Post-Doctoral Position for development of self-learning digital twins

A digital twin is a representation of a physical object through data, multi-scale probabilistic simulations, and mathematical equations. It can be connected to the real world via physical sensors (e.g., temperature sensors) and can support the design and engineering of a product or enables predictions about the development of a physical object. By feeding sensory data into the digital twin the physical and the virtual world are bridged. One of the fundamental challenges in using the digital twin consists in handling of uncertainties. Uncertainties can enter mathematical models and experimental measurements in various ways. The study of the behaviour of parameterized non-linear dynamic models is often impeded by lack of knowledge of a subset of parameters (uncertainty) and/or non-uniqueness (variability) of another subset of the parameters. A core topic in the field of uncertainty quantification is the question how uncertainties in model inputs are propagated to uncertainties in model outputs. Quantification of the output of the digital twin and reacting to new data by updating the digital twin resulting into improved predictions is a challenging topic.

This post-doctoral position is in the context of Predictive Food Modelling or Predictive Food Microbiology. Gene expression is a fundamentally noisy process, giving rise to a significant cell-to-cell variability at the phenotype level. The phenotypic noise is manifested in a wide range of microbial traits. Heterogeneous behaviour of individual cells is observed at the growth, survival and inactivation responses and should be taken into account in the context of Predictive Food Microbiology. This project will be embedded in a larger project which is coordinated by tsenso GmbH and in which we aim to test modern experimental techniques and develop self-learning digital twins for food products. The overarching goals of the project are to bring food modelling innovation to the market, hereby reducing food waste, improving the current food safety processes, and enhancing transparency for the consumer. The post-doctoral project is right at the interface between science and industry.

Requirements

For this position we request a solid background in mathematics, statistical methods, physics, and an understanding of and interest in molecular biology.

In particular:

- Ph.D. in Physics or Applied Mathematics
- Interest in start-up ecosystem and product-oriented research
- Experience in doing research in a multi-disciplinary team
- Experience in systems biology, mathematical biology, dynamic systems
- Interest in machine learning approaches
- True interest in biological problems
- Strong interest in combining different scientific disciplines to develop new insights
- Excellent programming skills (e.g., C, C++, Python, etc.)
- Excellent command of the English language (German is not required)

We offer:

Participation in an exciting project which may alter the way how the food supply chain is handled. Interesting and challenging problems. Gain knowledge in applied industrial research. A contract for three years with a monthly gross salary between 4100 - 4800 €.

We are

Freiburg University

The Fleck group for Spatial Systems Biology is part of the Freiburg Center for Data Analysis and Modelling (FDM). Our research focus is on the analysis of dynamic biological networks. The position will be located at Freiburg University at the FDM.

tsenso GmbH

A Stuttgart based food-tech start-up providing cloud-based quality analytics for the food supply chain from farm to fork. The post-doctoral position will be funded by tsenso (www.tsenso.com).

Interested?

Please send a letter of motivation and a CV to: christian.fleck@fdm.uni-freiburg.de

Additional information

For more information about this position, please contact Christian Fleck who heads the Spatial Systems Biology Group at the FDM and is Head of R&D at tsenso GmbH (christian.fleck@fdm.uni-freiburg.de).