

SII/PJI/2019-00414 AISEEME (2020-2022)

*Aiding diagnosis by self-supervised deep learning from unlabeled
medical imaging*

D5 v1

Results Report

Video Processing and Understanding Lab

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Supported by

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HISTORY

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1. Introduction

This *report* summarizes the results obtained within the AISEEME project. The results and deliverables referenced here are available in the project website (<http://www-vpu.eps.uam.es/projects/aiseeme/>).

2. Publications

2.1. Journals

2.2. Book Chapters

2.3. Conferences

2.4. PhD Thesis

2.5. Master Thesis

2.6. Graduate Thesis

- [1] Aprendizaje auto supervisado para reconocimiento de objetos, Alejandro Camacho Valladares (advisor: Marcos Escudero Viñolo), Trabajo Fin de Grado (Graduate Thesis), Grado en Ingeniería de Tecnologías y Servicios de Telecomunicación, Univ. Autónoma de Madrid, Jun. 2020.
- [2] Detección precoz de cáncer de piel en imágenes basado en redes convolucionales, Francisco Javier Martín Ameneiro (advisor: Juan Carlos San Miguel Avedillo), Trabajo Fin de Grado (Graduate Thesis), Grado en Ingeniería de Tecnologías y Servicios de Telecomunicación, Univ. Autónoma de Madrid, Jun. 2020.
- [3] Análisis de la evolución, en número y tamaño, de lesiones de piel en zonas amplias del cuerpo, Juan Antonio Álvarez Castillo (advisor: Jesús Bescós Cano), Trabajo Fin de Grado (Graduate Thesis), Grado en Ingeniería de Tecnologías y Servicios de Telecomunicación, Univ. Autónoma de Madrid, Jun. 2020.
- [4] Detección de lesiones cutáneas en imágenes basado en redes generativas adversarias, Nicolás Alexander Wolyniec Rojas, (advisor: Juan Carlos San Miguel Avedillo), Trabajo Fin de Grado (Graduate Thesis), Grado en Ingeniería Informática, Univ. Autónoma de Madrid, Jul. 2020.

3. Project Documents

3.1. Published Deliverables

3.1.1. D1.1 “System Infrastructure” (version 1: Jan 2021)

This deliverable describes the activities related to the maintenance and update of the data processing infrastructure available at VPULab for the development of the tasks within the AISEEME project.

3.1.2. D1.2 “Evaluation datasets” (Jan. 2021)

This deliverable describes the work related to task T.1.2 “Collection and generation of datasets”: the aim of this task is to support to other tasks by generating train and test data and associated evaluation methodologies. It includes the selection of appropriate datasets (images and associated ground-truth) and their generation if required.

4. Main Achievements of the Project

4.1. Main achievements during months 1 to 12

4.1.1. WP1: Infrastructure and datasets

- T1.1: Infrastructure update and maintenance (Deliverable D1.1)
 - Acquisition and configuration of new hardware for GPU-based processing of visual data
- T1.2: Collection and generation of datasets (Deliverable D1.2)
 - Collection of generic wide-range and narrow-domain image classification datasets
 - Collection of skin lesion and lung malignancy assessment datasets
 - Collection of additional X-Ray and COVID-19 datasets
 - Post-processing of three-dimensional lung CT scans

4.1.2. WP2: Enabling technologies

- T2.1: Self-supervised frameworks and pretext tasks (Deliverable D2)
 - Set up of an open-source self-supervised learning framework
 - Initial analysis of self-supervised model representations for an automatic definition of a pretext task curriculum
- T2.2: Skin lesion assessment (Deliverable D2)
 - Evaluation of state-of-the-art methods on the ISIC-17 and ISIC-19 skin lesion datasets
- T2.3: Lung nodule malignancy evaluation (Deliverable D2)
 - Preliminary evaluation of suitable reference benchmarks

4.1.3. WP3: Curriculum-based multi-task self-supervised learning

- T3.1: Empirical definition and completion of a pretext task curriculum (Deliverable D3)
 - Exploratory experiments on the transferability of features learned by SSL methods to different image datasets
- T3.2: Evaluation of the impact of the architecture and training schedule (Deliverable D3)
 - Preliminary experiments on the effect dataset size and CNN extraction layer
- T3.3: Self-paced multi-task self-supervision (Deliverable D3)
 - No relevant activity on this task during this period

4.1.4. WP4: Use cases in medical imaging

- T4.1: Multi-task SSL approaches for skin lesion assessment (Deliverable D4)
 - No relevant activity on this task during this period
- T4.2: Multi-task SSL approaches for lung nodule malignancy detection (Deliverable D4)
 - No relevant activity on this task during this period

4.1.5. WP5: Management and dissemination

- T5.1: Management
 - Relevant workplan and budget adjustments performed due to the COVID-19 pandemic
 - Ethical committee approval for a collaborative project with Puerta de Hierro hospital
- T5.2: Dissemination
 - Publication of four Bachelor Thesis.