



## Masters 2 internship in AI and Systems Biology



**Dates:** April 2025–October 2025 (can be flexible)

**Company or University + lab:** IBENS (CNRS UMR8197, Inserm U1024) and INSERM PARCC (UMR U970)

**Address:** Institut de Biologie de l'Ecole Normale Supérieure, 46, rue d'Ulm, 75005 Paris– France

**Supervisor (to be contacted for applying):** REDA Clémence, CNRS research associate, [reda@ens.psl.eu](mailto:reda@ens.psl.eu), <https://clreda.github.io>

**Co-supervisor :** Dr Olivia Lenoir, group leader at Inserm PARCC

**Internship title:** Analysis of biological pathway networks using artificial intelligence to better understand focal segmental glomerulosclerosis

**Keywords:** Graph embedding learning, Network analysis, Systems biology, Focal segmental glomerulosclerosis, Pathway identification and enrichment

**Internship description :** Focal segmental glomerulosclerosis (FSGS) is a rare kidney disease characterized by partial and localized lesions of the glomeruli, the filtering structures of the kidney. Recent research highlights the dual role of two glomerular cells, parietal epithelial cells (PECs), and their interaction with podocytes as a central factor in fibrosis. Despite its low prevalence (7 cases per million per year), FSG places a disproportionate burden on healthcare systems, contributing to early dialysis needs and high recurrence rates after transplantation. Furthermore, 40–50% of patients do not respond to current treatments. Renal lesions due to FSGS, caused by various etiologies, lead to clinical and histological presentations that are difficult to deconvolute. Obtaining a mechanistic model of FSGS progression involving the activation of PECs in relation to podocytes would be an important step towards better identifying the causes of FSGS and its therapeutic management. Approaches based on regulatory network analysis are therefore interesting because they highlight the role played by entire functional pathways and not just potentially isolated groups of genes. Furthermore, artificial intelligence allows the analysis of even large networks across multiple biological pathways to answer mechanistic questions about the disease.

The Master 2 internship focuses on two objectives: (A) the construction, AI-guided refinement and validation of a podocyte and PEC regulatory network model specific to FSGS, based on transcriptional data provided by Inserm PARCC; (B) AI-based network analysis, first to identify genes and biological pathways central to the etiologies, and then to explain the recurrence or remission of FSGS after kidney transplantation based on transcriptional data. The applicant will have the opportunity to gain a high level of competence in artificial intelligence applied to systems biology and healthcare.

**Salary or allowance:** gratification

### Profile

- M2 Computer Science Student in AI or Bioinformatics Student with a strong background in AI
- Proficiency in R and Python with Shell usage
- Good knowledge of high throughput sequencing data, systems biology and/or ML and AI libraries (Pytorch, scikit-learn) is a plus
- Willingness to work in an interdisciplinary environment
- Organizational skills and autonomy

### How to apply?

Interested candidates should apply either in English or French to [reda@ens.psl.eu](mailto:reda@ens.psl.eu) and [olivia.lenoir@inserm.fr](mailto:olivia.lenoir@inserm.fr) with a detailed CV and a motivation letter. The desired starting date is anytime between February and April 2025, for six months.