# Internship position

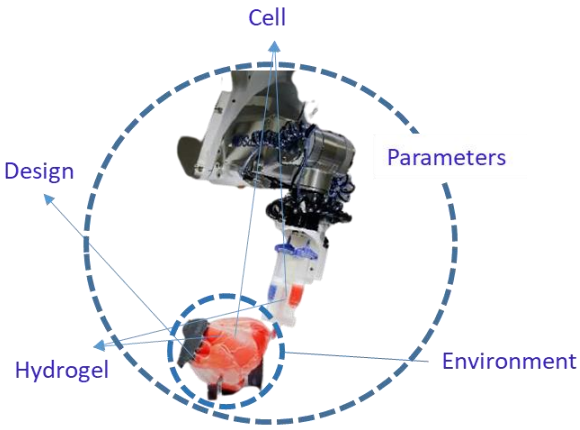
# Building a high-quality dataset for bioprinting

**Platform description**:

3d.FAB is the only French "Plateforme Technologique Innovante" dedicated to academic and private innovation through additive manufacturing and bioprinting, in the field of health. We have two main areas of expertise:

- For biochemistry, especially diagnosis with prototyping 3D lab-on-chip, novel materials for 3D medical devices, biocompatible polymers and cell-size 3D printing.
- For regenerative medicine through dedicated living cells and tissues printers.

**Internship context, objective and activities:** The internship activities are involved in an interdisciplinary project combining material sciences, biology, fluid mechanics, simulation and deep learning, to push forward of bioprinting of cellularized scaffolfds. Bioprintability is a theoretical concept. It provides the basis to produce cellularized scaffolds that will become living tissues or organs [1]. Modelling it with a scientific law has been difficult so far because current approaches use a partial description of bioprintability limited to only two cornerstones (Hydrogel and Parameters).




Current datasets are not high-quality because they are partial and based on non-standardized procedures. A public bioprinting dataset is available with +800 references [2]. This dataset suffers from a lack of standardization of analysis procedures and complete description of the five bioprinting cornerstones (Hydrogel, Design, Cell, Parameters and Environment) because characterization methods differ and some data feature are missing (Cell and Environment), leading to poor-quality dataset. It allows scientific community to easily access references but it does not allow us to identify the physical relations responsible for the bioprintability. It is necessary to create a new dataset integrating five bioprinting cornerstones. The standardization of characterization and bioprinting protocols is the key success of the high-quality dataset [3]. The project will establish standardized protocols that will significantly improve the quality of current databases. Then we will investigate the missing cornerstones, especially environment, where 3d.FAB platform is pioneer, through the development of freeform 3D printing in gel [4] or powder bath [5]. We will establish experiments protocols for biological, rheological and bioprinting methods using high-performance and common equipment such as rotational rheometer, flow cytometer or bioprinter positioned in sterile environment.

The internship activities will be focus on the full bioprinting chain-value (*i.e.* cell culture, biofabrication by using extrusion-based bioprinting, mechanical and structural characterization) within interdisciplinary team working on artificial intelligence.

The candidate will work in an excellence and international academic research environment with industrial partners.

**Expected candidate profile:** Engineer with a strong knowledge in cell biology, cell culture, bioprocess and mechanic.

**Location:** The activity will be located on the innovative 3D.FAB platform: Axel'One Campus (University Claude Bernard Lyon 1, Villeurbanne, France).

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**Degree:** Engineer/Master (BAC +5) - **Type of contract:** Internship - **Start:** Q1-2023 - **Duration:** 5 or 6 months

**End date of application:** According to recruitment **- How to apply:** Send *CV* and cover letter to Edwin-Joffrey Courtial (edwin.courtial@univ-lyon1.fr).

*References: [1] A. S. Theus et al., "Bioprintability: Physiomechanical and Biological Requirements of Materials for 3D Bioprinting Processes," Polymers , vol. 12, no. 10. 2020, doi: 10.3390/polym12102262. [2] "3D Printing Database | Center for Engineering Complex Tissues." https://cect.umd.edu/3d-printing-database (accessed Jan. 13, 2022). [3] J. An, C. K. Chua, and V. Mironov, "Application of Machine Learning in 3D Bioprinting: Focus on Development of Big Data and Digital Twin.," Int. J. bioprinting, vol. 7, no. 1, p. 342, 2021, doi: 10.18063/ijb.v7i1.342. [4] A. Colly, C. Marquette, and E.-J. Courtial, "Poloxamer/Poly(ethylene glycol) Self-Healing Hydrogel for High-Precision Freeform Reversible Embedding of Suspended Hydrogel," Langmuir, vol. 37, no. 14, pp. 4154–4162, Apr. 2021, doi: 10.1021/acs.langmuir.1c00018. [5] E.-J. Courtial, A. Colly, C. Marquette, Dynamic Molding: Additive manufacturing in partially ordered system, Addit. Manuf. 51 (2022) 102598. doi: https://doi.org/10.1016/j.addma.2022.102598..*