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 in 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 breast 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.

Skanray 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.

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 pretext 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.