

FIFTH NEWSLETTER – Apr 2023

Welcome to the fifth newsletter!

CLARIFY is now in the home stretch! And that means that our ESRs are at the peak of their research.

Since the last Newsletter, the **latest secondments of the ESRs** have mostly taken place, as they now have to focus especially on putting an end to their work.

However, there is still room for training activities and social events. Next month the **3rd training school will take place in Amsterdam**. And judging by the experience of the 2nd training school, it is sure to be a fun and productive days, full of learning and good times.

If you want to know more details about the progress of our project, read on, and don't forget to follow us on our **social networks** and visit our **website**.



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CLARIFY in a nutshell



4 Universities
UPV, UGR, UvA
& UiS



3 Hospitals
INCLIVA, SUH &
EMC



2 Companies
BitYoga & Tyris
Software



12 ERSs

Milestones achieved

Monthly meetings between ESRs and supervisors

8 secondments concluded from October to March

1 Scientific deliverable

3 conference papers since the last newsletter

3 journal papers since the last newsletter

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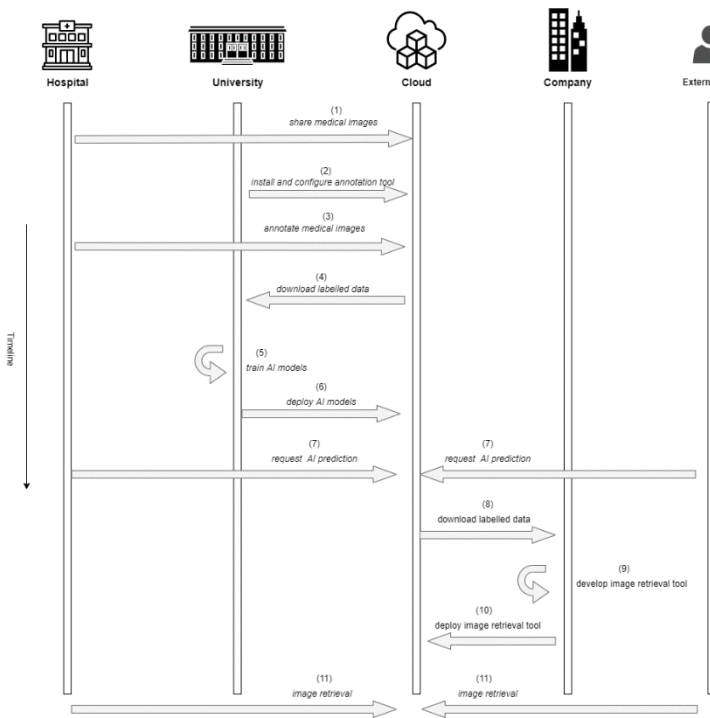
Scientific Deliverables

D2.3. A Blockchain-based Secure Transaction System

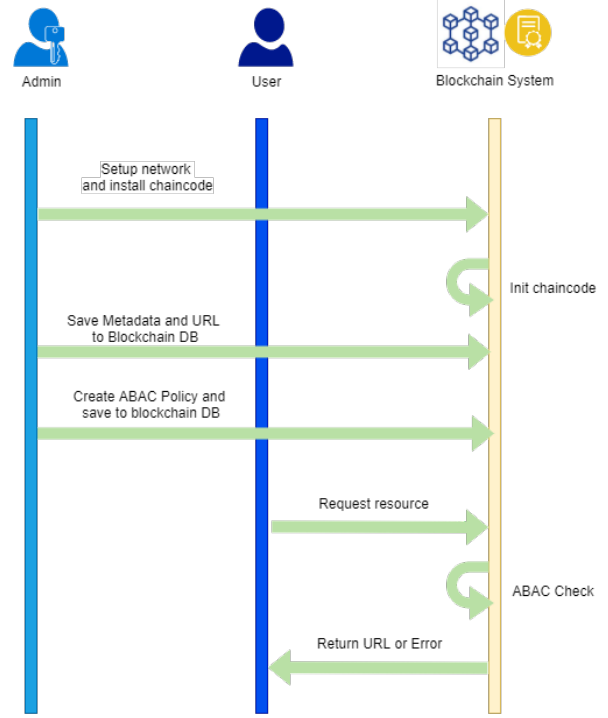
This deliverable primarily presents the design of a blockchain-based secure transaction platform for the Clarify project. Specifically, it analyzes the application of blockchain technology in healthcare, potential application scenarios within the Clarify project, and the system's design and implementation.

D2.3 explains the process of building blockchain applications, assisting medical professionals and cloud computing system designers in understanding blockchain systems and integrating their work to contribute to the project.

The following two diagrams represent the project requirement analysis and the interaction design of the blockchain system, respectively.



Clarify project digital resource sharing and access workflow.



Interactions between the users and Blockchain system.

ESR project updates



ESR1: Na Li, Universiteit van Amsterdam: *“Semantic interoperability of digital pathology data via common formal terminology”*

- A **poster** titled "CNSVRE: A Query Reformulated Search System with Explainable Summarization for Virtual Research Environment" has been **accepted by the WWW 2023 conference**.
- Attendance the **WWW 2023 conference virtual event** at the beginning of May.
- Finish the first draft of a **survey paper** about applying active learning for data quality control.



ESR2: Yuandou Wang, Universiteit van Amsterdam: *“Seamless trusted data sharing techniques”*

- Submitted a **research paper** entitled “Towards a Service-based Adaptable Data Layer for Cloud Workflows” to the International Computer Software and Applications Conference (COMPSAC 2023).
- Submitted a **work-in-progress paper** entitled “Towards a privacy-preserving distributed cloud service for preprocessing very large medical images” to IEEE International Conference on Digital Health (IEEE ICDH 2023) in February 2023.
- **Contributed a joint paper** entitled “A Survey on Dataset Distillation: Approaches, Applications and Future Directions”, which has been submitted to the 32nd international joint conference on artificial intelligence - IJCAI 2023 Survey Track.



ESR3: Jiahui Geng, bitYoga AS: *“Taking computation to Data: integrating BigData and Blockchain allowing secure analysis of sensitive health data on-premise”*

- Three **papers accepted** by main tracks and one paper accepted a workshop in **CloudCom2022** and he gave corresponding **presentations** in Bangkok.
- Attending the **CloudCom2022 conference** with his supervisor
- Two **paper accepted**: one at **IEEE Transactions on Big Data** and another one at Pacific-Asia Conference on Knowledge Discovery and Data Mining-**PAKDD2023**.



ESR4: Neel Kanwal, University of Stavanger: *“Preprocessing, segmentation and anonymization of WSI”*

- **Submitted a paper** on melanoma detection to **EUSIPCO 2023 conference**.
- **Submitted a journal** on deep kernel learning for artifact detection.
- **Paper accepted at PAKDD 2023** related to vision transformers learned through knowledge distillation.
- Completed a **secondment at UvA** for cloud computing and data sharing techniques.

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ESR5: Saul Fuster Navarro, University of Stavanger: *“Extracting diagnostic and prognostic information from histological images of NMIBC”*

- A **conference paper** on a novel machine learning architecture was published at **IEEE ICMLA 2022**. The findings show that nested data collections can be disentangled with a suited network architecture, which can be used for a wide range of applications due to its flexibility.
- A **conference paper** on melanoma prognosis for metastasis was **accepted** for publication at **IEEE ISBI 2023**.
- Wrapping up a project on BCG treatment response of HR-NMIBC patients using WSI from the first TURBT. We hope to submit our work as a journal publication in the near future.



ESR6: Claudio Fernández - Universitat Politècnica de València: *“Significant feature extraction from WSI for diagnosis and prognosis of TNBC”*

- Presented his article “Challenging mitosis detection algorithms: Global labels allow centroid localization” in **IDEAL 2022** conference and received the **Best Paper Award** in November 2022.
- **Secondment at the University of Granada** from September to December 2022 at the Department of Computer Science and Artificial Intelligence of Professor Rafael Molina Soriano in Granada, Spain.
- **Submitted article** “Uninformed Student for distilling uncertainty in weakly supervised mitosis localization” to the Computer Methods and Programs in Biomedicine journal in March 2023.



ESR7: Laëtitia Launet - Universitat Politècnica de València: *“Deep learning for spitzoid melanocytic lesion (SML) characterization”*

- **Journal paper published** in January 2023 in Applied Sciences about the Notebook Federator approach for federated learning: [“Federating Medical Deep Learning Models from Private Jupyter Notebooks to Distributed Institutions”](#), in **collaboration with ESR2**.
- Focusing on analyzing the spitzoid tumors of uncertain malignant potential (STUMP) together with ESR12, aiming to help pathologists understand better this particularly challenging tumor type.
- Working on the extension of the **ICIP conference paper** (Oct. 2022) to integrate pathologists’ feedback into the workflow by using active learning methods.



ESR8: Arne Schmidt - Universidad de Granada: *“Probabilistic large scale crowdsourcing methods for histological image classification”*

- **Published paper** on probabilistic multiple instance learning in **IEEE TNMLS**. The proposed method is based on an attention mechanism with Gaussian Processes and provides the uncertainty of predictions.
- **Submitted an article** about active learning with Bayesian Neural Networks to the **journal Medical Image Analysis** in collaboration with the Northwestern University and Kitware Inc. The network acquires new informative samples while avoiding images with ambiguities or artifacts.
- **Submitted an article** about probabilistic crowdsourcing to **the ICCV conference**. The proposed Pionono (‘Probabilistic Inter-Observer and iNtra-Observer variation NetwOrk’) captures the different labeling behaviours of medical experts.

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ESR9: Zahra Tabatabaei - Tyris Software S.L.: *“Strategies for cloud-based histological image retrieval”*

- **Submitted a conference paper**, "Self-supervised learning of a tailored Convolutional Auto Encoder for histopathological prostate grading" at EUSIPCO 2023 .
- **Published a paper** "[Deep learning models in Whole Slide Imaging Melanocytic Tumors: A Systematic Review](#)" at Multidisciplinary Digital Publishing Institute (MDPI)
- Worked on the combination of Federated Learning with content-based medical image retrieval for histopathological images. The article is going to be submitted in the following month



ESR10: Farbod Khoraminia - Erasmus Medisch Centrum Rotterdam: *“Improving HR-NMBC diagnosis and prognosis by digital pathology”*

- **Reviewed additional samples** to further refine and clean up our dataset
- **Working with ESR4** to experiment with different setups, error analysis, hyperparameters, and algorithms to optimize clinical outcome prediction. Implementing clinical perspective to improve models.
- **Secondment at Tyris and INCLIVA**, where he has worked with ESR9, ESR11 and ESR12.



ESR11: Umay Kiraz - Helse Stavanger HF: *“Evaluation of TNBC for diagnostic and prognostic by digital pathology”*

- Completed annotations of interesting features in the WSIs of the TNBC dataset.
- **Focusing on more advanced molecular techniques** to get detailed information about tumor infiltration lymphocytes (TILs), and testing automated TILs quantification algorithms to her dataset, previously described.
- Finished **two secondments at Tyris software and INCLIVA**, where she learnt more about AI in digital pathology and dermatopathology.
- **Attended the Nordic Breast Cancer Symposium** in Denmark to meet other breast cancer researchers and share their experiences, **and the Norwegian National Network for Breast Cancer Research-Annual Workshop** in Trondheim, where she presented her study.



ESR12: Andrés Mosquera-Zamudio - Instituto de Investigación Sanitaria INCLIVA: *“Analysis of the implementation of AI algorithms in the evaluation of spitzoid melanocytic tumours for diagnosis and prognosis”*

- **Published paper** on Cancers (Q1) journal, [“Deep Learning for Skin Melanocytic Tumors in Whole-Slide Images: A Systematic Review”](#) along with ESR7 and ESR9.
- **New certification**: DEEP LEARNING APPLIED TO IMAGE AND SIGNAL ANALYSIS, from Universitat Politècnica de València (UPV).
- Completed a **secondment at Stavanger University Hospital** where I gained skills in molecular pathology and in the digital pathology workflow.

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What's happening?



3 conference papers



3 journal papers



3 local training activities



8 Secondments

• Scientific publications

CONFERENCE PAPERS

IDEAL 2022

Manchester, UK,
November 24-26, 2022

Intelligent Data Engineering and Automated Learning–IDEAL 2022: 23rd International Conference, IDEAL 2022. (November 2022)

Launet, L., Amor, R. D., Colomer, A., Mosquera-Zamudio, A., Moscardó, A., Monteagudo, C., Zhiming Zhao, Naranjo, V:

[Challenging Mitosis Detection Algorithms: Global Labels allow Centroid Localization](#)

IDEAL 2022

Manchester, UK,
November 24-26, 2022

Intelligent Data Engineering and Automated Learning–IDEAL 2022: 23rd International Conference, IDEAL 2022. (November 2022)

Ferández-Martín, C., Kiraz, U., Silva-Rodríguez, J., Morales, S., Janssen, E., Naranjo, V:

[Federating Unlabeled Samples: A Semi-supervised Collaborative Framework for Whole Slide Image Analysis](#)



21st IEEE International Conference on Machine Learning and Applications (ICMLA) (December 2022)

Saul Fuster, Trygve Eftestøl, Kjersti Engan:

[Nested Multiple Instance Learning with Attention Mechanisms](#)

JOURNAL PAPERS



NATIONAL INSTITUTES OF HEALTH: [Deep Learning for Skin Melanocytic Tumors in Whole-Slide Images: A Systematic Review.](#) (December 2022)

Mosquera-Zamudio, A., Launet, L., Tabatabaei, Z., Parra-Medina, R., Colomer, A., Oliver Moll, J., Monteagudo, C., Janssen, E., & Naranjo, V.

DOI: [10.3390/cancers15010042](https://doi.org/10.3390/cancers15010042)

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MDPI: Federating Medical Deep Learning Models from Private Jupyter Notebooks to Distributed Institutions. (January 2023)

Launet, L., Wang, Y., Colomer, A., Igual, J., Pulgarín-Ospina, C., Koulouzis, S., Bianchi, R., Mosquera-Zamudio, A., Monteagudo, C., Naranjo, V., & Zhao, Z.

DOI: [10.3390/app13020919](https://doi.org/10.3390/app13020919)



IEEE Transactions on Neural Networks and Learning Systems: Probabilistic Attention based on Gaussian Processes for Deep Multiple Instance Learning (February 2023)

A. Schmidt, P. Morales-Álvarez, and R. Molina

DOI: [10.1109/TNNLS.2023.3245329](https://doi.org/10.1109/TNNLS.2023.3245329)

• Events and training

LOCAL TRAINING ACTIVITIES

24-26 Nov 2022

IDEAL 2022

Manchester, UK,
November 24-26, 2022

IDEAL 2022: ESR6 and ESR7 presented their work in the 23rd International Conference on **Intelligent Data Engineering and Automated Learning** (IDEAL 2022). ESR7's article was **Federating Unlabeled Samples: A Semi-Supervised Collaborative framework for Whole Slide Image Analysis**". ESR6's article was titled **Challenging Mitosis Detection Algorithms: Global Labels allow Centroid Localization**", and he received award for the best paper.

13-16 Dec 2022



CLOUD COM 2022: ESR3 attended and gave two presentations in the 13th IEEE International Conference on Cloud Computing Technology and Science, which took place in Bangkok. The first one was entitled "Blockchain-based Cross-organizational Workflow Platform", and the second one under the title of "NFT as a proof of Digital Ownership-reward system integrated to a Secure Distributed Computing Blockchain Framework".

26-27 Jan 2023

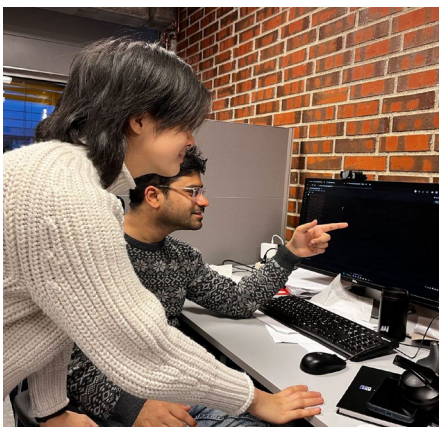
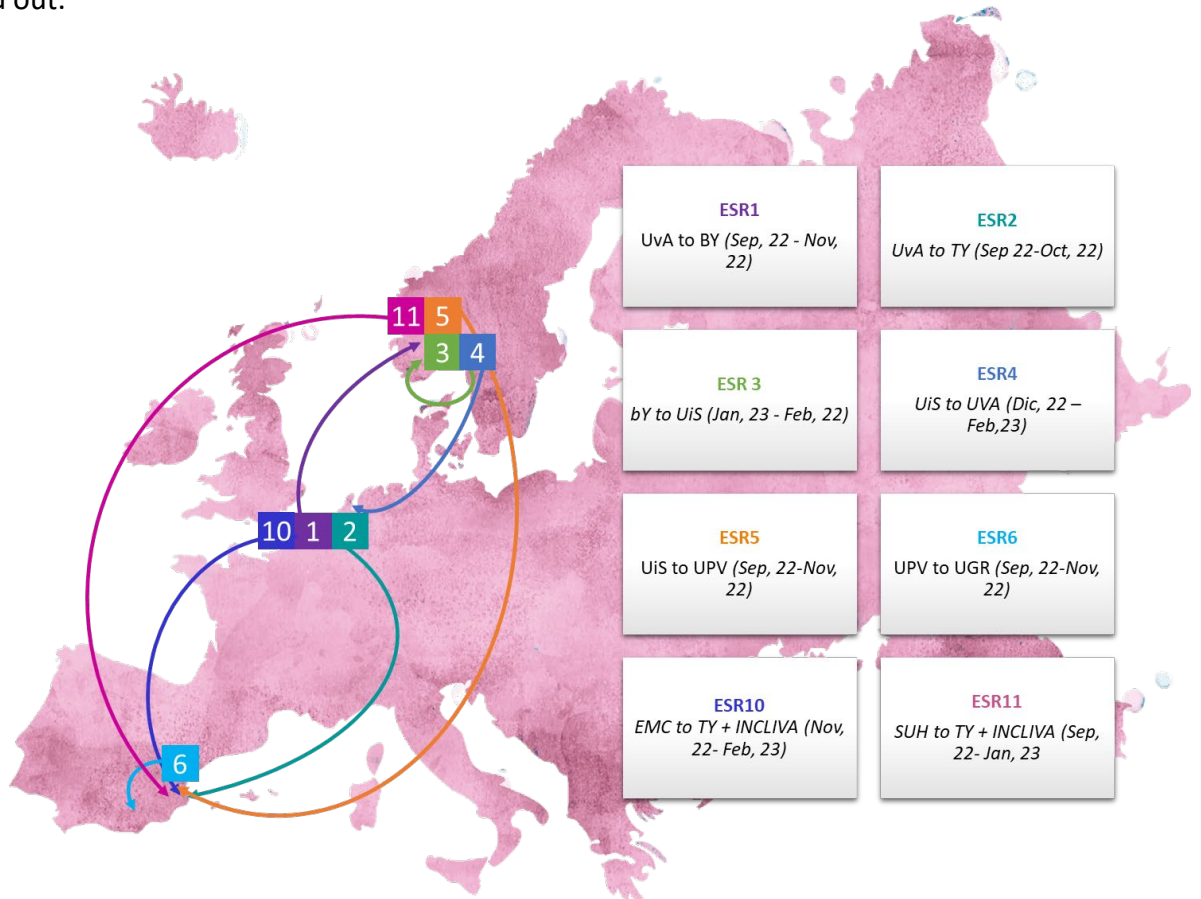


Nordic Breast Cancer Symposium: ESR11 attended the Nordic Breast Cancer Symposium in Denmark to meet other breast cancer researchers and share their experiences.

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- Secondments**

Since October, **8 of our 12 ESRs** have been in a secondment. In total, **8 secondments** have been carried out.



During ESR1 secondment, she experienced a relaxed atmosphere in the lab and observed that PhD students were supportive of each other. These time, ESR1 had the opportunity to engage with individuals from diverse backgrounds, including those working in medical image processing, natural language processing, and anomaly detection in the oil industry, which broadened my understanding of these fields and allowed her to gain valuable insights. Some talks were very informative and ESR1 received constructive suggestions from peer researchers. The lab's emphasis on collaboration and cooperation facilitated these interactions, and the PhD students' willingness to help each other facilitated a culture of openness and sharing of knowledge.

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Host Entity:
Tyris

Host Supervisors:
Javier Oliver

Period of secondment:
Sept- Oct 2022

ESR:
ESR2

In this secondment, ESR2 worked together with ESR9 and ESR11. She learned about content-based medical image retrieval, and shared ideas about distributed machine learning and federated learning that can handle decentralized data, speed up DL-based experiments like CBMIR, and reduce the burden of a single server.

ESR2 and ESR9 collaborated on Federated Content-Based Medical Image Retrieval, conducting extensive experiments on cloud infrastructure and clusters across different countries. Also, they deployed and trained FeCBMIR over GPU servers from Tyris Software (TY, Spain), the University of Amsterdam (UvA, The Netherlands), Universidad de Granada (UGR, Spain), and Universidad Politécnica de Valencia (UPV, Spain), which were working together with the cloud server. They get good results on FedCBMIR and conclude them in their manuscript.

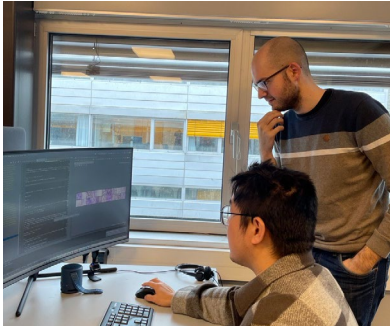


Host Entity:
University of Stavanger

Host Supervisors:
Kjersti Engan

Period of secondment:
Jan-Feb 2022

ESR:
ESR3



During his secondment at BMDLab in UiS, led by Kjersti, ESR3 learned to handle WSI of various cancers and explore medical AI, including multi-instance learning, weakly supervised learning, learning from noisy labels, and other methods. These experiences will help him better understand medical AI and design security and privacy protection solutions. Over the course of two months, ESR5 and ESR3 have been discussing how to design and improve experiments, and they are pleased to report that their experiments have achieved initial results.

Host Entity:
University of Amsterdam

Host Supervisor:
Zhiming Zhao

Period of secondment:
Dec 2022- Feb 2023

ESR:
ESR4

The last secondment of ESR4 took place at UvA and was about data sharing techniques, where he learned about implementing distributed computational services for medical image processing over the cloud. ESR4 collaborated with ESR2 to build a preprocessing service for histological artifacts over the public cloud resources to mitigate the challenges of computation, privacy, and data sharing.



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Host Entity:
University of
Valencia
(UPV)

Host Supervisor:
Valery Naranjo

Period of secondment:
September -
November 2022

ESR:
ESR5



During the secondment period at the CVB Lab, at UPV, ESR5 could benefit from further training in developing WSI analysis. CVB Lab has a lot of researchers working on the field of computational pathology, which have given me a lot of insight into frameworks, methodologies, pipelines, among others. Taking advice and guidance from others, ESR5 could develop and try different approaches for the BCG treatment application. This particular application has proven to be ambitious, and, even if the application is not ready yet, ESR5 progressed significantly while he was there.

Host Entity:
University of
Granada

Host Supervisor:
Rafael Molina

Period of secondment:
September -
November 2022

ESR:
ESR6

ESR6 completed his three-month Secondment at the 2022 at the Department of Computer Science and Artificial Intelligence of Professor Rafael Molina Soriano in Granada, Spain. Here, he learnt about Gaussian Processes and Probabilistic Attention Modelling from experts in the field such as Miguel López Pérez. Also, he started a collaboration with Arne Schmidt (ESR8) for predicting metastasis in the axillary lymph nodes using biopsy images from the main breast tumor leveraging the uncertainty in the predictions of the deep learning model.



Host Entity:
Tyrís

Host Supervisors:
Javier Oliver

*Period of
secondment:*
Nov-Dec
2022

ESR:
ESR10



During ESR10 secondment in Valencia, Javier Oliver taught him how to set up a startup, and with his guidance, ESR10 created a draft business plan for his own company. ESR9 taught him image analysis in Matlab, and ESR6 improved my coding and image analysis skills; He learned a lot from him. With ESR11, they reviewed 200 samples of HR-NMIBC, and together with ESR5, they cleaned up our dataset by removing inappropriate images and patients. This experience was invaluable, and ESR10 will be able to apply the knowledge and skills gained to future projects.

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Host Entity:
Tyris and
INCLIVA

Host Supervisors:
Javier Oliver and Carlos
Monteagudo

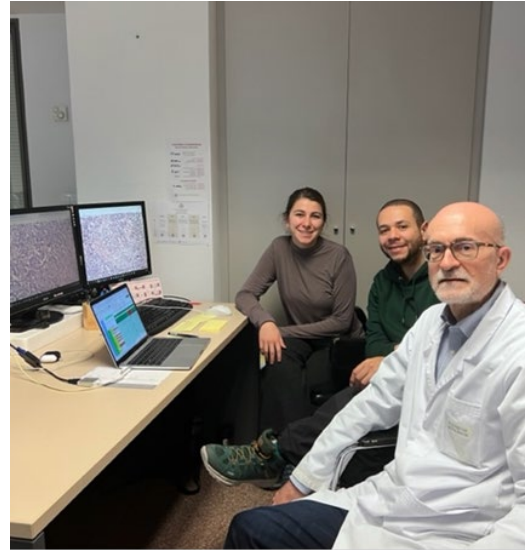
*Period of
secondment:*
Sept 2022-
Jan 2023

ESR:
ESR11

ESR11 carried out two secondments in Valencia. The first one was in Tyris Software, where she has the opportunity to know more about the scientific work of ESR9, who works on Content-Based Medical Image Retrieval (CBMIR). She collaborated with ESR9 by providing her pathological perspective and evaluating some patches from her dataset. It was a good chance to share their expertise in their fields and provide CBMIR relevant solutions in pathology practice.

The second secondment took place at INCLIVA, where she had a great opportunity to look at some WSI of Spitz tumors with Carlos Monteagudo and ESR12. This secondment allowed her to expand her knowledge of skin biopsies.

ESR11 highlights the most important aspect of these secondments as getting to know their CLARIFY colleagues better, because this facilitates the exchange of the knowledge and makes the project clearer



Upcomming events

3rd training school in Amsterdam!



The 3rd training school will take place in Amsterdam on 24-26 April, 2023. This training school will be mainly **focused on Data Management** but there will also be some transferrable skills activities and our ESRs will present their last achievements.

If you don't belong to the CLARIFY network but you are interested in Data Management and want to physically or remotely attend the first day of our training school, **register now by filling out [this form](#)**.



Registration is open until April, 10th!

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