

## Research Project

*Research Fellowship 2027 - Radiology Trainee Position*

**Name of Institution and department:** Institut Curie - Department of Medical Imaging

**Link to website:** <https://www.curie.fr>

**City and Country of Institution:** Paris, France

**Research framework:** EIC Pathfinder-funded ILC programme; ELBCC European consortium; host PI co-leader of the imaging working group

### RESEARCH GROUP

Institut Curie is the leading French comprehensive cancer centre and the leading European centre for breast cancer care. It brings together more than 2,405 collaborators across three hospital sites and cares for approximately 54,000 patients per year [1]. The Department of Medical Imaging is embedded within the Breast Oncology multidisciplinary pathway and provides a high-volume environment for clinical imaging research, radiology-pathology correlation, and evaluation of imaging innovations in women's oncology.

This fellowship will take place within the Department of Medical Imaging at Institut Curie, Paris, in close interaction with the Breast Oncology multidisciplinary team. The project will be conducted within the framework of an EIC Pathfinder-funded programme on invasive lobular carcinoma (ILC), with dedicated institutional resources for cohort constitution, data curation, imaging-pathology linkage, and dataset harmonisation. It will also be performed under the aegis of the European Lobular Breast Cancer Consortium (ELBCC), within which the host principal investigator is co-leader of the imaging working group. The project addresses a current limitation of AI-assisted mammography: performance is usually reported at the global screening-population level, whereas histology-specific data remain scarce. ILC is a relevant stress test for mammography AI because it may present as architectural distortion, asymmetry, subtle density, or no visible abnormality. Recent data remain limited. In the peer-reviewed literature, Arce et al. reported 80% sensitivity for an AI-CAD system in 153 biopsy-proven ILC lesions on digital mammography, with lower sensitivity for architectural distortion than for calcifications [2]. More recently, Lamb et al. presented a retrospective single-centre DBT study at the 2026 Society of Breast Imaging Symposium, including 239 ILC cases; adjunctive AI reached 89.3% sensitivity, compared with 82.1% for unassisted radiologists, correctly localised 88.6% of true-positive ILC cases, and detected 19 of 44 cases initially interpreted as negative [3]. These results are promising but derive from conference/news-release data and require independent validation.

### TITLE OF PROPOSED RESEARCH PROJECT

***Performance of Mammography AI in Invasive Lobular Carcinoma: Imaging Features, Histopathology, and Detection Errors***

### BRIEF DESCRIPTION OF THE PROJECT

Invasive lobular carcinoma is a frequent histological subtype of breast cancer with distinct radiological presentations and a risk of mammographic under-detection. Although AI tools are increasingly used in mammography screening, little is known about their performance in ILC and even less about the radiological and pathological characteristics of ILC cases flagged or missed by AI.

This 3-month fellowship will evaluate which ILC cases are detected by a mammography AI system and which are missed. The fellow will review a curated cohort of histologically confirmed ILC with available mammography and AI outputs. Each lesion will be classified as AI-detected or AI-missed according to spatial concordance between the AI mark, heatmap or suspicion score and the known tumour location. AI detection status will be compared with mammographic phenotype, breast density, MRI phenotype when available, and pathology data, including classic versus non-classic ILC and markers of biological aggressiveness.

## OBJECTIVES

The main objective is to identify radiological and histopathological factors associated with AI detection or failure in mammographic ILC.

- To curate a cohort of histologically confirmed ILC cases with available mammography and AI outputs.
- To classify each lesion as AI-detected or AI-missed using spatial concordance with the known tumour location.
- To compare mammographic features of AI-detected versus AI-missed ILC, including mass, architectural distortion, asymmetry, calcifications, lesion conspicuity and breast density.
- To explore whether AI detection status differs according to classic versus non-classic ILC and according to markers of biological aggressiveness, including grade, receptor status and Ki-67 when available.
- To develop a radiologist-led error taxonomy for AI failure in ILC, including no mark, low score, wrong location, wrong breast, and clinically misleading mark.
- To prepare a final ESOR report and a draft congress abstract or manuscript section.

## METHODS AND FEASIBILITY

This retrospective observational study will use a predefined institutional ILC cohort. The primary endpoint will be lesion-level AI detection status. AI-detected cases will be defined by a suspicious AI mark, heatmap or score spatially concordant with the tumour location; AI-missed cases will have no AI signal or a spatially discordant signal. Analyses will be descriptive and exploratory, with comparison of imaging and pathology features between AI-detected and AI-missed cases. The project is feasible because the EIC Pathfinder framework provides resources for case identification, data curation, and imaging-pathology linkage before the fellow's arrival.

## APPLICANT'S DUTIES

- Complete onboarding in data protection, breast imaging research methodology, mammography AI outputs and structured annotation.
- Screen the predefined ILC case list and verify the availability of mammography, AI outputs and reference clinical/pathology data.
- Perform structured mammographic review, including lesion visibility, lesion type, breast density, lesion size and localisation.
- Record AI detection status at lesion level, including AI mark/heatmap availability, spatial concordance, AI score category and false-positive marks when available.
- Review available MRI and ultrasound examinations when needed for lesion localisation and correlation with extent of disease.
- Extract or verify predefined pathology variables, including classic versus non-classic subtype, grade, receptor status, Ki-67, tumour size and nodal status.
- Participate in consensus sessions with a senior breast radiologist for ambiguous, subtle or discordant cases.
- Contribute to descriptive analysis, interpretation of AI failure categories, bias identification and preparation of the final report, abstract and/or manuscript draft.

## APPLICANT'S BENEFITS

- Practical training in histology-aware evaluation of AI-assisted breast imaging.
- Acquisition of skills in lesion-level performance assessment, spatial concordance, false-negative analysis and error taxonomy.
- Improved expertise in mammographic presentations of ILC and radiology-pathology correlation.
- Understanding of why global AI performance metrics may not reflect performance in clinically relevant tumour subgroups.
- Exposure to dataset curation, bias identification, interaction with data scientists and statisticians, and scientific writing.

- Integration into the ELBCC European consortium and the EIC Pathfinder ILC research programme, and opportunities for future scientific collaborations.

## PROJECT LEADER

**Project Leader:** Caroline MALHAIRE, MD, PhD, Department of Medical Imaging, Institut Curie, Research Center, Imaging, Innovative Radiotherapy, and Systems Medicine Laboratory (IRIS), INSERM, CNRS, U1353 / UMR 9029 Institut Curie; co-leader of the ELBCC Imaging Working Group]

**Members:** Senior breast radiologists, breast pathologist, data manager

## SELECTED REFERENCES

1. Institut Curie Press Office. Curie en bref. Institutional key facts. Accessed 2026.
2. Arce S, Vijay A, Yim E, Spiguel LR, Hanna M. Evaluation of an artificial intelligence system for detection of invasive lobular carcinoma on digital mammography. *Cureus*. 2023;15(5):e38770. doi:10.7759/cureus.38770.
3. Lamb LR, Kim H, Do S, Bahl M. Artificial intelligence for the detection of invasive lobular carcinoma on screening digital breast tomosynthesis. Oral presentation, Society of Breast Imaging Symposium, Seattle, April 2026. Summary reported by Applied Radiology, Diagnostic Imaging and Hologic.