

26<sup>th</sup> September 2024



# Discover the applied research of five groups of the **Xarxa RDI-IA!**

**Bhalaji Nagarajan**  
**Postdoctoral Investigator**



**AIBA**  
*Artificial Intelligence and  
Biomedical Applications*



UNIVERSITAT DE  
BARCELONA



# Artificial Intelligence and Bio-Medical Applications (AIBA)

## SGR Consolidated Research Group



- ❖ Advanced ML/DL & CV algorithms focusing on Data-Centric Deep Learning, Probabilistic modeling, Generative AI, Explainable AI
- ❖ Challenges of Visual Food Analysis, 3D Reconstruction, Volume Estimation, Medical Imaging and NeuroComputing
- ❖ Our portfolio contains >60 research projects, >50 technology transfers, 25 international patents and 2 spin-offs



AIBA is a **“consolidated research group”** formed by 8 Doctors (Full professors, Associate professors and Assistant professors) in Computer Science and more than 30 PhD students

**Group Headed by: Prof. Petia Radeva, University of Barcelona**

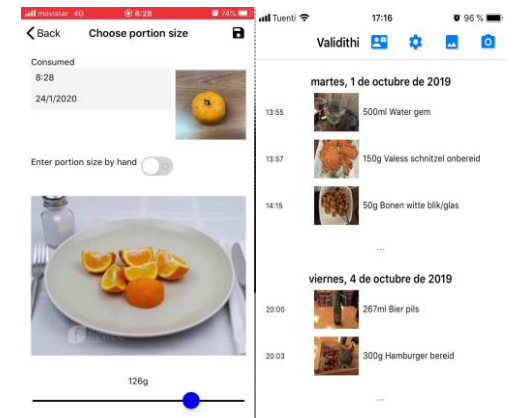


# Project 1: Data-Centric Food Analysis

- ❖ Harnessing innovative Deep Learning algorithms and advanced data management for Food Recognition
- ❖ Addressing challenges in large-scale food data – learning with noisy labels, self-supervised learning
- ❖ Developing data curation pipeline and efficient deep learning methods to leverage large volumes of non-annotated images
- ❖ Developing deep learning algorithms tackling specific challenges in food recognition, detection and segmentation
- ❖ Model behaviour understanding through uncertainty modelling and quantification



NESTOR



TRL: 8



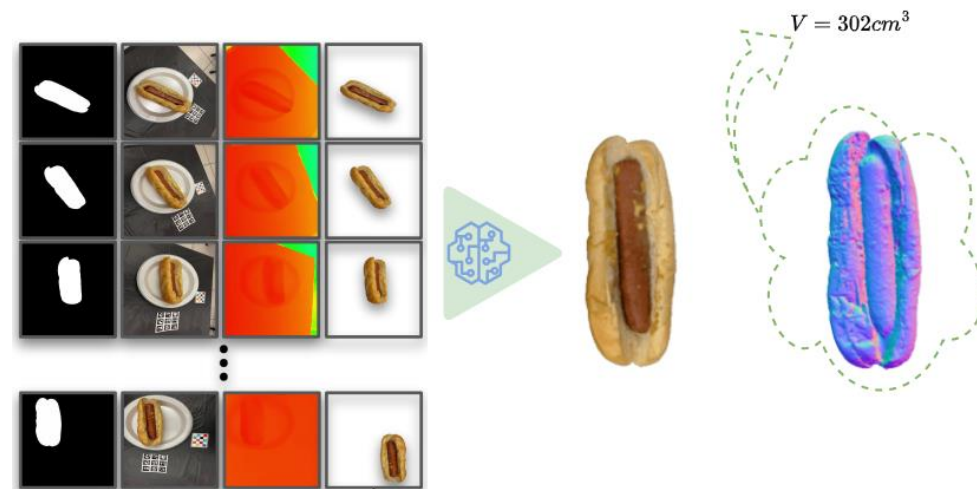
# Project 2: 3D Reconstruction & Volume Estimation

## Food Volume Estimation

- ❖ Generating 3D models and accurately estimating object volumes from sparse or dense unbounded scenes.

## Neural Radiance Fields

- ❖ Synthesizing novel views of complex scenes by optimizing an underlying continuous volumetric scene function using a sparse set of input views.
- ❖ One/few shot learning framework: Input is a single continuous 5D coordinate (spatial location  $(x, y, z)$  and viewing direction  $(\theta, \varphi)$ ) and whose output is the volume density and view-dependent emitted radiance at that spatial location



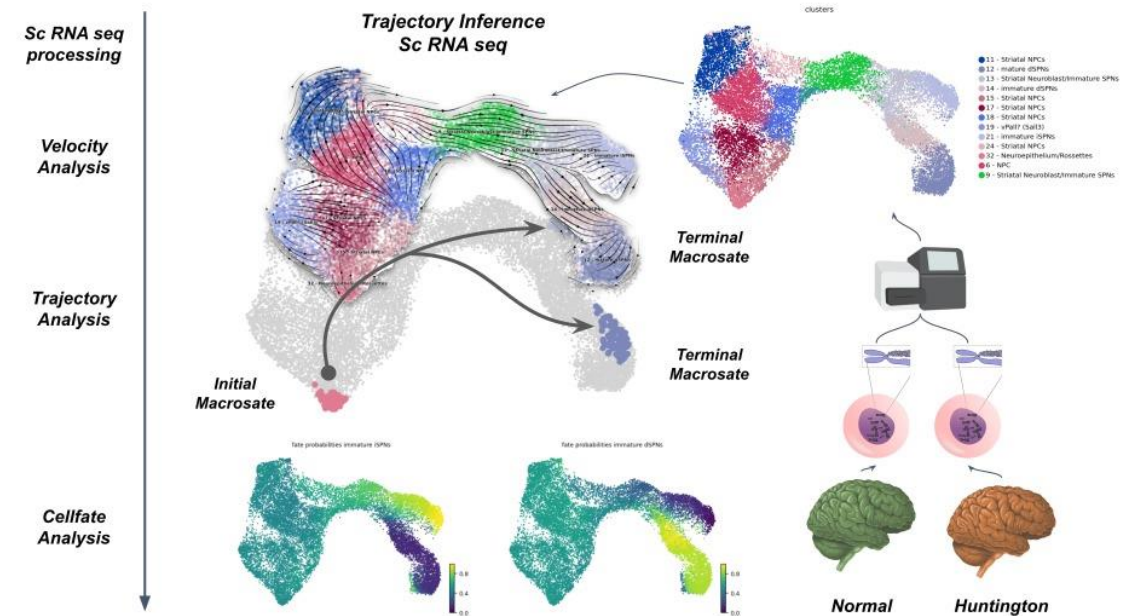
Physically Informed 3D Food Reconstruction Challenge  
**Winners**

**TRL: 6**



# Project 3: Machine Learning for Single-Cell Analysis

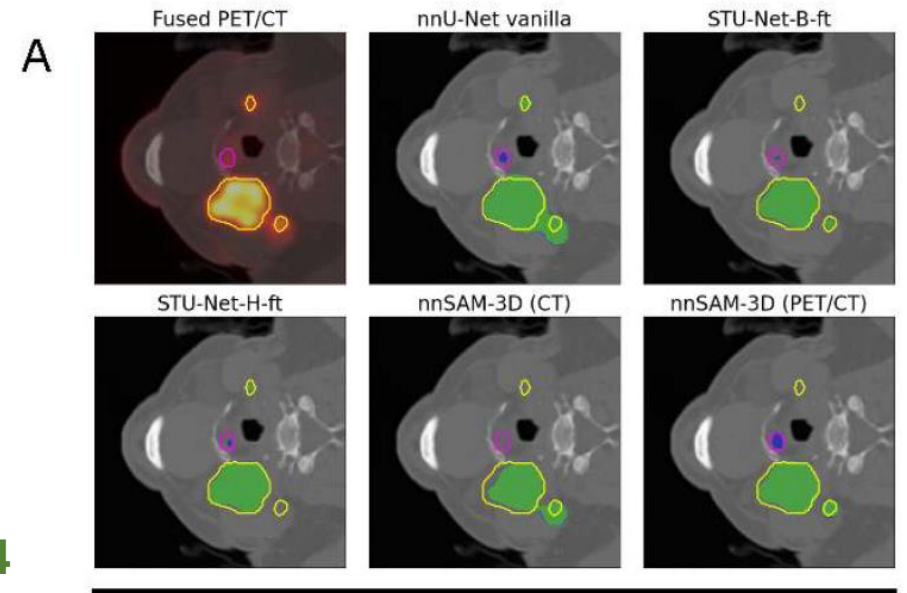
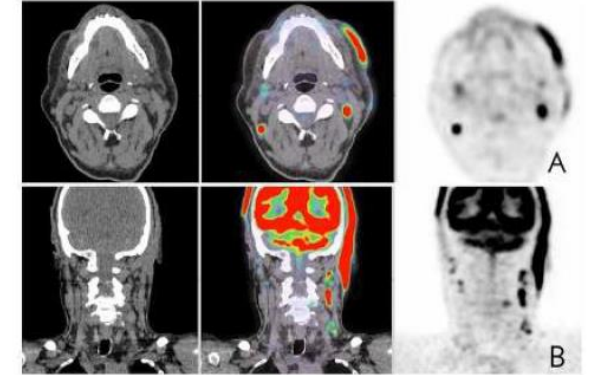
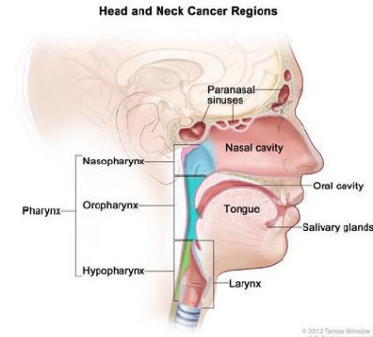
- ❖ Diagnosing cells of Huntington's disease and halting their evolution through In vivo reprogramming
- ❖ Reverting HD damage by tuning affected neural progenitor cells (NPCs)
- ❖ Single-cell analysis and cell tracking
- ❖ Gene-expression Analysis
- ❖ Trajectory Analysis





# Project 4: Head and Neck Tumors

- ❖ Deep learning solutions for Oropharyngeal cancer
- ❖ Role of Human Papilloma Virus (HPV) infection in HNSCC
- ❖ Developing deep learning models addressing the challenges in Detection of HPV positive OPSCC.
- ❖ Developing multimodal segmentation solutions using CT and PET Imaging



TRL: 4



# Project 5: MUSAE

- ❖ MUSAE: a human-centred factory for a future technological sustainable development (EU project)
- ❖ The project aims to set up the MUSAE Factory Model and include it in a network of (E)DIHs, establishing a deep connection with the S+T+Arts (Science + Technology + Arts) ecosystem
- ❖ Application of AI to Nutrition and Arts: by collaborating Artists and Tech providers

TRL: 3



**S + T + ARTS**  
SCIENCE + TECHNOLOGY + ARTS





# Project 6: Modelling the behaviour of gas sensors by Deep learning (DeepSens)

- ❖ Using deep learning to solve challenges in measurement technology
- ❖ Modelling the behaviour and calibration of gas sensors based on Deep learning (DeepSens)
- ❖ Predictive modelling
- ❖ Machine learning algorithms for Gas sensor calibration



TRL: 5







# Project 7: Robo STEAM- Inclusive Technologies

- ❖ Robo STEAM is an Erasmus+ Project, EU's programme to support education, training, youth and sport in Europe
- ❖ The project develops remote robotic application called S(T)reamIT
- ❖ The platform is aimed to help schoolteachers and students with remote access to Museums and life distance interaction with experts through Museum administrators



TRL: 6



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