

Doctoral Researchers in the Digital Waters (DIWA)
Doctoral Pilot
Aalto University

Direct Link: <https://www.AcademicKeys.com/r?job=233052>

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Posted Mar. 18, 2024, set to expire Dec. 30, 2024

Job Title Doctoral Researchers in the Digital Waters (DIWA)
Doctoral Pilot

Department T213 Built Environment

Institution Aalto University
, , Finland

Date Posted Mar. 18, 2024

Application Deadline Open until filled

Position Start Date Available immediately

Job Categories Post-Doc

Academic Field(s) Water Resources Engineering

Job Website https://aalto.wd3.myworkdayjobs.com/aalto/job/Otaniemi-Espoo-Finland/Doctoral-Researchers-in-the-Digital-Waters--DIWA--Doctoral-Pilot_R39079-3

Apply By Email

Job Description

Aalto University is where science and art meet technology and business. We shape a sustainable future by making research breakthroughs in and across our disciplines, sparking the game changers of tomorrow and creating novel solutions to major global challenges. Our community is made up of 13 000 students, 400 professors and close to 4 500 other faculty and staff working on our dynamic campus in Espoo, Greater Helsinki, Finland. Diversity is part of who we are, and we actively work to ensure our community's diversity and inclusiveness. This is why we warmly encourage qualified candidates from all backgrounds to join our community.

Doctoral Researchers in the Digital Waters (DIWA) Doctoral Pilot

The Aalto University is inviting applications for Doctoral Researcher positions in the Digital Waters (DIWA) doctoral education pilot. The duration of the positions is three years, starting no later than in

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January 2025. The open positions cover variety of topics related to water and its management (see below the link to each open position), and we therefore encourage applications from a diversity of fields.

DIWA doctoral pilot positions are funded by the Ministry of Education and Culture. The research themes of the open positions are linked to DIWA Flagship (<http://www.digitalwaters.fi>) funded by Research Council of Finland. The flagship is a leading research and innovation ecosystem, bringing research and new innovations together to support decision-making and management in the water sector - digitally. DIWA enables a transition towards the digital representation of real-world water systems (Digital Twin) to reproduce hydrological storages, their states, fluxes and processes, as well as ecosystem responses with novel options for improved scenario analyses, planning and governance.

The doctoral pilot will contribute to all five Flagship research themes related to hydrosphere processes; new observational systems; integrated analysis and modelling; digital services, platforms, and business applications; and transformative water management. The relevant research areas in the pilot cover variety of contexts, including river systems, groundwater processes, agricultural systems, and pristine, rural and urban areas. Similarly important are the interactions and responses in the hydro-, atmo- and cryosphere as well as diverse linkages between water, climate, land, and ecosystems. The large datasets and other information gathered during DIWA flagship will be available for doctoral researchers. Both the DIWA flagship and the doctoral pilot aim for major societal impact, and will collaborate with key stakeholders from public and private sector as well as civil society.

The DIWA doctoral pilot offers a unique and multidisciplinary research and learning environment that provides systematic training, access to excellent research infrastructure, and professional career development. Doctoral Researchers will be working closely with the researchers, supervisors, and partner organisations of the DIWA ecosystem, including cities and municipalities, ministries, companies, research institutes and civil society organisations. Doctoral Researchers can have secondment periods in the partner organisations outside academia. The pilot will include altogether 60 Doctoral Researchers, out of which, 14 Doctoral researchers at Aalto University.

We are now looking for a Doctoral Researchers for the following five topics at Aalto University (see the detailed descriptions at the end of this page):

1. Hydrological modelling of biomass production area for flexible water management - computational tool for a digital twin
2. Digital twin in integrated sanitation system management
3. Transformative water governance
4. Accurate spatial modeling of agricultural field run-off within fields and the surrounding environment

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5. Totally decentralised and digital twin based automation of water treatment and supply

Requirements for the position

- * Master's degree from a relevant field (completed before starting in the position)
- * A good command of English (typically demonstrated with an official certificate, e.g., IELTS/TOEFL).
- * Applicants should demonstrate the ability and enthusiasm to work as part of a multidisciplinary research and expert network.

We encourage applicants from a variety of relevant fields to apply: see the detailed topic descriptions below.

Applicants must fulfill the admission criteria of the Aalto Doctoral Programme in Engineering and, if chosen for a position, apply for, obtain and accept the right to pursue doctoral studies at Aalto University. For more information on the general requirements and the application process for doctoral studies, please visit [\[url=https://www.aalto.fi/en/study-options/aalto-doctoral-programme-in-engineering\]](https://www.aalto.fi/en/study-options/aalto-doctoral-programme-in-engineering)<https://www.aalto.fi/en/study-options/aalto-doctoral-programme-in-engineering>

Our workplace values equality and diversity, and we therefore encourage qualified applicants from all backgrounds to apply for our open positions.

What we offer

- * We offer you an interesting job in an inspiring and multidisciplinary work environment. We will familiarize you with your work tasks, and you will be part of a competent team that will provide you with support for your tasks. We encourage and offer opportunities for continuous development of your own expertise.
- * You will become part of a wide and unique network of Doctoral Researchers, early career and senior researchers, and supervisors within the DIWA Flagship and the related Doctoral Education Pilot Projects.
- * The expected starting date in the position is at the latest on January 1st, 2025. Presence in Finland for the duration of the contract is compulsory.
- * Employment contracts will be made for three years with the funding from the Finnish Ministry of Education and Culture. Contract includes a prerequisite to apply, receive and accept doctoral study right within the probation period of the first 6 months.
- * Aalto University follows the salary system of Finnish universities. The starting salary is approximately 2700 €/month (gross), and it increases as the Doctoral Researcher progresses in the research and

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studies.

* The contract includes Aalto University occupational healthcare.

* We work in a hybrid way with flexible office hours, and the primary workplace is at our active university campus in Otaniemi, Espoo.

Join us!

To apply, please submit your application through our recruitment system by Saturday April 20, 2024 (23:59 EET [UTC+2]). Click "Apply now".

Please include the following documents in English, preferably as a single pdf-file (name the file: lastname_firstname_application.pdf):

* Letter of Motivation (1-2 pages), where you introduce yourself and describe your research interests and motivation for pursuing doctoral studies. Applicant is asked to indicate their preferences in case of applying multiple positions at Aalto or between the partner universities of the DIWA doctoral education pilot (<http://www.digitalwaters.fi>).

* A Curriculum Vitae (2 pages), including contact details of two relevant referees (please see CV example:

[https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Ftenk.fi%2Fsites%2Fdefault%2F06%2FTENK_CV_template_2020.docx](https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Ftenk.fi%2Fsites%2Fdefault%2F06%2FTENK_CV_template_2020.docx&wdOrigin=BROWSELINK) (live.com)). You are also encouraged to include links to your personal webpage, LinkedIn page or similar.

* List of Publications, including the titles and possible links to Bachelor Thesis and Master's Thesis as well as possible scientific publications.

* An official Study Transcript of your Master's degree, listing all courses and grades.

* A copy of the M.Sc. degree certificate or equivalent (for doctoral study application it will need to be officially translated into Finnish, English or Swedish). If the degree is still pending, then a plan for its completion must be provided.

* Research statement of the selected research topic (2-3 pages), indicating the planned context, research questions, key methods and theories as well as novelty of your research. The research statement can be checked with the Turnitin Originality Check plagiarism detection software. The use of artificial intelligence to assist in the preparation of the research plan should be clearly indicated in the research plan.

Kindly note that we will start to go through the applications and may also invite suitable candidates to interview already during the application period. The position will be filled as soon as a suitable

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candidate is identified: this can happen already before the application period closes. You are thus encouraged to submit your application as soon as possible.

Aalto University reserves the right to leave the position open, extend the application period, reopen the application process, and to consider candidates who have not submitted applications during the application period.

Any questions?

For additional information about the DIWA doctoral researcher positions regarding the Aalto University, kindly contact Assistant Professor Eliisa Lotsari (eliisa.s.lotsari@aalto.fi).

For questions about applying, please contact HR partner Sanni Mero (sanni.mero@aalto.fi).

Want to know more about us?

You can watch these videos: [[url=https://www.youtube.com/watch?v==5k_og_6zUJQ](https://www.youtube.com/watch?v==5k_og_6zUJQ)]Aalto University - Towards a better world, [[url=https://www.youtube.com/watch?v==dUfEGVM-ZP8&feature==youtu.be](https://www.youtube.com/watch?v==dUfEGVM-ZP8&feature==youtu.be)]Aalto People , and [[url=https://www.youtube.com/watch?v==ZK6pDWm1_CE](https://www.youtube.com/watch?v==ZK6pDWm1_CE)]Shaping a Sustainable Future. Read more about working at Aalto: [[url=https://www.aalto.fi/en/careers-at-aalto](https://www.aalto.fi/en/careers-at-aalto)]https://www.aalto.fi/en/careers-at-aalto

About Finland

Finland is a great place for living with or without family - it is a safe, politically stable and well-organized Nordic society. Finland is consistently ranked high in quality of life and was just listed again as the happiest country in the world: [[url=https://worldhappiness.report/news/its-a-three-peat-finland-keeps-top-spot-as-happiest-country-in-world/](https://worldhappiness.report/news/its-a-three-peat-finland-keeps-top-spot-as-happiest-country-in-world/)]https://worldhappiness.report/news/its-a-three-peat-finland-keeps-top-spot-as-happiest-country-in-world/. For more information about living in Finland: [[url=https://www.aalto.fi/en/careers-at-aalto/for-international-staff](https://www.aalto.fi/en/careers-at-aalto/for-international-staff)]https://www.aalto.fi/en/careers-at-aalto/for-international-staff

TOPIC DESCRIPTIONS

1. Hydrological modelling of biomass production area for flexible water management - computational tool for a digital twin

Background

Agricultural water management is challenged by climate warming, which is leading to transitions in field cultivation. The occurrence of extremes is affecting the operation of drainage/irrigation systems and increasing the need of short-term control. Modelling and simulation are viable tools to prepare for mitigation and adaptation against the changed conditions. Such modelling tasks are in the core of

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DIWA, where hydrological models are developed as part of the digital twin construction.

Topic description

The doctoral researcher develops a computational setup that connects a hydrological model to the DIWA digital twin platform. The model simulates water balance and water management measures in northern bioproduction areas. The data connection in the computational setup is two-way: (1) the model reads spatio-temporal input data from the DIWA data space and (2) produces outputs to the digital twin platform for visualization. The computational setup is applied to produce forecast simulations for planning short term water management actions.

The applicant is expected to have a master's degree on hydrology, water engineering, agricultural and forest sciences, or related field. The position requires good teamwork skills and self-management. The applicant should have experience in programming (preferred languages python/C#++), model development and application, as well as data management and analysis. Previous experience in version control (Git) is seen as an asset.

Collaboration/secondment with Natural Resources Institute Finland (Luke), Finnish Environment Institute (Syke), and/or Finnish Field Drainage Association.

Work will be done in WAT/Aalto (Water and Environmental Engineering | Aalto University [[url=https://www.aalto.fi/en/department-of-built-environment/water-and-environmental-engineering](https://www.aalto.fi/en/department-of-built-environment/water-and-environmental-engineering)]<https://www.aalto.fi/en/department-of-built-environment/water-and-environmental-engineering>)

2. Digital twin in integrated sanitation system management

Background

Water and wastewater treatment are basic necessities in our welfare societies safeguarding health and prosperity by providing key assets for many services and industries as well as protecting the environment. The main focus of the wastewater treatment has been to meet the effluent requirements specified by the environmental permit while operating the process in a cost-effective manner. Recently, ambitious goals for climate impact mitigation have been set in country, municipality and water utility level. This has led to a new focus in plant operation towards climate impact mitigation and offset benefits. Digital solutions are needed in order to efficiently link the information collected from the urban water management system to the process optimization.

Topic description

The planned work is to enlarge the on-going development of wastewater treatment plant digital twin to include the network and the receiving water. The developed integrated digital twin can be used to

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assess the impact of changes in the climate hydrology and develop solutions for the integrated system management. The renewal of the EU Urban Wastewater Treatment Directive brings more stringent requirements for both wastewater treatment and energy optimization. The goal of this project is to enhance the benefits of digitalization for an overall optimization of the sanitation system. The project has links to urban water management (energy optimization, GHG emission mitigation, effluent control) and it will be carried out in close collaboration with water utilities companies offering solutions for process control and automation, network and process modelling as well as instrumentation.

The applicant is expected to have a master's degree on water/environmental engineering, civil engineering, process engineering or related field. The position requires good teamwork skills and self-management. The applicant should have experience in network and/or process modelling (preferred platforms Fluidit/Sumo/Simulink), model development and application, as well as data management and analysis. Previous experience from working with urban water system design or operation is an asset.

Collaboration/secondment with HSY.

Work will be done in WAT/Aalto (Water and Environmental Engineering | Aalto University [[url=https://www.aalto.fi/en/departement-of-built-environment/water-and-environmental-engineering](https://www.aalto.fi/en/departement-of-built-environment/water-and-environmental-engineering)]<https://www.aalto.fi/en/departement-of-built-environment/water-and-environmental-engineering>)

3. Transformative water governance

Background

Water is critically important for addressing the key sustainability challenges related climate change, biodiversity, and pollution, and there are high hopes that so-called Twin Transition (green and digital transition) will provide new, more sustainable and efficient ways of working also in the water sector. Yet, the thorny issues related to participation and decision-making power remain, as water brings together a variety of actors with differing interests, needs and knowledges. Such a setting calls for new ways of viewing water resources management and governance. It also means that transformative water governance can be understood simultaneously in two different ways: through water's key role in the on-going sustainability transformation and as a need to re-think and even transform current water governance practices.

Topic description

The doctoral research under this topic will look at the changing dynamics of the governance of water resources in Finland, considering both established (e.g. EU Water Framework Directive) and emerging (e.g. multistakeholder platforms such as water vision processes) governance mechanisms. The

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research can also study critically the potential of Twin Transition in the water field, considering the pros and cons of digitalisation (e.g. digital participation, citizen science, access to information) and the ways it links to key sustainability challenges. The research may look at national and also regional (e.g. Baltic Sea, EU) scales, but can also focus on one or several case studies at different scales (e.g. cities, river basins).

The position requires understanding of the key theories related to sustainability, natural resources management and governance as well as at least some knowledge on qualitative research methods. Knowledge on quantitative research methods is a merit. The applicants can thus come from a variety of relevant fields, including water and natural resources management, environmental sciences, sustainability science, and social sciences. Experience from carrying out expert interviews and related analysis methods and software is a merit. As the research utilises also relevant Finnish-language planning and policy documents, the competency also in Finnish is a strong merit.

Collaboration/secondment with Finnish Environment Institute (Syke).

Work will be done in WAT/Aalto (Water and Environmental Engineering | Aalto University [[url=https://www.aalto.fi/en/department-of-built-environment/water-and-environmental-engineering](https://www.aalto.fi/en/department-of-built-environment/water-and-environmental-engineering)][<https://www.aalto.fi/en/department-of-built-environment/water-and-environmental-engineering>])

4. Accurate spatial modeling of agricultural field run-off within fields and the surrounding environment Background

Water balance is a critical aspect of agriculture. In irrigated fields it is important to know when and how much additional water is required. In non-irrigated fields knowing the water balance in the field is a critical aspect in estimating within field growth potential and thus, for example, guide the planning of future field operations. The agricultural water system is also affected by and affects the behavior surface and ground water in the vicinity of the field. However, accurate measuring of this whole system is complex, and therefore modeling of the water both within fields and in the immediate vicinity can provide immense help in assessing the situation. Precise and accurate models of agricultural fields, including the soil up to several meters in depth, can therefore help in managing the farm, and thus contribute to smart farming and improve the eco-friendliness of farms.

Topic description

The doctoral researcher tackling this topic will research the means for precise and accurate modeling of agricultural fields and their immediate vicinity. The goal is to provide better tools for smart farming and for managing the ecological impacts of agriculture. An important application area for the field

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models will be within-field water balance as well as the interaction of the water within the field and the water in the immediate surroundings.

The position requires understanding of spatial models, and the ability to develop and assess models based on the available data. In addition, understanding of water modeling and agriculture is very important. Experience in spatial data modeling, spatial data analysis, and spatial statistics is a definite merit for an application. Possible background for a successful applicant includes relevant studies in geoinformatics, in water management, in agricultural sciences, or a similar field.

Collaboration/secondment with Natural Resources Institute Finland (Luke).

Work will be done in GIS/Aalto (Geoinformatics | Aalto University
[\[url=https://www.aalto.fi/en/departement-of-built-environment/geoinformatics\]](https://www.aalto.fi/en/departement-of-built-environment/geoinformatics)<https://www.aalto.fi/en/departement-of-built-environment/geoinformatics>)
and WAT/Aalto (Water and Environmental Engineering | Aalto University
<https://www.aalto.fi/en/departement-of-built-environment/water-and-environmental-engineering>)

5. Totally decentralised and digital twin based automation of water treatment and supply Background

Water supply systems are critical infrastructures facing challenges like environmental uncertainties and security threats. Traditional centralized automation systems are vulnerable to single points of failure and cyber-attacks. To address these issues, there's a growing need for decentralized automation architectures. Inspired by swarm intelligence principles, these architectures distribute decision-making across multiple nodes, enhancing system resilience and responsiveness.

Key advancements driving this shift include 5G/6G connectivity, digital twins, and AI. These technologies enable real-time data exchange, predictive maintenance, and autonomous decision-making, essential for ensuring the integrity and safety of water supply systems. Additionally, the project aims to enhance water security by integrating decentralized monitoring with digital twins to proactively detect and mitigate threats at both cyber and physical system levels. Ultimately, this project seeks to revolutionize water treatment automation, bolstering the resilience and security of water supply systems to safeguard public health and societal well-being.

Topic description

Addressing resilience and safety criticality of water supply systems, this project will propose and validate a novel automation architecture of water treatment automation that is based on the concept of decentralised swarm intelligence. This new automation approach will rely on the latest technology advancements, such as 5G/6G connectivity, digital twins and artificial intelligence. One of the targets is

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to guarantee the level of water security making it impossible to conduct adversary attacks against the society. In this project, we will investigate the concept of distributed cyber-physical security in which decentralised nodes monitor the situation independently, compare the observations with the digital twins, thus preventing any attacks not only on the cyber level, but also on the physical system level.

An ideal candidate for this position would have a strong background in automation software and hardware and experience of developing and using simulation software. Graduates from electrical engineering, automation systems engineering, software engineering programs and computer science are encouraged to apply.

Collaboration/secondment with VTT Technical Research Centre of Finland Ltd.

Work will be done in ELEC/Aalto (School of Electrical Engineering | Aalto University:
[url=<https://www.aalto.fi/en/school-of-electrical-engineering>]<https://www.aalto.fi/en/school-of-electrical-engineering>)

Contact Information

Please reference Academickeys in your cover letter when applying for or inquiring about this job announcement.

Contact

Finland