# Wageningen University & Research

# Fellowships in Data Science & Artificial Intelligence

*Wageningen Data Competence Center (WDCC), July 2022*

## Background

As part of the investment program Data Science & Artificial Intelligence (DS/AI), WUR opens an internal call for *Expression of Interest (EoI)* for fellowships in DS/AI. The investment program aims to strengthen competences in research and education in DS/AI in combination with domain expertise. As part of this program, in 2021, three personal professors in DS/AI have been appointed at WUR.

The fellowships aim to develop avenues for **long-term** research and education combining the expertise from the personal professors and chair and research groups at WUR. For that reason, this call provides full or partial budgets to fellowships. The total budget available for this call is 823 k€. We estimate to use approximately 450 k€ and 350 k€ for PhD and post-doc positions, respectively.

Partial budgets require additional commitment from chair and research groups or other sources at WUR for full-time appointments. In this manner, we intend to organize commitment to a joint development of expertise addressing **ambitious** interdisciplinary research questions.

The fellowships aim to contribute to a lively community at WUR to cooperatively develop and apply methods of DS/AI to tackle the scientific and societal challenges within the WUR research domain. The exchange of ideas and experiences is intended to further strengthen our competences. This community may be imagined as an organization-wide laboratory working on AI and can be referred to as Wageningen AI Lab(s).

## Objective

The objective of this call for EoI is to select interdisciplinary research problems to be tackled in the context of one to four PhD positions and one to two post-doc positions (typically with partial support from this call, as specified below; higher numbers of PhD and post doc positions are possible depending on the co-funding brought in by the applicants). The parts of these positions not supported by this call are required as co-funding in the proposals (e.g., as in-kind, project employment, datasets, etc.).

## Time schedule

The call for EoI will open on July 15th, 2022 and will close on September 15th, 2022. Proposers will be invited for a sandpit session scheduled for October 1st, 2022. Fellowships are expected to start then as soon as possible.

## Who can submit?

Anybody with a tenured or permanent position at a chair group (WU) or research group (WR) can submit. Members of the review committee are excluded from submission.

## What can be asked for?

An EoI can ask for either **full or partial funding** (20%, 40%, 60%, or 80%) of a PhD candidate position or full or partial funding (20%, 40%, 60%, or 80%) of a post-doc position. Each EoI concerns a single position. Each proposer can submit multiple EoIs.

Positions can be proposed ‘open,’ meaning to be opened as a vacancy, or ‘available,’ meaning for a particular researcher at WUR who will take the proposed position as a PhD candidate or post-doc.

## Conditions

The following scientific conditions need to be specified for interest to be eligible:

* The *EoI* is aligned with at least one of the three focus areas in DS/AI as specified in the Supplementary Material. Proposers are encouraged to explore ambitious interdisciplinary research questions, defined in close collaboration with at least one of the three personal professors in DS/AI: Anna Fensel, Ioannis Athanasiadis, or Ricardo Torres. The goal is not only to advance the state of the art in the domain knowledge but also in DS/AI.
* The *EoI* addresses scientific challenges in the research domain to be answered and motivates why these challenges need to be answered using methods from DS/AI.
* The *EoI* describes methods of DS/AI to be **developed** and **used**, motivates why these methods are needed in this case, indicates how these methods relate to the focus areas in DS/AI as described in the Supplementary material to this call.
* The *EoI* covers how the proposed position will contribute to the exchange of ideas and experience in combining domain challenges with the application and development of methods in DS/AI and contribute to a lively community referred to as Wageningen AI Lab(s).
* If applicable, the *EoI* describes the involvement of external researchers, groups, or institutes to the proposed research including scientific expertise, particular contribution to the proposed research, an indication of time spent on this research per month, and financial commitments to this research.

## Format

Each EoI adheres to the following format:

1. Title of the proposed position
2. Author(s) responsible for the EoI and proposed position
3. Scientific domain challenges
4. Scientific ambitions in DS/AI
5. Envisioned contributions to the exchange of ideas and experience
6. External relations (if applicable, otherwise empty)
7. Co-funding available for the positions
8. In case of funding for an existing researcher, add CV of the researcher as annex
9. Maximum 1000 words for items 4 to 8 above

## Procedures

The review committee consists of researchers in the area of DSAI indicated by WDCC and the three personal professors: Anna Fensel, Ioannis Athanasiadis, and Ricardo Torres. The committee will assess whether EoIs meet the conditions specified above. These conditions have been discussed in advance with the WDCC Advisory Group. Selected and rejected EoIs will be informed of this result only. Detailed feedback on the EoIs is available on request from the review committee.

Within the sandpit, selected EoIs will be discussed. The goal is to identify projects that are coherent and can provide synergy and critical mass to make a breakthrough. Together the projects will contribute to the Wageningen AI Lab(s). The meeting will also cover procedures for the definition and announcement of positions supported by the funding available. The sandpit meeting will be procedurally chaired by Bas Zwaan, director of PE&RC Graduate School.

## Organization

This call is organized by Wageningen Graduate Schools in cooperation with Wageningen Data Competence Center

## Submission

EoIs can be submitted through a message to data@wur.nl with the subject “[Fellowships in Data Science & Artificial Intelligence]”.

## Contact information

For more information, contact data@wur.nl

## Supplementary material

General focus: the complex domain of ‘exploiting the potential of nature to improve the quality of life’ at WUR is researched with methods such as experiments, observations, mathematical modelling, statistics, and reasoning, which are all methods developed by human design. Increasing volumes, diversity, detail, and availability of data provide new methodological approaches. Such approaches require methods of computer science to derive meaningful information from data, such as those developed in Data Science and Artificial Intelligence. We use these methods to derive scientific hypotheses on the organisms, environments, and ecosystems we study to improve our understanding and so enable, for instance, predictions, scenario analyses, and the investigation of new behavior. Our aim is to unravel the mysteries of nature using explainable AI. Here, explainable is inherent to our approach which is not limited to reproducing behavior caught in data but to identify key driving factors and guiding principles for this behavior from the data.

In some more detail, with this general focus, we define three focus areas open for ideas.

Focus areas in Data Science & AI

**Data Sharing and Intelligent Data Value Chain Production and Consumption Ecosystems**.

Contact: Anna Fensel

Goal: Enabling automated exchange of information across systems (handling of semantic interoperability, consent, contracts/monetization, privacy), for:

* research data, platforms, infrastructures,
* industrial data for the applications creation, such as in the domains of food, health, consumer understanding, behavior intervention.

**Combining Symbolic and Sub-Symbolic AI**:

Contact: Anna Fensel

Goal: Developing hybrid methods based on Knowledge Graphs, Data Analytics and Machine Learning, toward making sensors, image, and stream data understandable and usable – e.g., processing and understanding of image data of food, or of large numbers of events (e.g., movements at a supermarket, or events on social media), and survey results. This research venue also concerns applying meta machine learning tools, such as Autokeras and h2o.ai, and decision-making systems combining symbolic and sub-symbolic reasoning.

**Responsible AI by means of Data Visualization, Behavioral Change Analysis, and Explainable AI**.

Contact: Anna Fensel

Goal: Developing data visualization and communication techniques based on semantic technology, specifically in applications allowing end users and the researchers to understand the data and system/algorithm complexity, make data more FAIR, make better decisions - e.g., which food to consume to be more sustainable and healthier, also considering the data of the researcher or end user, such as the data about previous nutrition, and medical conditions.

**Digital Twins Intelligence**

Contact: Ioannis Athanasiadis

The goal is to investigate digital twin intelligence: how digital twins improve with more experience, either in terms of data available or user feedback? This will enable digital twins to effectively adapt to local conditions and update their internal states in line with field and other contextual/historical data. Reinforcement learning and hybrid learning approaches can be investigated towards intelligent digital twins!

**Artificial intelligence for detecting tipping points and cross-scale effects**

Contact: Ioannis Athanasiadis

Goal: Can data-driven methods help us quantify uncertainty in complex systems? This research line aims to evaluate and advance machine learning algorithms as symbolic regression or probabilistic AI for capturing cross-scale, spatio-temporal phenomena, and detect tipping points. Can Artificial intelligence help to learn policies for better understanding complex systems?

**Data driven discoveries with partial-view learning**

Contact: Ioannis Athanasiadis

Goal: This research line aims to investigate algorithms that learn from noisy, incomplete, and irregular data streams. It is typical for both experimental and real-world data in the Wageningen domains not to capture all factors/drivers of variation, rather a subset of them. Learning the complete picture from partial views can enable discoveries from existing/legacy datasets, advance our understanding of natural phenomena and factor interactions, and tackle global challenges.

**DS/AI for Dynamics system Analysis**

Contact: Ricardo Torres

Goal: This research venue concerns the design, implementation, validation, and application of data-driven methods in the analysis of dynamical systems. Research in this area comprises data-driven methods for representing and characterizing time series, spatiotemporal, and temporal network data, as well as for embedding nonlinear dynamics.

**Multimedia analysis and understanding**

Contact: Ricardo Torres

Goal: Developing and applying algorithms to support analysis and understanding of multimedia data, including (semi-) automatic procedures for representing, detecting, segmenting, recognizing, classifying, annotating, tracking, and searching for objects within images and videos (and sequences of images).

**ELSA aspects associated with DS/AI**

Contact: Ricardo Torres

Goal: This venue focuses on theoretical and practical open research questions related to the implementation of ELSA-complaint artificial intelligence systems. It covers the development of solutions for technological challenges concerning representing, managing, and using time-evolving ELSA elements, aiming to support the creation of responsible and human-centered AI systems that are amendable to responsibility, accountability, explainability, transparency, and social awareness.

**Digital Twins**

Contact: Ricardo Torres

Goal: Developing and applying digital twins. It comprises the formal specification of digital twins, design, and implementation of their components (data management, data-driven methods, modelling and simulation tools, and visualization and their assessment in real-world settings (e.g., planning, decision-making).

