



## DEVELOPMENT OF NOVEL DATA PROCESSING SYSTEMS FOR IMAGE ANALYSIS TO PREDICT PATHOLOGY STAGING IN EXPERIMENTAL MODELS OF PARKINSON'S DISEASE

*PhD Candidate:* Gaia Faustini

*Email:* [g.faustini004@unibs.it](mailto:g.faustini004@unibs.it)

**XXXII Cycle**

*Tutor:* Prof. Alessandra Valerio

Prof. Arianna Bellucci



### Background

Parkinson's disease is a movement disorder characterized by the degeneration of dopaminergic neurons of the nigrostriatal system. The available diagnostic methods do not allow to identify the pathology in the prodromal stage of the disease as motor symptoms appear when dopaminergic terminals are almost completely lost.

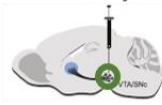
### Objectives

The aim of this project is to develop novel neuroimaging algorithms that recognizes very early neurodegenerative changes in experimental models of PD in order to identify possible therapeutic-responsive windows for intervention in the early phases of the disease.

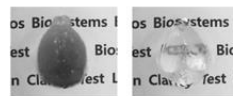
### Methodologies

The whole nigrostriatal system will be visualized by the injection of an adeno-associated vector overexpressing the green fluorescent (AAV-GFP) protein in the Substantia nigra of wild type and PD animal models (transgenic mice) (a). Tissue clearing will be performed using the X-Clarity system (b). Two-photon microscopy technique will be used to identify dopaminergic neurons in whole mouse brains (c). Minimal changes in the structural organization of striatal dopaminergic fibers will be identified by developing new algorithms (d).

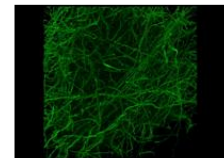
#### a. AAV-GFP injection



#### b. Tissue clearing



#### c. Two-photon acquisition



#### d. Algorithm development

FIGURE 1. NIGROSTRIATAL INJECTION (A), CLARIFICATION PROCESS (B), MULTI-PHOTON ACQUISITION (C) AND ALGORITHM DEVELOPMENT (D)

### Expected Results and Impact

The development of these novel-imaging methods to single out early structural changes along PD development will open new perspectives to improve our basic understanding of disease pathophysiology, and hopefully diagnosis, through the establishment of novel comparative human brain imaging studies.