

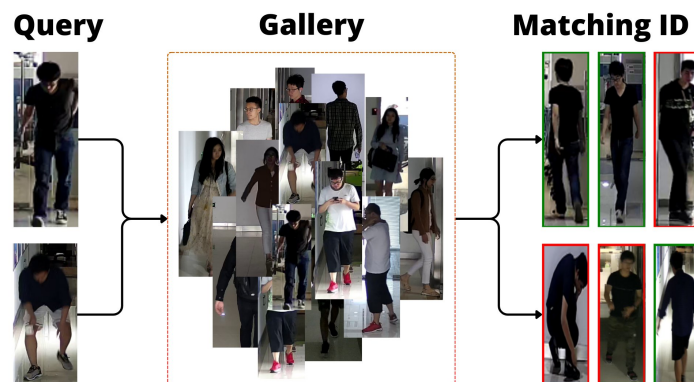
Internship context

Based in Saclay (Essonne), the LIST is one of the two institutes of CEA Tech, the technological research division of the CEA. Dedicated to intelligent digital systems, its mission is to carry out technological developments of excellence on behalf of industrial partners in order to create value.

Within the LIST, the Laboratory of Vision and Learning for Scene Analysis (LVA) conducts research in the field of computer vision and artificial intelligence for the perception of intelligent and autonomous systems. The laboratory's research themes include visual recognition, behavior and activity analysis, large-scale automatic annotation, and perception and decision models. These technologies are applied in major sectors such as security, mobility, advanced manufacturing, healthcare, and sports...

Missions

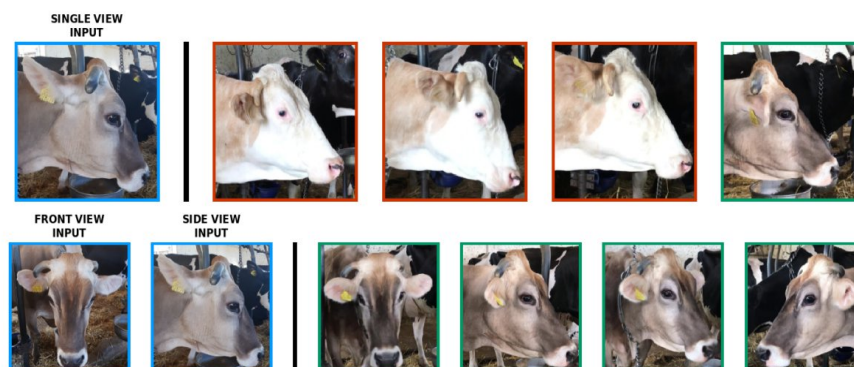
Many monitoring applications such as pedestrian video protection, cow monitoring in a farm or automatic analysis of team sports games rely on the correct re-identification of individuals in a camera network. The subject of re-identification has been widely studied for several years, and results are already very good when it comes to finding a person from discriminating details linked to their appearance, based in particular on differences in color and texture. However, the task becomes increasingly complex when it comes to recognizing individuals seen from different points of view. Indeed, various parameters change in addition to appearance, such as the resolution of the individual in the image, its pose or its lighting conditions.



Re-identification principle : Retrieve query individual in a gallery of multiple persons or objects

To overcome these various limitations, our team is proposing a new method based on 3D understanding of the individual. Indeed, the results of recent methods for 3D reconstruction of objects are increasingly impressive, and it is interesting to exploit these new representations in a context of individual re-identification.

With this internship, we would like to explore the extension of this research to the use of multiple views of the same object or individual.



Use multiple views for cattle re-identification [3]

Internship objectives

Different approaches can be explored during the intership :

- Exploiting multiple images as query or gallery for re-identification during training or inference.
- Explore the concept of multiple view fusion in a unique re-identification representation enriched by each point of view.
- Compare it to strategies that keep each unique view re-identification information and using ranking or matching to retrieve the person.
- Explore the fusion of 2D images as an implicit multi-view re-id representation [2] vs a more explicit 3D representation leveraging SOTA 3D reconstruction approaches from one or many images [3]
- Explore the fusion of static vs articulated objects (luggage vs person), leveraging semantics from foundation models or generative models [4].



Use of semantics to compare the same parts of objects for re-identification [4]

References

- [1] Dmitry Tochilkin, David Pankratz, Zexiang Liu, Zixuan Huang, Adam Letts, Yangguang Li, DingLiang, Christian Laforte, Varun Jampani, and Yan-Pei Cao. TripoSR: Fast 3D Object Reconstruction from a Single Image, March 2024
- [2] BERGAMINI, Luca, PORRELLO, Angelo, DONDONA, Andrea Capobianco, et al. Multi-views embedding for cattle re-identification. In : 2018 14th international conference on signal-image technology & internet-based systems (SITIS). IEEE, 2018. p. 184-191.
- [3] LI, Mengfei, LONG, Xiaoxiao, LIANG, Yixun, et al. M-LRM: Multi-view Large Reconstruction Model. arXiv preprint arXiv:2406.07648, 2024.
- [4] Dutt, N. S., Muralikrishnan, S., & Mitra, N. J. (2024). Diffusion 3d features (diff3f): Decorating untextured shapes with distilled semantic features. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (pp. 4494-4504).

Qualifications

- Students in their 4th or 5th year of studies (M1, M2 or gap year)
- Computer vision and 3D geometry understanding skills
- Machine learning skills (deep learning, perception models, generative AI...)
- Python proficiency in a deep learning framework (especially TensorFlow or PyTorch)

Job-related benefits

Joining the CEA List and the LVA as an intern means:

- Joining an organization that addresses societal challenges to build the world of tomorrow.
- Working in one of the most innovative research organizations in the world (ranked in the global top 100, top 3 in France).
- Discovering a rich ecosystem where the institute creates privileged links between the industrial and academic sectors.
- Conducting research in an environment where autonomy and creativity are recognized, and where valorizing results is encouraged (publication of scientific articles, patents, and sharing of open-source code whenever possible).
- Joining a young and dynamic team made up of research engineers, PhD students, post-doctoral researchers, and interns.
- Benefiting from an internal computing infrastructure equipped with around 300 state-of-the-art GPUs.
- Receiving a stipend between €1300 and €1400 per month.
- Having the opportunity to continue with a PhD or as a research engineer after the internship.
- Having the possibility of remote work, receiving a 75% (instead of 50%) reimbursement on public transportation costs, and benefiting from the "mobili-jeune" aid to reduce rent costs...