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## Accenture – Personalised Medicine for Cancer Using an Integration of Machine Learning Models and Systems Biology Classic Mechanistic Models

TIN-ACC-028

### About the Organisation

Accenture Labs BioInnovation is Accenture's dedicated arm of research and development on Bioinformatics and Artificial Intelligence for healthcare and life sciences. We offer a blend of industry and academic research activities, including an open publication policy and contribution to the open-source community. All are supported by our Accenture Labs network of applied R&D specialists at seven sites worldwide.

### Role Description and Responsibilities

**Analysis Methods:** Biodata, Multi-Omics Data, Bioinformatics, Deep Learning.

**Data Source:** Publicly available data sets. Internal private data sets.

**Expected Outcomes:** The research intern will work with Bioinformatic and AI

researchers to determine the most important signalling pathways in a particular cancer and investigate which features (genes and proteins) in this pathway are i) prognostic, ii) most critical (predictive) for the associated signalling pathway, overall aiding to the area of biomarker and drug discovery.

**Expected Deliverable:** Prototype and a publication submission to a major academic conference.

**Broader Objectives:** Design and apply machine learning/bioinformatics to generate and provide a comprehensive list of prognostic features, genes, and proteins (potential biomarkers) crucial for the formation/function associated to critical signal transduction networks across a common cancer. Such features may help to identify potential drug targets at a faster rate than simply using mechanistic systems biology.

### Internship Description:

Biomarkers are foundations of clinical and personalised medicine; despite being vital tools in the area of clinical diagnostics, many are based on single timepoint measurements and lack the dynamic information that is needed to follow diseases and therapy [1,3]. Recent studies demonstrate that using mechanistic information in combination with machine learning can

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identify novel features (genes and proteins), i.e., potential biomarkers that are important for explaining the signal transduction network heterogeneity between patients and their association to clinical outcomes (survival and response to therapy) [1,2]. Thus, a hybrid machine learning and systems biology approach can enhance future biological predictability.

The research intern will:

1. Determine what signalling pathways are of importance in a particular cancer.
2. Perform bioinformatic techniques on transcriptomic / proteomic data to determine what genes in such patients are important for patient survival or relapse. (Determine the association between signal transduction network pathway activity and patient survival).
3. Design, implement and evaluate a range of robust machine learning models based on; (1) the gene-set of a state-of-the-art mechanistic model in the literature, (2) novel genes identified, and (3) novel proteins identified.
4. Generate a comprehensive list of prognostic features (potential biomarkers) crucial for the formation of a critical signal transduction network in cancer.
5. Use in house dataset of 54M patients to determine if there is a correlation between discovered comprehensive list and clinical attributes available.

***NOTE: The research intern can choose a specific cancer to focus on (preferable associated to their PhD) or can work alongside Bioinformatic researcher at Accenture Labs Dublin to determine what cancer to focus on.***

[1] Nwaokorie, A.; Fey, D. Personalised Medicine for Colorectal Cancer Using Mechanism-Based Machine Learning Models. *Int. J. Mol. Sci.* 2021, 22, 9970.

<https://doi.org/10.3390/ijms22189970>

[2] Hock Chuan Yeo, Kumar Selvarajoo, Machine learning alternative to systems biology should not solely depend on data, *Briefings in Bioinformatics*, Volume 23, Issue 6, November 2022, bbac436, <https://doi.org/10.1093/bib/bbac436>

[3] Kolch, W.; Fey, D. Personalized computational models as biomarkers. *J. Pers.*

*Med.* **2017**, 7, 9. <https://www.mdpi.com/2075-4426/7/3/9>

### Supervision and Mentorship

On-site supervision by Annabelle Nwaokorie and other members of the research team in Accenture Labs Dublin will be provided.

### Person Specification

The ideal candidate will possess:

- PhD in Bioinformatics, Computational Biology, Cancer Research, Molecular Biology or related Life Sciences fields

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- Expertise in \*at least one\* of these areas: System Biology, Human Genomics, Biomedical Informatics, Cancer Research, Transcriptomics, Single-Cell analysis, Pharmacogenomics, Large Scale Proteomics, Gene Therapy or Genome Editing
- Familiarity with publicly available multi-omics datasets (genomic, transcriptomic, proteomic, and other biological datasets) and multi-modal clinical data sources (real world data)
- Solid expertise in computational analysis of whole genome and whole exome sequencing data
- Familiarity with mainstream machine learning methods
- Previous hands-on experience with either drug discovery and development or genomic medicine projects
- Ability to work creatively and analytically in a problem-solving environment
- Excellent verbal and written communication in English
- Eagerness to contribute to a team-oriented and diverse environment

### Optional

- Track record of publications in academic journals.
- Previous exposure to \*at least one\* of these areas: Large Language Models (LLMs), Machine Learning for Knowledge Graphs (e.g. Graph Neural Networks), Interpretable and Trustworthy AI.

### Internship Logistics

This internship will be based in Accenture, Dublin - The Dock, 7 Hanover Quay. Please note that it is **not** possible for this internship to be performed remotely and it requires relocation to Dublin, Ireland.

**Start Date:** May 2024 (negotiable)

**Duration:** 6 months

**Salary:** €40k per annum pro rata

***This is a full-time position, and we regret that we are unable to consider part-time applications.***

When applying for this role, please include your resume.