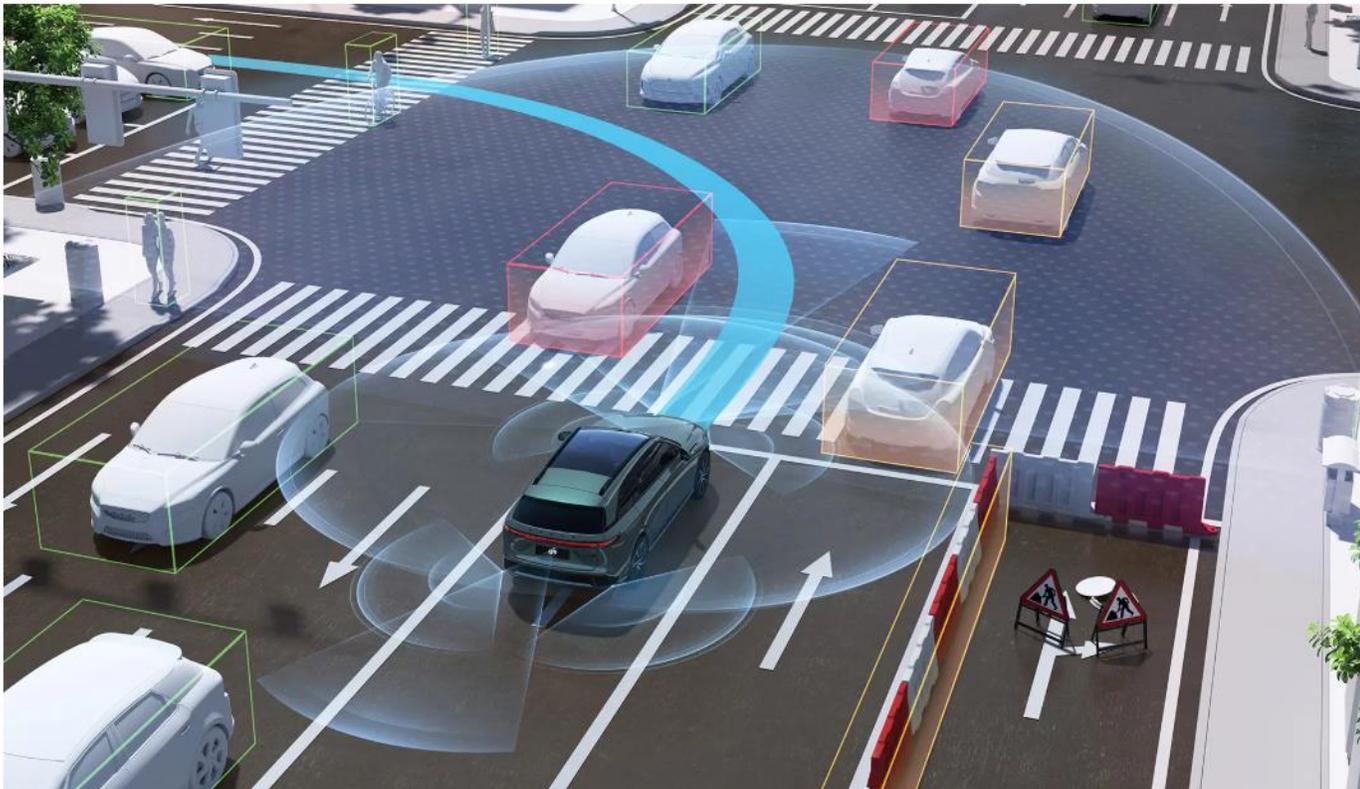


After

Computer Vision: Vision for Autonomous driving

DL5. End-to-End Autonomous Driving with Sparse Scene Representations

DL6. Occupancy Flow for Motion Prediction in Autonomous Driving



Computer Vision: Biomedical imaging

DL7. Generation Post-Placement for Expert Training of Tracking and Object Detection

DL8. Interaction modelling and simulation in 2D+time and 3D+time biomedical datasets

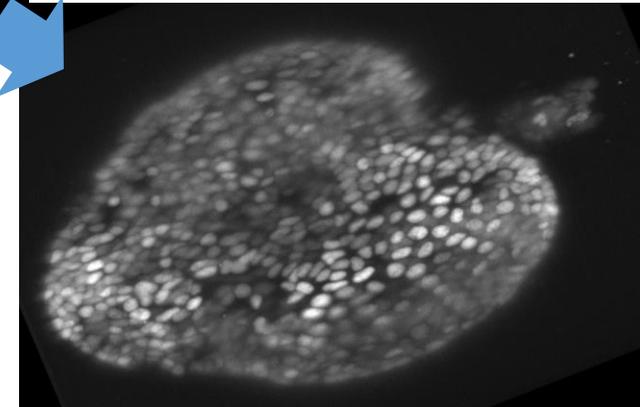
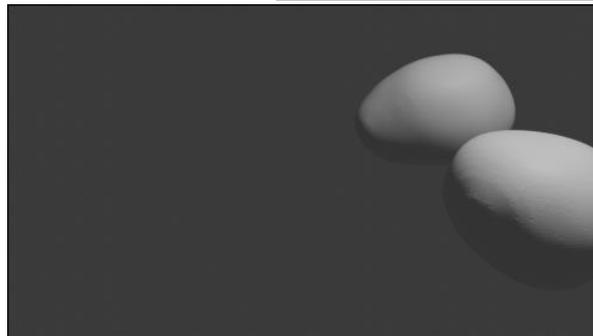
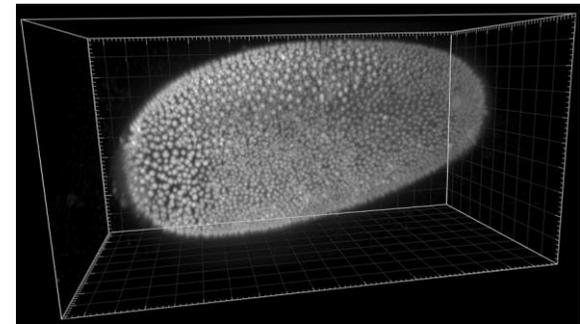
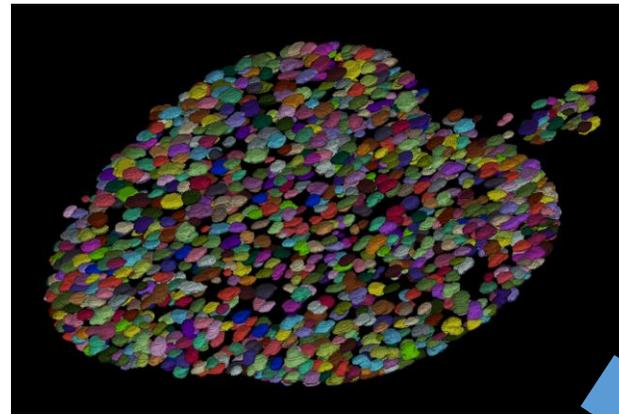
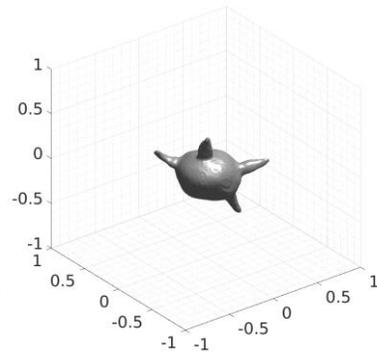
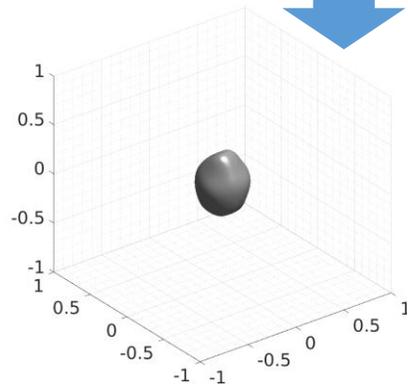
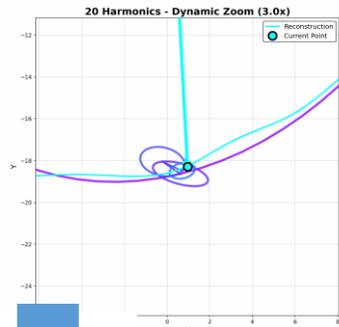
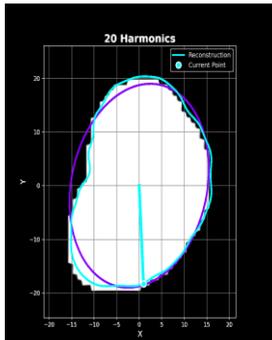
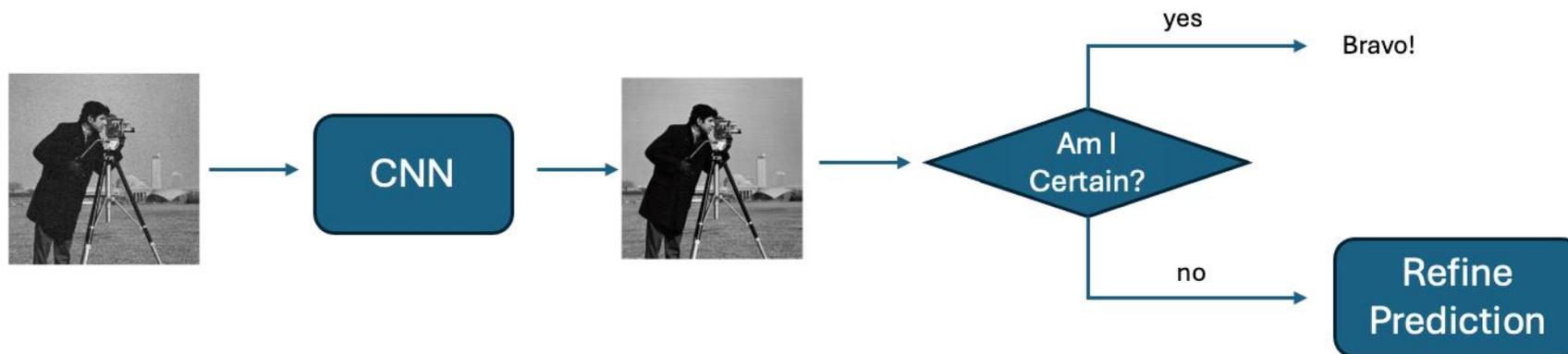


Image processing

IP1. Mitigating BSNs loss of information for self-supervised denoising



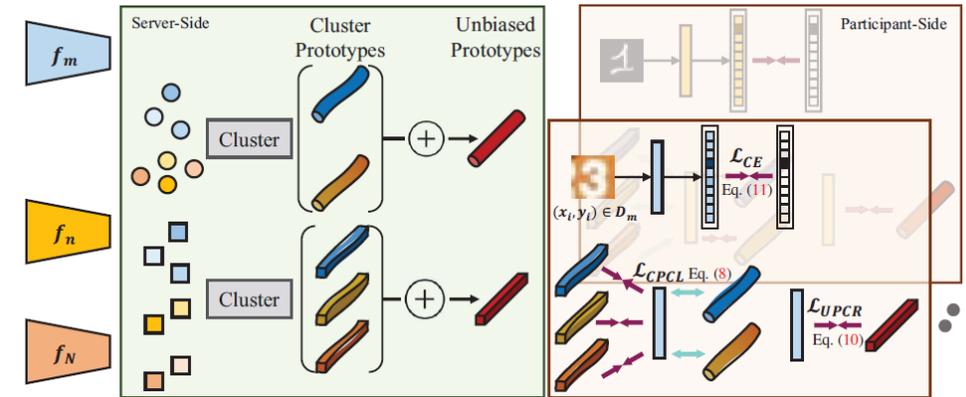
IP2. Uncertainty Exploitation for Deep Image Denoising



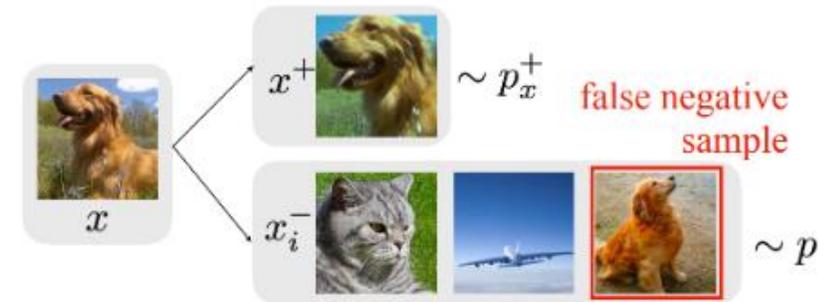
Machine Learning



ML1. Unlabeled but Not Unlearned:
Semi-Supervised Federated Learning in
Domain Shift

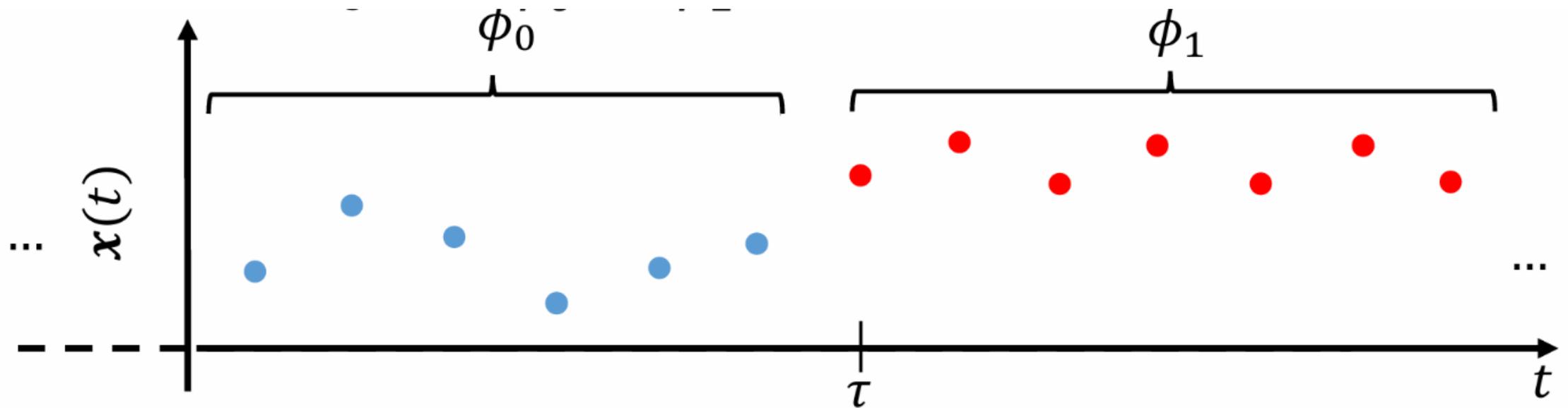


ML2. Pseudo-Negative Labeling for Contrastive
Learning under Class-Imbalance



Machine Learning

ML3. Set Change-Detection in Datastreams

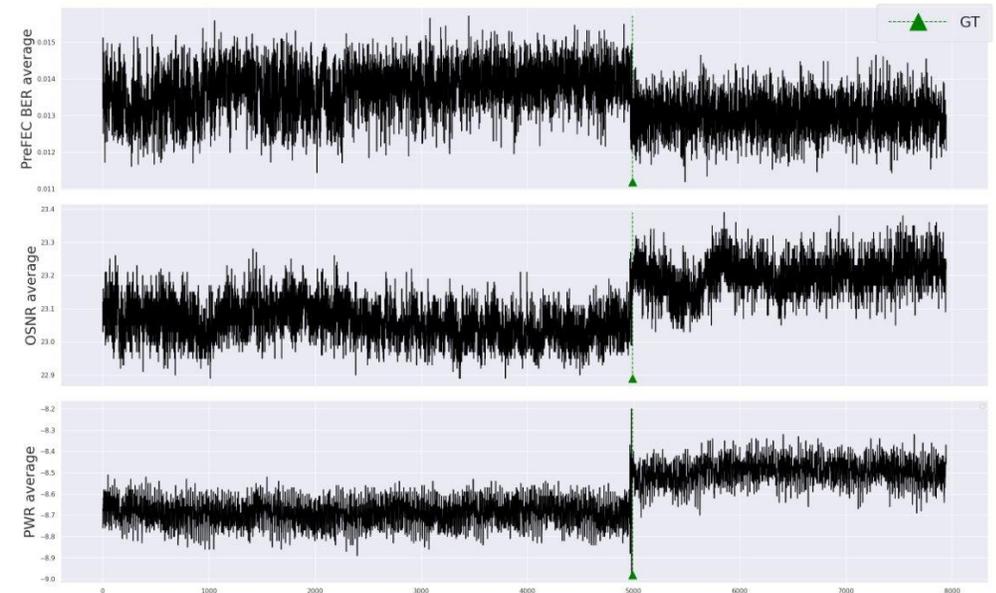
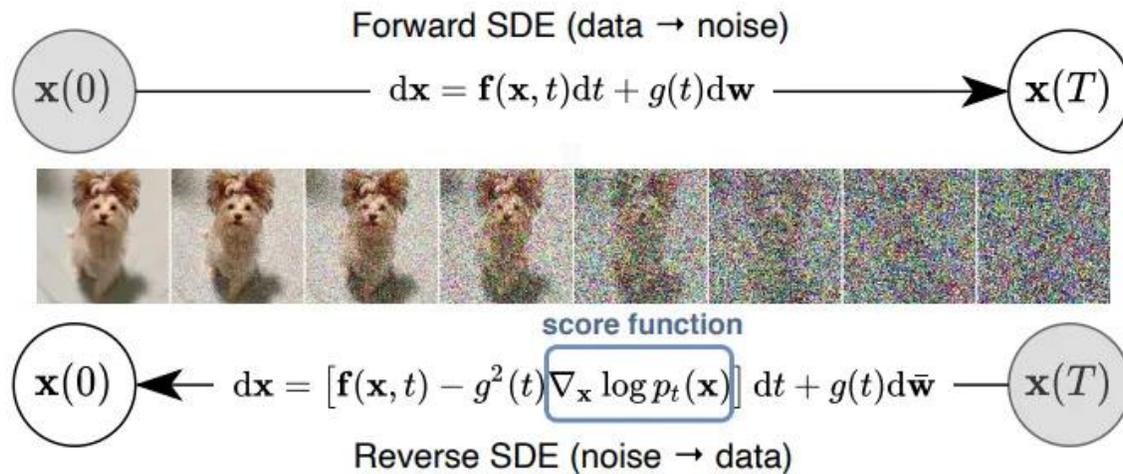


Project related thesis

Project thesis: Generative data stream



PR1. Diffusion Models for Realistic Optical Data Stream Generation



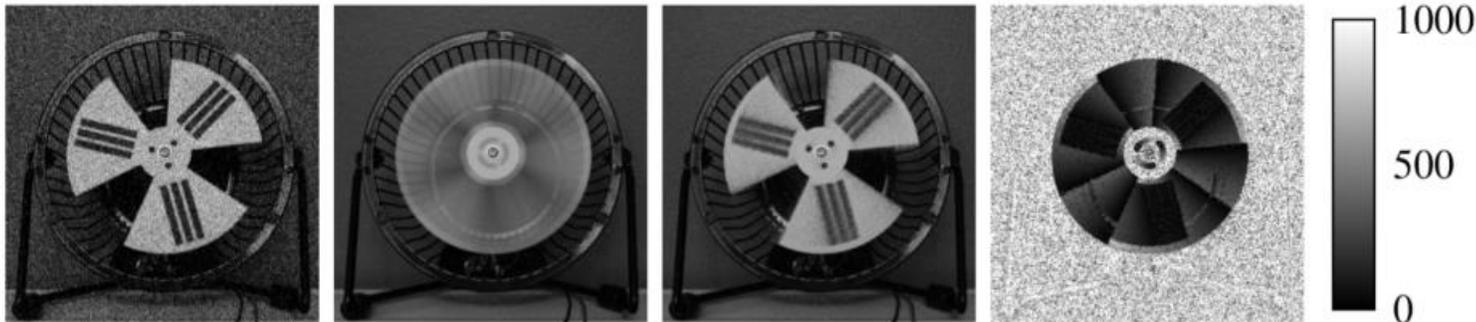
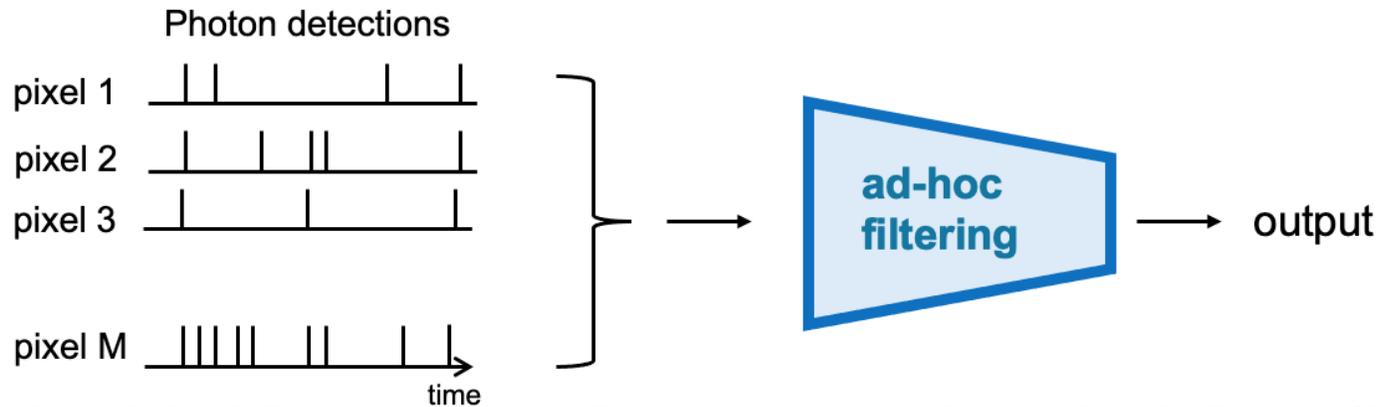
The thesis will investigate:

- how to condition diffusion models on physically meaningful quantities, enforcing consistency across correlated performance indicators;
- how to exploit topology-aware simulators (e.g., GNPpy) to guide generation toward network-coherent behavior;
- how to generate anomaly-conditioned time series that realistically emulate rare failure scenarios.

Project thesis: Image processing



PR2. Adaptive Filtering, Adaptive Sampling and Compact Representation for Single-Photon Cameras

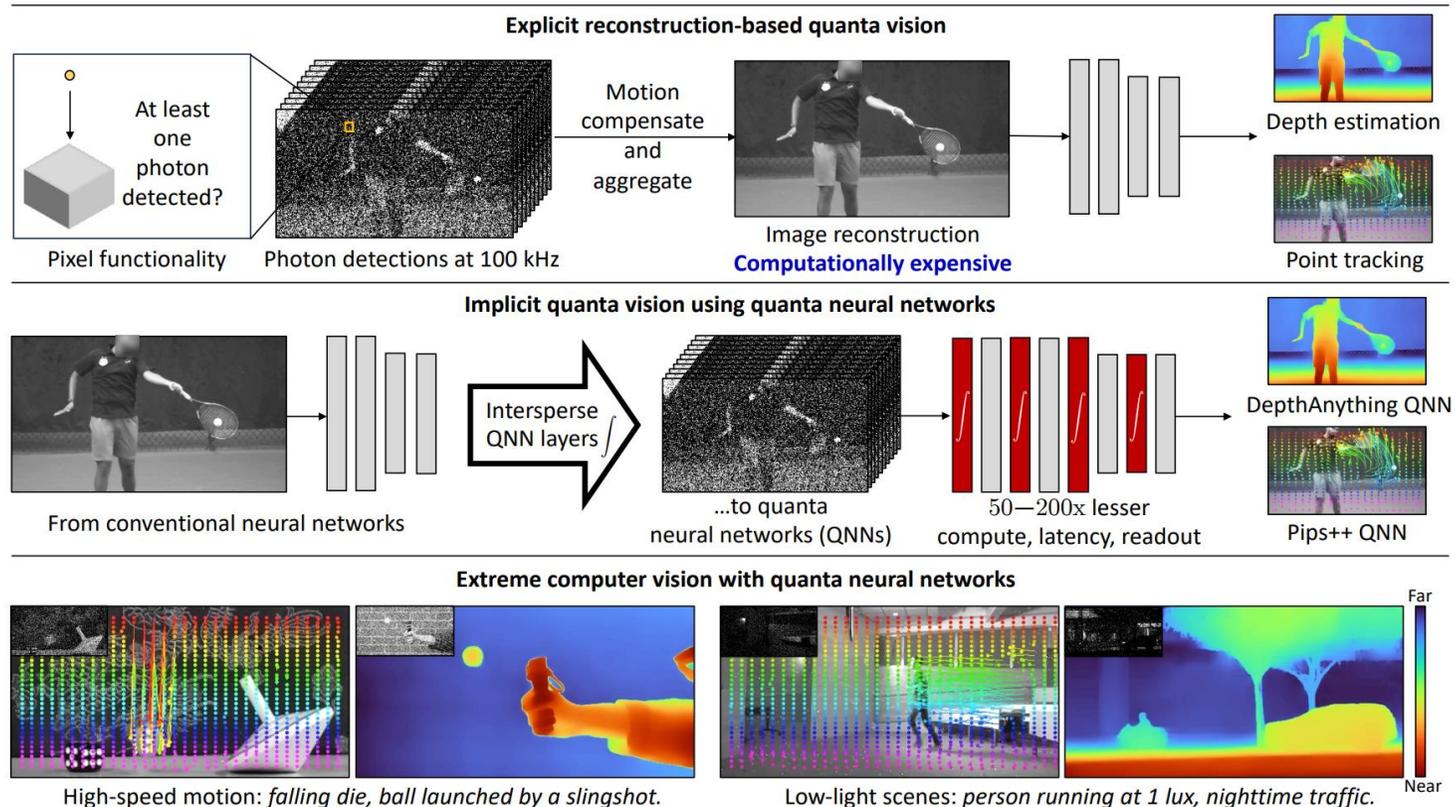


Project thesis: Image processing



PR3. Computer *vision* and perception from photons

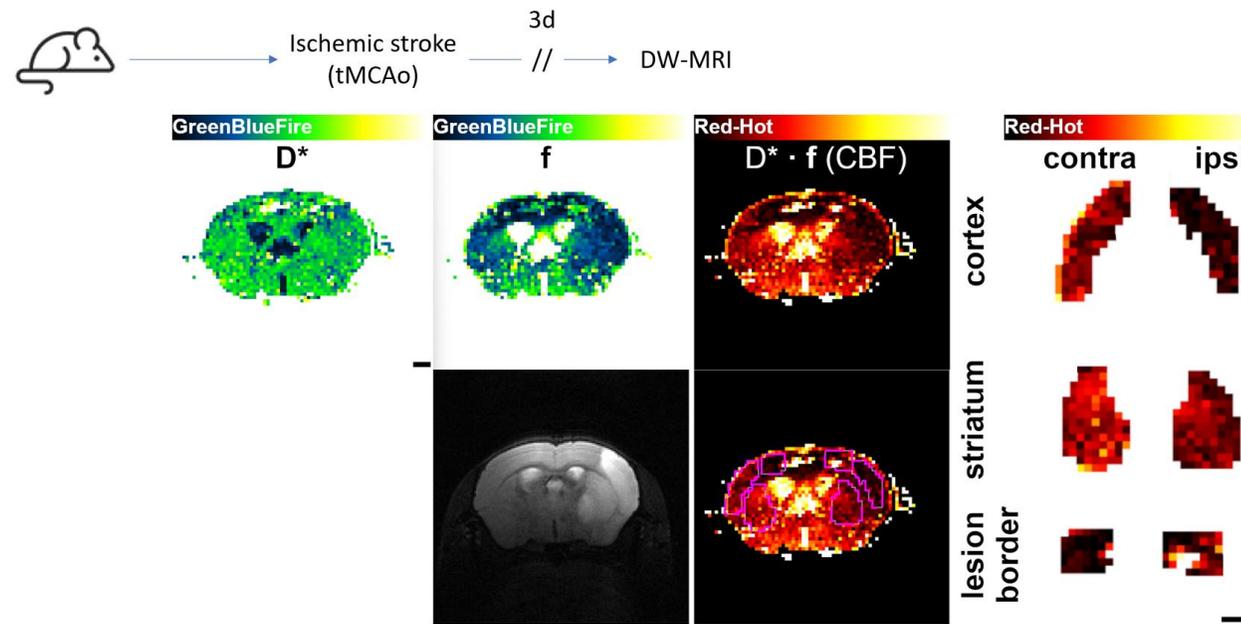
[project with Huawei]



Project thesis: Deep Learning



PR4. Mario Negri Research Institute: Multimodal integration of 3D MRI and Xray tomography images for the characterization of microvascular damage



Internships Thesis: MLCube



Pose estimation and Face Recognition for fashion photos

- Generative AI often loses subject identity and anatomical precision when converting standard **technical fashion photos** into dynamic editorial shots.
- This thesis aims to enforce high-fidelity facial consistency and precise pose adherence across complex, non-standard poses.
- The research will utilize face recognition embeddings and feature matching to ensure strict identity retention during generation.



Reference Pose

Input Pose

