

Postdoctoral position

Learning front propagation from multi-modal data

The MEDIA IRM 3D (MEDical Data Intelligent Analysis - Interpretation, Reconstruction and Manipulation in 3D) project is based on the advent of new modeling approaches at the intersection between the physics of MRI, large-scale numerical simulation based on mathematical models, machine learning and high-performance computing. Our ambition is to allow a new generation MRI (3T and 7T) to become a real tool for diagnosis, prediction, simulation and medical decision support through completely non-invasive medical screenings.

We are interested here in monitoring the evolution of gliomas seen as the growth of fronts. Recent magnetic resonance imaging methods and their associated post-processing methods (multi-modal data fusion) provide not only a large amount of anatomical data but also metabolic information.

The influence of each of these attributes on tumor growth can be of a mechanical and/or biological nature. The goal of this post-doc is the estimation by machine learning methods of the behavior of tumor growth from the data mentioned above, using the mathematical framework of front propagation models. The main task will be to assess the effectiveness of this approach with regard to the models chosen and the available data.

We believe that this approach is general enough to be able to be transposed to other fields such as subsurface flows or forest fires, where the multimodal nature of the available data allows a data-driven approach of modeling. The post-doc will be responsible for evaluating the generalization of the methodology to these other scientific fields.

Essential criteria

- Experience in Machine Learning basics.
- Python and common libraries for numerics and machine learning *i.e.* NumPy/SciPy, Tensor Flow/Keras, scikit-learn, PyTorch, Matplotlib, pandas.
- Good writing and communication skills.

Desirable criteria

- Level-set methods for front propagation.
- Knowledge of collaborative development tools (GitHub)
- Experience working in a multidisciplinary environment/team.
- Aspiration to apply the methods to diverse scientific fields.

To apply, or if you have any inquiries send your CV to:
julien.dambrine@math.univ-poitiers.fr .

The application deadline is **July 15, 2021**.

The preferred starting date is **September 30, 2021**.

Location: Laboratoire de Mathématiques et Applications, Poitiers, France.

Grant: MEDIA IRM3D (subvention de recherche région Nouvelle-Aquitaine) / LRCom I3M (Siemens/CNRS/Université de Poitiers).

Advisors: Mathieu Naudin, Julien Dambrine (LMA, Poitiers, France), Romain Chassagne (Heriot-Watt Univ., Edinburgh, UK).

Duration: 12 months.