Quantitative Neuroimaging Research Data Scientist
Cerebrovascular Surgery and Interventions Center (CSIC)
Boston Children's Hospital | Boston, MA

Position overview

The Cerebrovascular Surgery and Interventions Center at Boston Children's Hospital seeks an early-career (postdoc/fellow) quantitative imaging researcher to develop and apply advanced MRI analysis methods to pediatric cerebrovascular disease.

Our research addresses how vascular disorders affect blood flow, oxygen delivery, and brain health in fetuses, infants and children—and how quantitative imaging can guide treatment and measure its effects. The successful candidate will work closely with clinical investigators and MR physicists to translate these questions into reliable imaging measurements, develop reproducible analysis tools, and advance projects toward publication.

The position is well suited to a candidate with a background in biomedical engineering, medical image computing, MR physics, or a related quantitative discipline. **Experience analyzing MRI data is essential; pulse sequence programming is welcome but not required.**

Research focus

Current projects span several complementary areas:

- **4D flow MRI:** Quantification of cerebral vascular hemodynamics, including vessel segmentation, velocity and volumetric flow measurements, and analysis of single- and dual-velocity-encoding acquisitions in children with complex vascular malformations.
- **Cerebrovascular reactivity:** Development and application of functional MRI processing workflows to assess cerebrovascular reserve, generate quantitative maps, and produce standardized research reports.
- **Cerebral blood flow and oxygenation:** Analysis of phase-contrast MRI and quantitative methods for estimating venous oxygen saturation and oxygen extraction, including TRUST MRI and emerging asymmetric spin-echo approaches.
- **Advanced vascular imaging:** Opportunities to contribute to fetal MR angiography, accelerated imaging, and image reconstruction in collaboration with MR physicists.

Projects include studies of vein of Galen malformations and other pediatric cerebrovascular disorders, and involve both specially acquired research imaging data as

well as patient data from funded clinical research projects. Note that specific methodological projects may be shaped by the candidate's expertise and interests. We have an ongoing collaboration with MIT, and the successful candidate will be expected to continue and foster that relationship.

Key responsibilities

- Develop, validate, and maintain quantitative MRI analysis pipelines in Python and/or MATLAB.
- Perform image preprocessing, registration, segmentation, physiological modeling, and quantitative visualization.
- Evaluate measurement reliability and address motion, artifacts, and other challenges in pediatric imaging.
- Integrate imaging measurements with physiological and clinical research data.
- Implement documented, reproducible workflows for individual studies and larger cohorts.
- Collaborate with clinicians and MR physicists on acquisition protocols, analysis strategies, and interpretation.
- Take intellectual ownership of research projects and contribute to manuscripts, conference presentations, and new research directions.
- Support other investigators through training, documentation, and maintenance of shared analysis resources.

Required qualifications

- An advanced degree in biomedical engineering, electrical engineering, computer science, physics, neuroscience, applied mathematics, or a related field, or equivalent relevant research experience.
- Early-career phase (postdoc/fellow level)
- Demonstrated experience in quantitative MRI analysis.
- Strong scientific programming skills in Python and/or MATLAB.
- A solid foundation in image processing, numerical analysis, and quantitative research methods.

- Ability to work independently, troubleshoot technical problems, and collaborate effectively with clinical and technical investigators.
- Strong organizational, documentation, and scientific communication skills.
- US residents or citizens are encouraged to apply

Preferred experience

Experience in one or more of the following areas would be valuable:

- Phase-contrast or 4D flow MRI.
- Functional MRI, cerebrovascular reactivity, or physiological signal analysis.
- Quantitative relaxometry, cerebral oxygenation, or other physiological MRI methods.
- Vascular segmentation, image registration, and neuroimaging tools such as FSL, AFNI, or ANTs.
- Reproducible scientific computing using Linux, Git, and containerized workflows.
- MR reconstruction, accelerated imaging, or Siemens/Philips pulse sequence development.
- Machine learning methods relevant to image analysis.

Expertise in every area is not expected. Candidates with strong quantitative MRI skills and an interest in learning new methods are encouraged to apply.

Research environment

The position is based within CSIC, with close collaboration across neurointerventional radiology, neuroradiology, neurosurgery, and MR physics. It offers the opportunity to connect computational research directly with important clinical questions, contribute to multidisciplinary publications, and develop methods for studying rare and complex pediatric cerebrovascular disorders.

How to apply

Please send a CV, a brief statement of relevant experience and research interests, a representative publication or software project if available, and contact information for two references to **darren.orbach@childrens.harvard.edu**