Marcelo HURTADO

B.eng. BIOENGINEERING

PhD student *in COMPUTATIONAL BIOLOGY & BIOINFORMATICS*

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marcelo-hurtado

mhurtado13

EDUCATION

Oct 2023

PhD student ③ ④ ⑤
- Paul Sabatier University, Toulouse, France
- Cancer Research Center of Toulouse (CRCT)
- **Team:** NetB(IO)^2 | **Supervisor:** Vera Pancaldi
- **Project:** Reinforcement learning approaches to control the tumor microenvironment

Current achievements:
- Develop a multiscale ABM of NLC-CLL differentiation using the **Physicell** software (Github repository).
- Develop a **Python** and **Bash** pipeline for Physicell model exploration (including parameter exploration, sensitivity analysis and genetic algorithms) for running in **HPC arquitectures** (Github repository).
- Apply basic reinforcement learning algorithms into the NLC-CLL model to evaluate cancer cell concentration
- Develop an advanced machine learning framework in **R** to extract clinically relevant features from bulk RNAseq data (**pipeML**)

Jan 2017
Dec 2023

B.Sc Bioengineering - **Mention in Biotechnology**
- Universidad de Ingenieria y Tecnologia UTEC Lima, Peru.
- **Courses:** Synthetic Biology, Biomedical signals, Medical robotics, bioprocesses, biofluids mechanics.

Aug 2021
Dec 2021

Exchange Program | Biotechnology and Biomedical Engineering
- Instituto de Estudios Superiores Tecnologicos de Monterrey - Monterrey, Mexico.
- **Courses:** Genetic engineering, neuroengineering, biomedical imaging

RESEARCH EXPERIENCE

Apr 2023
Oct 2023

Bioinformatics Engineer | Cancer Research Center of Toulouse (CRCT)
- **Team:** NetB(IO)^2 | **Principal Investigator:** Vera Pancaldi
- **Tasks:** Analisis of transcriptomics data to evaluate patient profiles of early and late stage NSCLC patients.
- **Achievements:** Develop a novel framework for characterizing TME patient profiles by constructing transcriptional regulatory networks (TRNs) based on inferred transcription factor (TF) activity and cell type deconvolution from bulk RNA-seq data (**CellTFusion**).

Hurtado M et al. (2024). Transcriptomics profiling of the non-small cell lung cancer microenvironment across disease stages reveals dual immune cell-type behaviors. Front. Immunol. 15:1394965. doi: 10.3389/fimmu.2024.1394965

Jan 2022
March 2022

Aug 2022
Feb 2023

Intern of Bioinformatics | Cancer Research Center of Toulouse (CRCT) ⑥ ⑦
- **Team:** NetB(IO)^2 | **Principal Investigator:** Vera Pancaldi
- **Tasks:** Analysis of tumor cell composition on NSCLC patients using computational tools based on transcriptomics data.
- **Achievements:** Develop of an algorithm that integrates a combination of multiple first or second-generation deconvolution methods and several cell type signatures to ensure robust and accurate profiling of cell composition starting from bulk RNAseq data (**multideconv**).

Jan 2021
Aug 2021

Research Assistant | Universidad de Ingenieria y Tecnologia UTEC Lima, Peru.
- **Department:** Bioengineer Department | **Supervisor:** Dr. Alberto Donayre
- **Tasks:** Design of a bioactive polymer based on self-assembling and antimicrobial peptides for wound applications.
- **Achievements:** Propose a genetic cassette for the production of self-assembling peptides with antimicrobial properties via the implementation of genetic engineering techniques and cloning methods (**Gibson assembly**, **restriction enzymes**, **golden gate**).

⭐ *Awards and achievements*

AWARDS AND ACHIEVEMENTS

1. Prix de la Fondation Silab Jean Paufique
2. Best poster presentation award
3. Campus France – France Excellence Eiffel PhD scholarship
4. Toulouse Foundation Cancer Sante – PhD scholarship
5. CARe Graduate School Univ. Paul Sabatier – Doctoral School Fellowship
6. CARe Graduate School Univ. Paul Sabatier – M2 internship fellowship
7. Research for Peruvian Undergraduates (REPU) program – International stage fellowship
8. iGEM Design League – Gold medal
9. iGEM Design League – Best Human Practices
10. iGEM Design League – Best aligned with Sustainable Development Goals (SGD)

POSTERS AND ORAL PRESENTATIONS

05/02/2025
07/02/2025

"CellTFusion: Transcriptional regulatory networks unravel cell states from immune cell type deconvolution and uncovers cell niches predictive of cancer progression"
Toulouse Oncoweek 2025 – Toulouse, France.

07/11/2024

"CellTFusion: Transcriptional regulatory networks unravel cell states from immune cell type deconvolution and uncovers cell niches predictive of cancer progression"
Journee Bioinfo/Biostat GenoToul – Toulouse, France.

29/06/2024
05/07/2024

"Transcriptional regulatory networks unravel cell states from immune cell type deconvolution and uncovers cell niches predictive of cancer progression"
14th Summer School On Medicines (SSM14)
Ribeirão Preto Medical School – University Of São Paulo, Brazil.

26/11/2023
01/12/2023

"Transcriptional regulatory networks unravel cell states from immune cell type deconvolution and uncovers cell niches predictive of cancer progression"
EMBO Workshop | Computational models of life: From molecular biology to digital twins
Sant Feliu de Guíxols, Spain.

22/11/2023
24/11/2023

"Transcriptional regulatory networks unravel cell states from immune cell type deconvolution and uncovers cell niches predictive of cancer progression"
19th Annual Meeting of the Canceropole GSO – Arcachon, France. (2)

05/10/2023

"Multi-omics Profiling of the Non-Small Cell Lung Cancer (NSCLC) microenvironment across disease stages and gender"
First Young Scientist Cancer Congress (YS2C) – Toulouse, France.

25/09/2023
29/09/2023

"Transcriptional regulatory networks unravel cell states from immune cell type deconvolution and uncovers cell niches predictive of cancer progression"
Institut Curie | Computational Systems Biology of Cancer 6th edition – Paris, France.

09/05/2023
11/05/2023

"Profiling of the Non-Small Cell Lung Cancer (NSCLC) microenvironment across disease stages"
EACR Defence is the Best Attack: Immuno-Oncology Breakthroughs – Barcelona, Spain.

25/01/2023
26/01/2023

"Profiling of the Non-Small Cell Lung Cancer (NSCLC) microenvironment Across disease stages"
The Festival of Genomics & Biodata – London, UK.

30/11/2022
02/12/2022

"Multi-omics Profiling of the Non-Small Cell Lung Cancer (NSCLC) microenvironment across disease stages and gender"
18èmes Journées du Cancéropôle GSO – La Grande Motte, France

Awards and achievements

COURSES AND WORKSHOPS

02/12/2024 06/12/2024	**Health Data Challenge 2024: Multimodal data integration to quantify tumor heterogeneity in cancer research.** Aussois, France.
29/06/2024 05/07/2024	**14th Summer school on medicines.** University of Sao Paulo, Ribeirao Preto Medical School.
21/04/2024 26/04/2024	**Computational Systems Biology for Complex Human Disease: from static to dynamic representations of disease mechanisms.** Wellcome Genome Campus, Hinxton, United Kingdom.
26/11/2023 01/12/2023	**EMBO Workshop. Computational models of life: From molecular biology to digital twins.** Sant Feliu de Guíxols, Spain.
25/09/2023 29/08/2023	**6th course on Computational Systems Biology of Cancer: models of data, data for models.** Institut Curie, Paris, France.
06/08/2023 12/08/2023	**2023 PhysiCell Hackathon and Workshop.** Indiana University USA (Online).
15/07/2023 11/08/2023	**Bioinformatics data science with Python.** Decode Life (Online).
11/02/2023 07/03/2023	**Cancer Genomics and Bioinformatics.** Decode Life (Online).
16/08/2021 27/08/2021	**Biomedical signal processing.** Instituto Tecnológico de Buenos Aires (ITBA) (Online).

SOFTWARE DEVELOPMENT

- **_multideconv:_** R pipeline for cell type deconvolution from bulk RNAseq using first and second generation methods.
- **_pipeML:_** A robust R machine learning pipeline for classification tasks and survival analysis.
- **_CellTFusion:_** R package for the integration of immune-cell type deconvolution features and prior-knowledge networks of TFs-gene interactions to characterize potential cell states of the tumor microenvironment using bulk RNAseq data.

LEADERSHIP & OUTREACH

Team leader – iGEM Desing League 2021 Synthetic Biology competition. ⭐8 ⭐9 ⭐10

Project _LECCHAIN:_ Improving vaccine thermal tolerance and stability of SARS-CoV-2 antigen using plant lectins.

Press release:
- Centro Bio
- Press coverage
- Peru21
- ElComercio

Team leader – Synthetic biology group 2020 | Universidad de Ingenieria y Tecnologia UTEC Lima, Peru.

MENTORING

Assistant Professor – Computation and Informatics Tools in Bioinformatics.
CINVESTAV – IPN (Online).

REFERENCES

Dr. Vera **PANCALDI**
Principal Investigator (NetBIO)
Cancer Research Center of Toulouse
vera.pancaldi@inserm.fr

Dr. Leila **KHAJAVI**
Bioinformatics Department, Evotec.
Toulouse, France.
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Dr. Alfredo **CARDENAS-RIVERA**
Bioengineering Department
Northeastern University, Boston-USA
a.cardenas-rivera@northeastern.edu

⭐ *Awards and achievements*