

## CORE SKILLS

**Machine Learning & AI:** Deep Learning (PyTorch, TensorFlow), Foundational Deep Learning Concepts, **LLMs & AI Agents (Development, Deployment, RAG)**, Prompt Engineering, Hyperparameter Optimization, Regression Analysis. **Computational Biology & Drug Discovery:** Therapeutic Target Identification, Biomarker Discovery, **Single-Cell & Spatial Transcriptomics/Proteomics**, Bulk RNA-Seq, Cancer Genomics (Myeloma, AML), **Immunology**, Gene Regulatory Networks, Pathway Analysis. **Technical Skills:** Python (including **package development**), R, Linux/Shell Scripting,, Docker, Git, High-Performance Computing (HPC), Cloud Platforms (GCP, AWS).

## WORK EXPERIENCE

### University of Galway

Galway, Ireland

*PhD, Genomics Data Science*

09, 2021 – Now

- Developed novel computational methods for identifying **cell-based therapeutic targets** in hematological malignancies using single-cell genomics data.
- **AI agents** leveraging LLMs:
  - Retrieval-Augmented Generation (**RAG**) for **automated literature review** and Q&A based on PubMed Central open access papers.
  - **Complex SQL database querying**, automated analysis (**GroundSearch**), and result **visualization**.
- Built scalable Nextflow pipelines incorporating **Genetic Algorithms for target gene prioritization**, enhancing **drug discovery** workflows.
- Researched and **implemented Neural Network** architectures for effective batch correction in **highly heterogeneous scRNA-Seq datasets**, including hyperparameter optimization.
- Supervised more than 70 students, deployed AWS servers to ensure access to data science platforms.
- **Engaged in daily collaboration with physicians, biologists, and engineers..**

### Broad Institute of MIT and Harvard/Dana Farber Cancer Institute

Boston, MA

*Visiting Researcher, Medical Oncology*

02, 2024 – Now

- **Trained XGBoost Deep Learning classifiers** for cell type annotation with an **accuracy over 96%**.
- Led **spatial proteomics** development of **2D and 3D models** in collaboration with **Standard Biotoools**.
- **Algorithm design** for the identification of spatial signatures for **CAR-T patient stratification** (patent in progress).
- Pioneered the first **spatial transcriptomics benchmark** of bone marrow biopsies.
- **Reduced computational times and costs up to 90%** for 3D image modelling through **GPU acceleration**.
- Performed **Cloud-based analysis on GCP** of large-scale **UKBB pilot scRNA-Seq** analysis of 400 samples.
- Collaborated with **clinicians, researchers and computational biologists**.

### University of Bern - Universität Bern

Bern, Switzerland

*Visiting Researcher*

01, 2025 – 02, 2025

- Researched **spatial proteomics and transcriptomics** integration with **AI**.
- Processed and performed QC on **scRNA-Seq long-read** sequencing data.

### CloudCix

Cork, Ireland

*Tester*

2023

- Diagnosed the performance of a **proof of concept for a new GPU cloud server**.
- Evaluated training of neural networks using the **NVIDIA CUDA Toolkit** on CPU vs GPU.

### Marche Polytechnic University

Ancona, Italy

*Research assistant, Immunology*

07, 2019 – 09, 2021

- **Counseled physicians** giving genetic advice to improve personalized treatments.
- **Evaluated the neoplastic risk** on a cohort of 67 immunodeficient patients.
- Created and curated databases of **> 100 patients' data**.

### Queen's University Belfast

Belfast, UK

*Intern*

02, 2020 – 08, 2020

- Automated and ran **virtual screenings of > 500 small molecules**.
- Created **protein-protein interaction network from genetic data**.
- Ran **molecular dynamics** simulation for lead stability analysis.

## EDUCATION

### University of Galway

Galway, Ireland

*PhD, Genomics Data Science*

09, 2021 – 06, 2025

Computational methods for therapeutic target identification in hematological malignancies

### Marche Polytechnic University

Ancona, Italy

*Master's Degree, Molecular and Applied Biology*

Grade: 110L/100

2018 – 2021

## CERTIFICATIONS

Google, <i>GenAI Intensive Course</i> ,	04-2025
NVIDIA, <i>Fundamentals of Deep Learning</i> ,	10-2024
NVIDIA, <i>Building Transformer-based NLP Applications</i> ,	11-2024
University of Galway, <i>Project management in the Real World</i> ,	11-2024
CITI, <i>Good Clinical Practice for Clinical Research</i> ,	02-2024
CITI, <i>Human research</i> ,	02-2024
University of Pavia, <i>Intensive School for Advanced Graduate Studies Machine Learning</i> ,	09-2020

## AWARDS

Thomas Crawford Hayes Travel Fund winner, €2300.

Longhack & VitaDAO 2023 hackathon Winning team, Team Leader, €1000 + 1000 VITA-Coin

## LANGUAGES

Language: English (C1), Italian (Native), Spanish (B2), French (A1)

## PUBLICATIONS

- [1] Verga, Jacopo U. and Konishi, Yoshinobu and Cordas Dos Santos, David M. et al. “Bone Marrow Spatial Signatures Predict Survival Outcomes and Toxicities after CAR-T Therapy in Patients with Relapsed/Refractory Multiple Myeloma”. In: *Cancer Cell* - submitted (2025).
- [2] Yoshinobu Konishi et al. “Bone Marrow Spatial Signatures Predict Survival Outcomes and Toxicities after CAR-T Therapy in Patients with Relapsed/Refractory Multiple Myeloma”. In: *Blood* 144.Supplement 1 (Nov. 2024), pp. 590–590. ISSN: 1528-0020. DOI: 10.1182/blood-2024-204144. URL: <http://dx.doi.org/10.1182/blood-2024-204144>.
- [3] Verga, Jacopo U et al. “NK Cell States in Multiple Myeloma: Pathways to Novel Immunotherapies”. In: *Blood* 144.Supplement 1 (Nov. 2024), pp. 6857–6857. ISSN: 1528-0020. DOI: 10.1182/blood-2024-210297. URL: <http://dx.doi.org/10.1182/blood-2024-210297>.
- [4] David Cordas dos Santos et al. “P-203 Ability To Perform Spatial Transcriptomics in FFPE Decalcified Bone Marrow Samples of Patients With Precursor Myeloma”. In: *Clinical Lymphoma Myeloma and Leukemia* 24 (Sept. 2024), S154–S155. ISSN: 2152-2650. DOI: 10.1016/s2152-2650(24)02106-2. URL: [http://dx.doi.org/10.1016/s2152-2650\(24\)02106-2](http://dx.doi.org/10.1016/s2152-2650(24)02106-2).
- [5] Verga, Jacopo U et al. “Genomic technology advances and the promise for precision medicine”. In: *Therapeutic Drug Monitoring*. Elsevier, 2024, pp. 355–371. ISBN: 9780443186493. DOI: 10.1016/b978-0-443-18649-3.00007-0. URL: <http://dx.doi.org/10.1016/b978-0-443-18649-3.00007-0>.
- [6] Verga, Jacopo U et al. “A Systems Biology Approach Reveals the Endocrine Disrupting Potential of Aflatoxin B1”. In: *Exposure and Health* 16.2 (May 2023), pp. 321–340. ISSN: 2451-9685. DOI: 10.1007/s12403-023-00557-w. URL: <http://dx.doi.org/10.1007/s12403-023-00557-w>.
- [7] Zachary Boswell et al. “In-Silico Approaches for the Screening and Discovery of Broad-Spectrum Marine Natural Product Antiviral Agents Against Coronaviruses”. In: *Infection and Drug Resistance* Volume 16 (Apr. 2023), pp. 2321–2338. ISSN: 1178-6973. DOI: 10.2147/idr.s395203. URL: <http://dx.doi.org/10.2147/idr.s395203>.
- [8] Maria Giovanna Danieli et al. “Common Variable Immunodeficiency in Elderly Patients: A Long-Term Clinical Experience”. In: *Biomedicines* 10.3 (Mar. 2022), p. 635. ISSN: 2227-9059. DOI: 10.3390/biomedicines10030635. URL: <http://dx.doi.org/10.3390/biomedicines10030635>.
- [9] Verga, Jacopo U et al. “Integrated Genomic and Bioinformatics Approaches to Identify Molecular Links between Endocrine Disruptors and Adverse Outcomes”. In: *International Journal of Environmental Research and Public Health* 19.1 (Jan. 2022), p. 574. ISSN: 1660-4601. DOI: 10.3390/ijerph19010574. URL: <http://dx.doi.org/10.3390/ijerph19010574>.
- [10] George S. Hanna et al. “Contemporary Approaches to the Discovery and Development of Broad-Spectrum Natural Product Prototypes for the Control of Coronaviruses”. In: *Journal of Natural Products* 84.11 (Oct. 2021), pp. 3001–3007. ISSN: 1520-6025. DOI: 10.1021/acs.jnatprod.1c00625. URL: <http://dx.doi.org/10.1021/acs.jnatprod.1c00625>.
- [11] Veronica Pedini et al. “Incidence of malignancy in patients with common variable immunodeficiency according to therapeutic delay: an Italian retrospective, monocentric cohort study”. In: *Allergy, Asthma & Clinical Immunology* 16.1 (June 2020). ISSN: 1710-1492. DOI: 10.1186/s13223-020-00451-z. URL: <http://dx.doi.org/10.1186/s13223-020-00451-z>.
- [12] Maria Giovanna Danieli et al. “A Case of CVID-Associated Inflammatory Bowel Disease with CTLA-4 Mutation Treated with Abatacept”. In: *Archives of Clinical and Medical Case Reports* 03.06 (2019). ISSN: 2575-9655. DOI: 10.26502/acmcr.96550124. URL: <http://dx.doi.org/10.26502/acmcr.96550124>.