TRANSLATION OF THE DIRECTOR'S DECREE NR. 483 DATED 27.07.2022

Selection for the conferment of three PhD fellowships in Theoretical and Scientific Data Science financed by Human Technopole Foundation- Academic year 2022/23

In the framework of the agreement signed with **Human Technopole Foundation**, the International School for Advanced Studies (SISSA) announces a selection based on academic qualifications and written and oral exams for the conferment of three PhD fellowships in **Theoretical and Scientific Data Science** starting from the academic year 2022/23

Amount of the fellowship: € 20.037,36 gross per year (approx. € 1.195,47 monthly net)
Financing Body: **Human Technopole Foundation**
Duration of the programme: 4 years

● **Other benefits:**

A contribution towards living expenses of the amount of €100,00 gross per month will be awarded to those who will subscribe a registered rent contract in the Trieste province.

A "laptop contribution" up to € 400,00 may be granted upon request and presentation of the relevant invoice.

A contribution towards the expenses to be enrolled in the health insurance system up to € 198,77 will be granted to non-EU students only.

Students enrolled in the third/fourth year can request a contribution of up to € 1.000,00 for their access to training and/or to create a network of academic contacts to help them in their future career.

A contribution (70% of the amount of the fellowship) may be awarded to students who should be forced to suspend their activity due to illness, maternity or other serious reasons up to 5 months.

During the periods of stay at the Milan premises, the Human Technopole Foundation will be able to provide further contributions.

● **Requirements:**

SISSA welcomes applications from young candidates who have completed, or are going to complete, their undergraduate studies, with a strong interest in research.

To apply, candidates, without limitations of age and nationality, must be in possession of one of the following degrees **by 31st October, 2022**:

- Italian **laurea** or **laurea specialistica/magistrale**
- A University degree obtained abroad and considered equivalent to the aforementioned Italian degrees by the evaluation Committee.

● **Online application:**

An online application must be filled and sent using the procedure available at the page https://pica.cineca.it/sissa/ **by 13.00 hrs of 31st August 2022 (Italian time).**

Candidates should upload the following documents in pdf format:

- *curriculum vitae*;
- a certificate of University examinations taken (with marks);
- a final degree certificate;
- If, at the time of application, candidates should not be yet in possession of a degree certificate, they can submit it at the time of the examination.
  European Union candidates can submit a personal declaration instead of the aforementioned certificates.
- a copy of the diploma thesis (if any), or its abstract.

At the end of the procedure, candidates will have to indicate the names and email addresses of two professors that will receive an email requesting to send a recommendation letter through the same online procedure **by 13.00 hrs. of 2nd September 2022 (Italian time).**

The candidate will then have to print out the admission request form, sign it and send it through the same online procedure.

Candidates with disabilities certified according to the law n. 104/1992 and subsequent modifications, and those diagnosed with Specific Learning Disorder certified according to the law n. 170/2010 and to the D.M. n. 5669 dated 12/07/2011, can report their needs together with the submission of the admission application, within the deadline set by this announcement.

● **Selection Procedure:**

After the deadline of the announcement, the Selection Committee, which will be composed of three (3) Faculty Members of SISSA, three (3) Human Technopole Members, and one (1) external, will evaluate the documentation produced by the candidates (*curriculum vitae*, letters of recommendation, etc.). Candidates who have obtained a minimum score of 7/10 will be invited to take the written test via zoom on **5th September 2022**. Those who will obtain a minimum mark of 28/40 in the written test, will be admitted to the interview which will be held on **16th September 2022** via zoom, with scheduled times that will be communicated later on.

For the interview, the candidate should be reachable at the address indicated in the application, at the time communicated by SISSA through email.

Candidates should show an ID document for identification at the beginning of the interview. The absence of a contact email in the application or of a valid ID during the interview, imply the exclusion from the competition.

● **Admission:**

The admitted candidates will be notified by email and will be asked to be present at SISSA on 3rd October 2022, for the registration.

Failure to do so without a valid reason will result in the loss of the fellowship awarded.

In order to be enrolled and to be awarded the fellowship, admitted candidates must pay a "Regional Tax" of the amount of € 120,00 - € 160,00 per year. Information can be retrieved at http://www.ardiss.fvg.it/.

For information about rights and duties of the doctoral students please consult the Teaching Regulations of the PhD courses of SISSA.

As per Legislative Decree 30.06.2003 n.196, and of the European Regulation 2016/679 (General Data Protection Regulation), we inform that all data given to this Administration will be processed only for purposes related to and instrumental to the existing contract, in compliance with the provisions in force.

The Director
Prof. Andrea Romanino
(digitally signed)

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Project: The project will deal with the development and application of data science and artificial intelligence methods to the issues of molecular biomedicine. Each project will be followed by a SISSA supervisor (for the theoretical/methodological part) and by an HT supervisor (for the biomedical problem).

Research Fields: The last two decades have witnessed an unprecedented development of biotechnology. This has led to the availability of increasingly extensive databases documenting at the molecular, genetic and phenotypic level a large number of biological and pathological processes. However, extracting biological knowledge, and consequently clinical strategies, from this large mass of high-dimensional data represents a formidable open problem at the intersection of biology, computer science and physical sciences. These three projects, part of the strategic collaboration between the data theory and science group at SISSA and the Institute for Computational Biology at HT, will develop new methodologies in the field of biomedical data science. Specifically, the research areas will be:

- **Novel machine learning methods for large medical imaging datasets**
  Large datasets comprising medical images from thousands of patients are now available and may contain information that could change the way we treat patients, from cancer to autoimmune diseases. However, those require radically new methods based on machine learning able to deal with the scale, multidimensionality, and complexity of the data.

- **Predicting evolution in adaptive biological systems, from cancer to bacteria**
  Ecological and evolutionary processes of microbial pathogens and cancer are key to understanding treatment resistance. Despite recent theoretical and experimental advances in the field, we still do not have a framework to predict ecological and evolutionary processes in microbes and cancer. We will combine systems-biology approaches, evolutionary models, statistical methods, and data analysis to develop mechanistic models of ecological and evolutionary processes that can predict evolution.

- **New machine learning methods for single cell multi-omic data**
  It has become recently possible to profile the molecular content of human cells at unprecedented resolution. Those multidimensional datasets from single cells are highly complex and hard to interpret in a biologically meaningful way. We need to develop novel machine learning algorithms for data integration and interpretation that will allow extracting new biological and medical information from those datasets.

- **Single-nucleotide resolution modeling of cell molecular machineries**

The resolution with which we can profile molecular processes on human cells goes way beyond our ability to analyze them with standard methods. We will develop computational methods to analyze thousands of molecules driving the cellulat machinery. Methods from spectral analysis and Natural Language processing (i.e. Transformers) will be employed to fully recapitulate these dynamics.

Qualification required: Italian **laurea** or **laurea specialistica/magistrale,** or equivalent degree obtained abroad

Amount of the fellowship: € 20.037,36 gross per year (approx. € 1.195,47 monthly net) financed by Human Technopole Foundation

Duration of the programme: 4 years (starting from 1 October 2022)

Deadline for online submission of applications: 31st August 2022 (13.00 hrs – Italian Time)

Admission: Academic and scientific qualifications + written test + oral exam

Written Test (remotely): 5 September 2022
Oral Exam (remotely): 16 September 2022

Evaluation of academic and scientific qualifications: 10 points
Access to Written test: minimum mark of 7/10 in the academic and scientific qualifications

Evaluation of written test: 40 points
Access to Oral Exam: minimum mark of 28/40 in the written test

Evaluation of Oral Exam: 50 points
Minimum Evaluation of oral exam: 35/50
Total Evaluation: 100 points
Eligibility: 70 points

Admission to the written test, oral exam and results of all evaluations will be notified by email.