Università degli Studi di Messina, Italia
Dipartimento di scienze matematiche e informatiche,
scienze fisiche e scienze della terra

Soggetto: proposta di tirocinio

ID	PTI_Ravi Daniele_14/10/2024 12.56.17
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Supervisore del progetto

Cognome	Ravi
Nome	Daniele
Dipartimento	MIFT
Laboratorio	MIFT
E-mail	dravi@unime.it
Numero di telefono	

Co-Supervisore del progetto

Cognome	
Nome	
Posizione	
Dipartimento	

Laboratorio	
E-mail	
Numero di telefono	

Dettagli de progetto

Titolo	Application of Deep Learning Techniques and Hyperspectral Imaging for Tissue Classification in the Medical Field

Descrizione dettagliata: 1. Context and Motivation:
In recent years, the field of medical imaging has undergone significant evolution thanks to the integration of advanced artificial intelligence (AI) and deep learning techniques. These technologies offer new tools to improve diagnostic accuracy and support medical professionals, particularly in critical areas such as early cancer diagnosis.

Hyperspectral imaging (HSI), a technique that captures images across an extended electromagnetic spectrum, represents a promising innovation in medical imaging. Unlike traditional techniques like dermoscopy or tomography, HSI provides detailed spectroscopic information that can reveal differences in tissues that are difficult to identify with conventional methods. When integrated with deep learning algorithms, the potential to identify and classify malignant tissue types (e.g., melanoma) compared to benign ones increases significantly.

However, research in this field is still in its early stages, particularly in terms of developing new hyperspectral imaging cameras and optimizing neural networks to process the large amounts of data generated by these technologies.

2. Internship Objectives:
The objective of this project is to develop a deep learning-based system for the automatic classification of tissues or materials, leveraging a state-of-the-art hyperspectral camera available in our laboratory.

The goals may include one or more of the following tasks:

State-of-the-art analysis: Study the existing technologies in AI-based medical imaging and hyperspectral imaging, and evaluate the performance of current algorithms for tissue or

material classification.
Dataset development: Use the new hyperspectral camera to collect a dataset of images.
AI modeling: Develop and optimize deep learning algorithms, such as convolutional neural networks (CNN) or other advanced architectures (e.g., Vision Transformers), to classify hyperspectral images.
Model evaluation: Compare the performance of the developed model with traditional classification methods and evaluate the system's accuracy, precision, and sensitivity in classifying different tissue types.
3. Project Evaluation:
The success of the project will be assessed through the completion of one or more of the following tasks:

Dataset quality: The quantity and quality of the collected images and their proper annotation.
Model performance: The accuracy and robustness of the AI model in correctly classifying tissue types.
Technological innovation: The integration and effectiveness of using the new hyperspectral camera, demonstrating improvement over existing diagnostic methods.
Practical impact: The potential clinical application of the proposed system, measured through feedback from the involved medical professionals and the ease of use of the software prototype.

Durata (mesi – max 12)	<<Durata in mesi>>
Durata (ore)	<<Durata in ore>>
Numero di posizioni aperte	2

Internship Skills

Requisiti tecnici: algorithms and programming

Altri requisiti	