Jobbnorge ID: 301215
Deadline: 6/29/2026
Website: http://www.ntnu.no
Scope: Fulltime
Duration: Temporary

The Department of Mechanical and Industrial Engineering has a vacancy for a

PhD Candidate in Machine Learning Approaches to Conservation Condition Needs of Historic Buildings

This is NTNU

NTNU is a broad-based university with a technical-scientific profile and a focus in professional education. The university is located in three cities with headquarters in Trondheim.

At NTNU, 9,000 employees and 43,000 students work to create knowledge for a better world.

You will find more information about working at NTNU and the application process here.

Video: https://youtu.be/Xt-yHCN5QS0

About the position

For a position as a PhD Candidate, the goal is a completed doctoral education up to an obtained doctoral degree.

We are looking for a PhD candidate for one of 13 PhD positions in Marie Sklodowska-Curie Action (MSCA) CHARM (Conservation of Heritage Architecture, buildings and sites by Resilient Methods: hydro-climate factors) project. The main objective of CHARM MSCA Doctoral Network project is to develop new sustainable conservation and restoration solutions, adapted to the current and future climate conditions, designed in a circular economy philosophy, having a low environmental footprint and high handprint. CHARM also responds to socio-economical requirements of wellbeing and proposes conservation/restoration solutions economically acceptable and respecting the cultural value of buildings.

CHARM proposes a holistic approach including:

- Site observation and data collection
- Data preparation to be used by AI, models, etc
- Methods for understanding and modelling past and future degradation of architectural heritage
- Sustainable conservation solutions to several observed problems
- Assessment of the impact of architectural conservation on the environment and of the environment (past, present and future) on architectural heritage
- Bidirectional interactions with society proposing risk management plans but also taking into account the society wills and needs

The vision of CHARM MSCA project is to educate young and talented scientists towards a combined high-level experimental and data driven approach for the early-stage accurate, precise detection of hydro-climate impact on cultural heritage, to answer to recruitment needs in time of climate change and natural hazards impact about research and innovation in the sector of cultural heritage conservation and restoration.

CHARM network gathers excellent academic centers that have decennial experience in the field of risk assessment, adaptation and mitigation solutions to the climate change impact, conservation of cultural heritage and restoration, documented by scientific papers published in high impact-factor journals, and by previous EU funded research projects. CHARM puts together researchers from universities and research organisms, national and local organizations in charge of Cultural Heritage conservation, Small and Midsize Enterprises, industrial producer of building materials, and Non-Governmental Organization, from 9 European and 1 South American countries.

Description of DC2 PhD position

Project title: **Understanding conservation condition and rehabilitation needs at district scale in time of energy saving and climate change via machine learning driven method**

Topic in brief:

The aim is to implement an approach based on artificial intelligence (AI) in the form of CNN to automatically detect cracks and morphological indices in order to manage the large amount of data obtained from Synchrotron and SEM images. This automatic tool will allow the analysis of a large number of samples to statically quantify the indices characterizing healthy and pathological bones. The AI-tool permits to classify the physio-pathological conditions, as an aid in the clinical diagnosis.

Objectives:

This doctoral project aims to develop deep learning neural networks to investigate data in available database (e.g., EU building stock observatory and other similar database) to

1. classify building stock at district scale more prone to decay based on buildings construction year, location, main constitutive material, exposure, use and
2. to predict potential maintenance and restoration priority based on (i) and existing energy retrofit directive and/or risk maps

Expected results:

(i)to build high-quality dataset highlighting the façade that is more prone to decay at district/city level from existing raw database;

(ii) to apply deep learning neural networks (e.g., convolutional neural network) to perform semi-automatic decay pattern segmentation and associated mapping;

(iii) to correlate the maintenance of buildings at district/city level with decay patterns/features at district scale to prioritize large scale intervention; and

(iv) to optimize the maintenance activities by leveraging these correlations learned by machine-learning based approaches.

Supervisory Committee:

- **Main supervisor:** Full prof. Chiara Bertolin, Norwegian University of Science and Technology (NTNU), Department of Mechanical and Industrial Engineering (MTP) (Academic)
- **Co-**supervisor: Associate prof. Chao Gao, Norwegian University of Science and Technology (NTNU), Department of Mechanical and Industrial Engineering (MTP) (Academic)
- **Mentor:** Dr. Marie Louise Anker, Department Director at Nidaros Cathedral Restoration Works. (Non.Academic)

Planned secondments

SECONDMENT 1 - Prof. P. Fafalios (FORTH Foundation for Research and Technology - Hellas, Crete) M12, duration: 4 weeks, AI and ML algorithms,

SECONDMENT 2 - Prof. Carradò (CY Cergy Paris University) Karima El Ganaoui, ESTI Pau CY Tech, M24, duration: 4 weeks, AI materials

Duties of the position

- Take part in the mandatory PhD research education programme
- Develop a quantitative deep-learning-based framework to detect the micro-cracks and validate the developed framework
- Define micro-scale indices to evaluate crack morphological characteristics and validate developed the indices
- Classify the micro-morphologies and damages of undamage and damage materials and/or hazard prone or not buildings and landscape
- Participate in other relevant research and dissemination activities through our international collaborators
- Conduct and publish high-level research at peer-reviewed journals and international conferences
- Carry on condition monitoring campaigns and surveys in situ
- write and defend a PhD thesis

Be prepared for changes to your work duties after employment.

Required selection criteria

- You must have a relevant Master's degree in Computer Science, Physics, Mathematics, Materials Engineering, Mechanical Engineering, Computer Engineering or equivalent. Your course of study must correspond to a five-year Norwegian course, where 120 credits have been obtained at master's level. Master students can apply, but the master's degree must be obtained and documented before starting the position.
- You must have a strong academic background from your previous studies and have an average grade from your Master's degree study, or equivalent education, which is equal to B or better compared to NTNU's grading scale. If you do not have letter grades from previous studies, you must have an equally good academic foundation. If you have a weaker grade background, you maybe considered if you can document that you are particularly suitable for a PhD education.
- You must meet the requirements for admission to the faculty's Doctoral Programme
- Excellent written and oral English
- Strong background in applying deep learning neural networks on image segmentation associated with materials and the built environment
- Excellent programming skills in Python and Matlab

PLEASE NOTE: For detailed information about what the application must contain, see paragraph “About the application”.

The appointment is to be made in accordance with NTNUs guidelines for recruitment positions for general criteria for the position.

Preferred selection criteria

- Experience in processing-imaging techniques (e.g. 3D Data Processing, point clouds, geospatial Analysis)
- Knowledge and technical skills of condition monitoring, analytical damage functions and/or analytical methods/models

Personal characteristics

To complete a doctoral degree (PhD), it is important that you are able to:

- Strong interest and self-motivated attitude to explore scientific questions
- Think and work independently
- Team player with cooperative attitude
- Good communication skills

Emphasis will be placed on personal qualities.

We offer

- Opportunity to carry our cutting-edge research in the area of applying machine learning technique to detection, classification and prediction of material degradation and get multidisciplinary and multisectoral training by experts and experienced supervisors from academic world
- Opportunity to publish your research findings in working team and participate the national and international conferences
- Opportunity to stay at our academic partners at FORTH Foundation for Research and Technology - Hellas in Crete (Greece), and Cergy Paris University in Paris, France.
- Opportunity to work in an international team and be part of a network of 13 PhD students
- An exciting job with an important mission in society
- Developing tasks in a strong and international professional environment
- Career guidance and follow-up during the PhD period
- Open and inclusive working environment with committed colleagues
- Working capital that can be used to implement the project
- Mentor programme as a new employee at NTNU
- Favorable terms as a member of the Norwegian Public Service Pension Fund (SPK)
- Free Norwegian language training at a basic level (A2)

As a PhD Candidate at NTNU, you will have access to employee benefits.

Diversity

Diversity is a strength, and at NTNU we aim to be an employer that reflects the diversity in society and that makes use of the potential of the population's collective skills. Our vision is Knowledge for a better world and our values are creative, critical, constructive and respectful. We believe that an organization that is equal, diverse and gender-balanced is essential for us to achieve our goals.

We strive to attract employees with different skills, life experiences and perspectives to contribute to even better problem solving of our societal mission in research and education.

If you think this position is relevant and interesting, we encourage you to apply, regardless of gender, functional ability and cultural background, or whether you have been out of work for a period of time.

At NTNU we want to increase the proportion of women in scientific positions. We have a number of measures to promote equality.

Salary and conditions

In the position of PhD Candidate, code 1017, your gross salary will normally be NOK 550 800,-per annum depending on qualifications and seniority. A 2% statutory contribution to the State Pension Fund is deducted from the salary.

The employment period is 3 years.

For employment as a PhD Candidate, it is a prerequisite that you gain admission to the PhD programme in Engineering within three months of your employment contract start date, and that you participate in an organized doctoral programme through out the period of employment.

The position is conditional on external funding from Marie Sklodowska-Curie Action (MSCA) for CHARM project.

As an employee at NTNU, it is important that you keep yourself up to date with academic and organizational changes and adapt to them.

For the necessary professional and social interaction, it is a prerequisite that you are physically present and available to the institution on a daily basis.

The appointment is carried out in accordance with the principles of the State Employees Act, and Export control (legislation that regulates the export of knowledge, technology and services). Candidates who, after assessment of the application and attachments, are considered to bein conflict with the criteria in the latter act, will not be able to be employed.

About the application

The attachments (including a description of your scientific work) must accompany the application as these documents form the basis of the application assessment. The documents must be in English.

Please note: the application will only be assessed on the basis of the information we have received by the application deadline. Therefore, make sure that your application clearly shows how your skills and experience meet the criteria described above. The application and all attachments must be sent electronically via Jobbnorge.no. If you are invited to an interview, you must bring certified copies of certificates and diplomas upon request.

The application must include:

- Transcripts and diplomas for Bachelor's and Master's degrees
- CV
- Copy of Master's thesis. If you have recently submitted your Master's thesis, you can attach a draft of the thesis. Documentation of a completed Master's degree must be presented before taking up the position.
- Short letter of motivation (400 words/1 page)

- Possibly publications etc. other relevant research work
- Possibly certificates
- Names and contact information of three relevant referees

If all, or parts, of your education has been taken abroad, we also ask you to attach documentation of the scope and quality of your entire education, both Bachelor's and Master's education, in addition to other higher education. If your institution uses “diploma supplement” (normal for most European institutions), you must attach this. A description of the documentation required can also be found here. If you already have a statement from Norwegian Directorate for Higher Education and Skills (HK-dir), please attach this as well.

Joint work will be considered. If it is difficult to identify your contribution to joint work, you must attach a brief description of your participation.

When assessing the best qualified, we emphasize necessary qualifications such as education, experience and personal suitability. Motivation for the position, ambitions, and potential for research will also count when assessing the candidates.

NTNU recognizes a wide range of academic contributions and has committed itself to The San Francisco Declaration on Research Assessment and CoARA (responsible assessment of research and recognition of a greater breadth of academic contributions in accordance with NTNU's social mission).

General information

A public list of applicants with name, age, job title and municipality of residence is prepared after the application deadline. If you wish to be exempt from entry on the public applicant list, this must be justified. Assessment will be made in accordance with current legislation. You will be notified if the exemption is not granted.

If you think this position looks interesting and in line with your qualifications, you are welcome to apply.

If you have any questions about the position, please contact Professor Chiara Bertolin, e-mail: chiara.bertolin@ntnu.no.

If you have any questions about the recruitment process, please contact HR Senior Consultant Hedda Winnberg, e-mail: hedda.winnberg@ntnu.no.

Application deadline: 29.06.2026

For practical information about working at NTNU, please visit this webpage.

The city of Trondheim is a modern European city with a rich cultural scene. Trondheim is the tech capital of Norway with a population of 200,000. The Norwegian welfare state, including healthcare, schools, kindergartens and overall equality, is probably the best of its kind in the world. Professional subsidized day-care for children is easily available. Furthermore, Trondheim offers great opportunities for education (including international schools) and possibilities to enjoy nature, culture and family life and has low crime rates and clean air quality.

NTNU - knowledge for a better world

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The Norwegian University of Science and Technology (NTNU) creates knowledge for a better world and solutions that can change everyday life.

Department of Mechanical and Industrial Engineering

We educate graduates who can create new products, operate and maintain products, and manage projects. The Department has a variety of bachelor’s and master’s degree programmes. We conduct wide-ranging research in fields such as technology, energy, product quality and development, and productivity. The Department of Mechanical and Industrial Engineering is one of eight departments in the Faculty of Engineering.

Additional information

Place of service:

Høgskoleringen 1 7491 Trondheim (Trondheim Municipality)