ELEGANCE: machinE LEarning for inteGrated multi-parAmetric eNzyme and bioproCess dEsign

DC1: Machine learning-guided multiparametric optimisation of cytochrome P450 monooxygenase

Organization
Denmark's technical university (DTU) provides world-class expertise in technical and life sciences and is ranked on Reuters "Top 100 World's most Innovative Universities" as number 65 (worldwide), 14 (Europe) and 1 (Nordic region). In 2023, DTU was named best technical university in Europe by the new EngiRank list which ranks 225 technical universities in 27 EU countries. The ranking is based on recognized EU data sources such as CORDIS and Erasmus+ as well as publication and citation statistics based on the Scopus database, and patent statistics from the European Patent Office. In 2022, DTU ranked 3rd place in biotechnology among world leading universities (Shanghai ranking). DTU is acknowledged as the best teaching institution in Denmark by students. DTU develops technology for people. With our international elite research and study programmes, we are helping to create a better world and to solve the global challenges formulated in the UN's 17 Sustainable Development Goals. Hans Christian Ørsted founded DTU in 1829 with a clear mission to develop and create value using science and engineering to benefit society. That mission lives on today. DTU has 13,500 students and 6,000 employees. We work in an international atmosphere and have an inclusive, evolving, and informal working environment. DTU has campuses in all parts of Denmark and in Greenland, and we collaborate with the best universities around the world.

The doctoral candidate (DC) will work at the Novo Nordisk Foundation Center for Biosustainability (DTU Biosustain), which was established at DTU as a centre of excellence in the design, construction, and testing of cell factories by developing and perfecting foundational engineering approaches for biomanufacturing. Recent progress in our ability to read and write genomic code, combined with advances in automation, analytics and data science, has fundamentally changed the scope and ambition of harnessing the potential of biological systems. Big data approaches and analysis of biological systems are key research instruments at the Center. DTU Biosustain utilizes these advances for microbial cell factory design to foster sustainable lifestyles in relation to three application areas: Sustainable Chemicals, Natural Products, and Microbial Foods.

Roles and responsibilities
The PhD will be carried out in 3 years at DTU Biosustain under the supervision of Dr. Carlos Acevedo-Rocha. Within this time, it is expected that three research stays (2-3 months) will be conducted, two in academic groups in Canada and Austria and one industrial stay in Germany. The Horizon Europe Marie Skłodowska-Curie Action (MSCA) doctoral network (DN) project starts in January 2026. The date of recruitment and state of the PhD project is planned for June 2026 and latest by December 2026. Your PhD degree will be awarded based on successful completion of the research work at DTU. You will also be required to participate in the training events organized by the DN and you are expected to contribute with the dissemination of your PhD results via social media and public engagement.

The PhD project will focus on:
- Engineering cytochrome P450 enzymes for enhanced activity, selectivity and stability
- Strain engineering for high-throughput screening of enzyme libraries
- Setting up analytics including HPLC, LC-MS and GC-MS
- Protein expression, purification and characterization using biochemical and biophysical assays
- Variant identification using next generation sequencing
- Applying machine learning-guided directed evolution to improve multiple enzyme properties
- Upscaling selected biotransformations in collaboration with academic partners

Main supervisor: Carlos Acevedo-Rocha, Technical University of Denmark, Lyngby, Denmark
Co-supervisor 1: Joelle Pelletier, University of Montreal, Canada
Co-supervisor 2: Jelena Ivanovska, Provolut (previously Exazyme), Berlin, Germany
Co-supervisor 3: Bernd Nidetzky, Austrian Centre of Industrial Biotechnology & TU Graz, Austria

Qualifications:
- MSc in biotechnology, biochemistry, biology, chemistry, biophysics, or related area
- Experience with molecular biology and protein engineering
- Experience with assay development and enzyme kinetics
- Excellent English proficiency in written and oral form
- Excellent communication skills for working within an interdisciplinary research team
- Strong analytical skills and ability to work independently

Preferred qualifications but not mandatory:

- Experience with bioinformatics including NGS (Nanopore, Illumina, PacBio)
- Experience with automation and coding in Python or other programing language
- Experience with protein software tools like AlphaFold3, Boltz2, PyMOL, Chimera, etc.
- Interest in advanced computational methods to improve and understand protein function
- Interest in entrepreneurship to make a positive impact on planetary and human health

Conditions of employment
You must have a two-year master's degree (120 ECTS points) or a similar degree with an academic level equivalent to a two-year master's degree.

Approval and Enrolment
The scholarship for the PhD degree is subject to academic approval, and the candidate will be enrolled in one of the general degree programmes at DTU. For information about our enrolment requirements and the general planning of the PhD study programme, please see DTU's rules for the PhD education.

We offer
DTU is a leading technical university globally recognized for the excellence of its research, education, innovation and scientific advice. We offer a rewarding and challenging job in an international environment. We strive for academic excellence in an environment characterized by collegial respect and academic freedom tempered by responsibility.

Salary and appointment terms
The preferred starting date is 1st June 2026 (or according to mutual agreement). The appointment will be based on the collective agreement with the Danish Confederation of Professional Associations. Furthermore, the PhD salary will be based on the Marie S. Curie compensation scheme conditions and according to the grant agreement. The period of employment is 3 years. Based on seniority the candidate will receive a minimum of DKK 29.701,83 (base salary) and 1.551,00 (PhD supplement). In addition, DTU will also pay pension consisting of 18,07%. Finally, it is possible to apply for family allowance.

You can read more about career paths at DTU here.

Further information
Further information may be obtained from Carlos Acevedo-Rocha: cargac@biosustain.dtu.dk
Website about MSCA doctoral network ELEGANCE: https://elegance.dtu.dk/
Google Scholar profile: https://scholar.google.com/citations?hl=en&user=yZDS88IAAAAJ
More information about DTU Biosustain: www.biosustain.dtu.dk
CPE group: https://www.biosustain.dtu.dk/research/research-areas/natural-products/computational-protein-engineering

If you are applying from abroad, you may find useful information on working in Denmark and at DTU at DTU – Moving to Denmark. Furthermore, you have the option of joining our monthly free seminar "PhD relocation to Denmark and startup "Zoom" seminar" for all questions regarding the practical matters of moving to Denmark and working as a PhD at DTU.

Application procedure
Your complete online application must be submitted no later than **January 31st, 2026 (23:59 Danish time)**. Applications must be submitted as **one PDF file** containing all materials to be given consideration.

To apply, please click the link "Apply now", fill out the online application form, and attach **all your materials in English in one PDF file**. The file must include:
- A letter motivating the application (cover letter)
- Curriculum vitae
- Grade transcripts and BSc/MSc diploma (in English) including official description of grading scale

You may apply prior to obtaining your master's degree but cannot begin before having received it.

Applications received after the deadline will not be considered.

All interested candidates irrespective of age, gender, disability, race, religion or ethnic background are encouraged to apply. As DTU works with research in critical technology, which is subject to special rules for security and export control, open-source background checks may be conducted on qualified candidates for the position.