Academic Supervisor Looking for an Industry Partner: Machine Learning-Guided Design of Biodegradable Nanocarriers for Safe-and-Sustainable Drug Delivery

Area of Science: Chemical Sciences (Drug Delivery, Materials Chemistry)

Pharmaceutical formulation remains a major bottleneck in drug development, relying heavily on trial-and-error approaches that increase costs, extend timelines, and lead to inefficient use of materials. In parallel, non-biodegradable delivery systems contribute to persistent pharmaceutical residues and increasing regulatory pressure.

This project develops a predictive modelling framework for efficient design of biodegradable drug delivery systems. By combining computational modelling and machine learning, the approach predicts drug loading, release behaviour, and stability, reducing reliance on experimental screening.

The framework enables rapid identification of high-performance nanocarrier systems, with an initial focus on polymer-based delivery systems for poorly soluble drugs, a key industry challenge. An iterative learning strategy will continuously improve prediction accuracy and expand the design space efficiently.

The project adopts a safe-and-sustainable-by-design approach, integrating biodegradability, reduced dosage requirements, and minimised experimental resource use. This supports reduction of pharmaceutical pollution and aligns with emerging regulatory and sustainability frameworks.

Expected outcomes include a predictive design tool, identification of high-performance biodegradable systems, and reduced development time and material consumption. The project provides industry-relevant insights into more efficient and environmentally responsible drug delivery design.

An industry mentor will provide advisory input on application relevance and translation pathways through periodic discussions, with no requirement for proprietary data sharing.

Contact

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