



Subject: Internship Proposal

<i>ID</i>	PTI_EN_Giovanni Finocchio_20/07/2026 17.13.24
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Project Supervisor

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Project details

<i>Title</i>	Privacy-Preserving Skin Cancer Detection
<i>Detailed description:</i> Skin cancer is among the most common forms of cancer worldwide, and early diagnosis significantly increases the effectiveness of treatment and patient survival rates. Recent advances in Artificial Intelligence, particularly Deep Learning, have demonstrated remarkable performance in the automatic classification and detection of skin lesions from dermoscopic and clinical images. However, the development of accurate and robust AI models typically requires access to large volumes of medical data collected from different hospitals and healthcare institutions. Such data are often subject to strict privacy regulations and cannot be easily shared across organizations. This internship aims to investigate the application of AI techniques to skin cancer detection and classification. The student will explore state-of-the-art deep learning architectures for medical image analysis and evaluate federated approaches for training models across decentralized datasets. Particular attention will be devoted to differential privacy, privacy-preserving machine learning, model performance, communication efficiency, and robustness in realistic healthcare scenarios. The internship has an exploratory and research-oriented nature, with a focus on the implementation, evaluation, and comparison of centralized and federated learning approaches for skin lesion classification and will be performed in collaboration with the group of dermatology of University of Messina. The activity will provide the student with experience at the intersection of Artificial Intelligence, medical image analysis, healthcare technologies, and distributed machine learning. The main objective of this internship is to support the development and evaluation of AI methods for privacy-preserving skin cancer detection. The work may include one or more of the following activities: (i) Literature review on Artificial Intelligence for skin cancer detection, medical image analysis, privacy-preserving machine learning, and Federated Learning frameworks. (ii) Study of publicly available skin lesion datasets and analysis of challenges related to data heterogeneity, class imbalance, and dataset bias.	

- (iii) Implementation of baseline deep learning models for skin lesion classification using modern architectures such as Convolutional Neural Networks (CNNs) and Vision Transformers.
- (iv) Development and implementation of different workflows using suitable software frameworks, enabling distributed training across multiple simulated healthcare institutions.
- (v) Investigation of privacy-preserving techniques, including secure aggregation, differential privacy, and communication-efficient learning strategies.
- (vi) Experimental evaluation and benchmarking of federated and centralized approaches, comparing metrics such as classification accuracy, sensitivity, specificity, F1-score, communication overhead, and computational requirements.
- (vii) Preparation of visual summaries, performance tables, and technical documentation describing methodologies, implementations, and obtained results.
- (viii) Participation in discussions with academic supervisors to refine experimental methodologies, interpret outcomes, and identify future research directions in AI-assisted healthcare technologies.

<i>Duration (month – max 12)</i>	4
<i>Duration (hours)</i>	150
<i>Open positions</i>	1

Internship Skills

Technical requirements: Basic knowledge of machine learning and Artificial Intelligence. Basic programming skills in Python. Knowledge of deep learning frameworks such as PyTorch or TensorFlow is desirable. Interest in medical image analysis, healthcare technologies, and distributed AI systems.

<i>Other skills</i>	Good analytical and problem-solving abilities. Good written communication skills in English. Interest in medical applications of Artificial Intelligence. Ability to work independently and document technical activities clearly. Interest in research activities involving privacy-preserving and trustworthy AI systems.
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