Offer #2024-07728

PhD Position F/M PHD: Improve the design, evaluation and implementation of readable data visualizations

Contract type: Fixed-term contract

Level of qualifications required: Graduate degree or equivalent

Fonction: PhD Position

About the research centre or Inria department

The Inria Saclay-Île-de-France Research Centre was established in 2008. It has developed as part of the Saclay site in partnership with Paris-Saclay University and with the Institut Polytechnique de Paris.

The centre has 39 project teams, 27 of which operate jointly with Paris-Saclay University and the Institut Polytechnique de Paris; its activities occupy over 600 people, scientists and research and innovation support staff, including 44 different nationalities.

Assignment

The goal of this PhD project is to improve the quality of data visualizations by formalizing the concept of "visualization readability" in terms of theory, empirical instruments, and implementation. These project goals are important for society, research, and practice because the ability to create higher-quality visualizations impacts professionals and citizens alike who increasingly interact with data visualizations in daily decision-making, statistical inference, learning, or communication. When looking at examples of data visualizations it is clear that some appear more readable; or put differently, it seems easier to retrieve information from some visualizations than others. But to what extent is one more readable than the other? How can we test differences in readability between visualizations and understand better how readability relates to factors of visualization design such as layout, data complexity, the audience, or the tasks?

To answer these questions, we are first faced with the challenge that the term "readability" is not well defined in the visualization field; even though improving readability is one of its most central research goals. So far the community broadly defines the "readability of a visualization" as the ease with which a reader can retrieve information from a visual representation of data. While this is an acceptable starting definition, readability is still an ill-defined concept. It is often discussed as a quality metric for visualizations—-even though readability is potentially highly personal and context-dependent and we have no standardized instruments to measure it for a particular person or group of people such as experts or novices. The PhD tackles a challenge that, if solved, will have a foundational impact on the field of visualization as it tries to address the fundamental question: "What makes a visual data representation readable?" The PhD work is innovative, ambitious, and original and will impact:

- Theory: Formally defining readability will affect data visualization theory and and practice;
- Evaluation: New instruments to measure readability can help to study unanswered empirical questions in the visualization research field. For example, we can build benchmarking workflows that test the scalability and usability of existing visualization techniques and algorithms under the constraint of human readability for a wide variety of different dataset sizes.
- Design: Theoretical grounding of the readability concept in visualization will allow us to improve 1) teaching materials for designers, 2) the design process 3) and ultimately, the quality of visualizations.
- Applications: Validated readability instruments can help to design, verify, and improve a new generation of visualization recommender and onboarding systems that help novice users read visualizations and understand data.

Main activities

The PhD work will have several core work objectives (to be prioritized based on the student’s interest and expertise):

- Theory building (Year 1–3):

  The ultimate goal is to build the first model of visualization readability. The student will classify existing visualization assessment approaches and extract fundamental components of visualization readability, and integrate models of text readability from the cognitive science literature, resulting in a coarse model of visualization readability. The student will refine this model during instrument building and validation in Years 2 and 3 (see below).
- Measurement instruments (Year 1-2):

The student will conduct studies to correlate the results of a validated scale we developed recently and measures from established instruments of cognitive and task effort, such as rating scales and physiological measures (e.g. via eye tracking). Qualitative methods, in the form of interview protocols, will round up their holistic assessment of visualization readability.

- Validation (Year 2–3):

With the help of the developed measurement instruments, the student will refine their theoretical model and assess additional visualization features that may impact readability. In the process, they will tackle some yet unsolved fundamental research questions in the visualization domain. They will study the roles of visualization construction, interactivity, aesthetics, visualization literacy, domain knowledge, tasks, and usage context that may involve motion on readability.

Further information:

https://drive.google.com/file/d/1lZgq3KXm0oWj4pHB3WDxUjsz6NZO2wZm/view?usp=drive_link

Skills

The PhD student should have an interdisciplinary background between psychology and design, with strong analytical and methodological skills, and research experience in a Computer Science lab / HCI research team.

Previous experience in applying quantitative and qualitative psychology research methodologies, publication writing, and experience programming in Python, R, CSS, HTML, and Javascript are a plus.

In addition, the student needs to be able to synthesize scientific literature, know basic statistics, craft engaging presentations, and have collaborative skills as well as project management skills.

Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

Remuneration

Gross salary 2,100 euros/mois

General Information

- Theme/Domain: Interaction and visualization
  Scientific computing (BAP E)
- Town/city: gif sur yvette
- Inria Center: Centre Inria de Saclay
- Starting date: 2024-10-01
- Duration of contract: 3 years
- Deadline to apply: 2024-06-03

Contacts

- Inria Team: AVIZ
- PhD Supervisor: Isenberg Petra / Petra.Isenberg@inria.fr

About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

Warning: you must enter your e-mail address in order to save your application to Inria. Applications
must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

**Instruction to apply**

**Defence Security:**
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST). Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

**Recruitment Policy:**
As part of its diversity policy, all Inria positions are accessible to people with disabilities.