

AJEY PAI KARKALA

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EDUCATION

The University of Amsterdam

September 2021 - Present

Amsterdam, the Netherlands

PhD Candidate

ICAI - AI for Oncology Lab

Researching risk of recurrence in breast and ovarian cancers by applying deep representation learning on histopathology images.

Indian Institute of Technology Delhi

July 2019 - August 2021

New Delhi, India

Master of Science through Research

GPA: 9.0/10.0

Department of Electrical Engineering

Major in deep learning for computer vision.

Nitte University, Karnataka

July 2014 - July 2018

Udupi, India

Bachelor of Engineering

GPA: 8.03/10.0

Department of Electronics and Communications Engineering

Major in signal processing, information theory, digital communication systems.

EXPERIENCE

The Netherlands Cancer Institute

September 2021 - Present

PhD Candidate

- Currently, my research is on developing deep-learning models to validate clinical hypotheses in breast and ovarian cancer histopathology. I work in collaboration with pathologists to design algorithms.

IIT-Delhi

December 2018 - August 2022

Project Associate/MS Research Scholar

- My research was on the automatic detection of clinically relevant regions in the histological images of the human duodenum using self-supervised learning methods. For this, our team has developed a novel dataset in collaboration with AIIMS, New Delhi.

Rayreach Technologies

November 2020 - March 2021

Consultant (computer vision)

- Created deep learning models to identify personal protective equipment and face masks worn by workers on factory floors.

Skandray Healthcare

August 2018 - November 2018

R&D Engineer

- Designed hardware and firmware for power delivery, sensory acquisition and pneumatic actuation for a turbine-based critical care ventilator.

ACADEMIC PUBLICATIONS

A shoe-mounted infrared sensor-based instrumentation for locomotion identification using machine learning methods

Published by Elsevier Measurement 2021

Read the paper [here](#).

- Designed a 1-D CNN for terrain classification using foot-to-ground-angle signals captured by a novel wearable instrument. A new scheme to extract features from time-series was proposed using the histogram of oriented gradients. The study will help in development of low cost intelligent lower-limb prosthetic for trans-femoral amputees.

CONFERENCES

Reliable comparisons between AI models and human experts in computational pathology

Oral presentation at the European conference on Digital Pathology (2024), Lithuania.

While concordance statistics measure AI-human agreement levels, it is hard to determine if AI outperforms human scoring due to ambiguous labels. In this work, we compare human experts and an AI model in extracting a prognostic biomarker from routine H&E-stained whole slide images (WSIs) of early stage triple-negative breast cancer resections from across 33 cancer centers in the Netherlands. We make recommendations for developing AI models that can be routinely deployed in clinics.

OPEN SOURCE SOFTWARES

itsper - Intra Tumoral Stroma Percentage Computer

Python library

Itsper is a simple command line utility which can be used to compute the intra-tumoral stroma percentage (ITSP) biomarker from tissue segmentations of histopathological tumor lesions. This biomarker is known to be an independent prognosticator in several cancer types. I developed it at the AI for Oncology lab.

ahcore - AI for Oncology Core for Computational Pathology

Python library

Ahcore are the AI for Oncology core components for computational pathology. It provides a set of tools for working with pathology images and annotations. It also offers standard computational pathology algorithms. I am one of the lead developers contributing to this project.

dlup - Deep Learning Utilities for Pathology

Python library

Dlup offers a set of utilities to ease the process of running deep learning algorithms on whole slide images. I am one of the lead developers contributing to this project.

OTHER PROJECTS AND SKILLS

A new self-supervised method for learning anatomical shapes and H&E stains in biopsy images of different tissues using targeted super-pixel inpainting and elastic deformation.

Individual project

competencies: Python, Tensorflow, Keras

- An encoder-decoder pair is trained to reconstruct an image deformed and masked using a novel pre-text task. The model learns representations for shapes and H&E color stain distributions of different important tissues in a biopsy image. Find the code [here](#).

Genomic Sequence Analysis using Support Vector Machines

Individual project

competencies: Python, numpy, sklearn

- A python implementation to classify ncRNA strands using different Support Vector Machines and interpret their behaviour with different regularisation parameters and sigma values. Find the code [here](#).

Adaptive background mixture models for real-time tracking

Team project, lead coder.

competencies: Python, numpy, opencv

- An exact, non-vectorized re-implementation of the Stauffer-Grimson adaptive background subtraction algorithm for videos. Idea is reproduced from the original [paper](#). Find the code [here](#).

Eigenfaces and Fisherfaces

Team project, lead coder.

competencies: Python, numpy, opencv

- A python implementation to understand using PCA to understand unsupervised classification and Fischer Linear Discriminant Analysis to perform supervised classification. Find the code [here](#).

Histogram of Oriented Gradients for time series classification

Team project, lead coder.

competencies: Python

- Novel implementation of the Histogram of Oriented Gradients (HOG) for Time Series classification. This is our published idea which is used to extract HOG features from a temporal signal measuring foot-to-ground angle while walking for terrain classification. Find the code [here](#).

ACHIEVEMENTS

Formally inducted into the Sakura Science Club in December 2017 by the Japan Science and Technology Agency (JST).

Licensed HAM radio user in India (restricted grade).

Self-published a poetry book titled “Wild Flowers”. It was unveiled to the public by Mr.Amish Tripathi in February 2019.

Co-founded [Lokagatha](#). It is a portal dedicated to disseminating traditional lores, philosophy and history of the Hindu culture.