Department of Computational and Data Sciences
Indian Institute of Science
Bangalore - 560012

Advertisement No : CDS/KA/SERB-SRG/DEC2020/PA

Date: 04/12/2020

Advertisement for the post of Project Assistant

Applications are invited for a Project Assistant position in the FLAME lab at CDS, IISc. The details are provided below:

Specific Roles and Responsibilities: The project work involves the following tasks -

- Deriving numerical schemes to solve Navier-Stokes Equations using Discontinuous Galerkin (DG) Method.
- Implementation of a scalable 3D DG solver on massively parallel computing systems.
- Presenting results at conferences and writing journal papers.

Essential Qualifications:

- Undergraduate (B.Tech, B.E.) or masters level (M.E., M.Tech or equivalent) degrees in mechanical, aerospace, chemical, computer science, computational and data sciences or equivalent subjects.
- Knowledge of numerical methods, linear algebra, probability, fluid dynamics, programming concepts (e.g., loops, logic of sorting, indexing, etc.)
- Experience in finite element/discontinuous Galerkin methods (preferable)
- Familiarity with Fortran or C/C++
- Familiarity with the fundamentals of parallel programming (preferable)

If there is no prior experience in parallel programming or FEM, candidates must demonstrate an interest to learn these topics.
Please revise Linear Algebra, Numerical Methods and Programming concepts before appearing for the interview.
The applicants are expected to be comfortable with Unix/Linux operating system, possess good communications skills (speaking and writing) and should be willing to work in a team environment. They should have the enthusiasm to learn new concepts and work on new problems.

Salary: Rs. 20,000 - Rs. 31,000 per month + HRA (depending on experience; as per GOI norms)

Terms of Appointment: Initially for one year and renewable thereafter depending on performance.

Conversion to Ph.D.: If the performance is outstanding, the candidate will be considered for admission to our regular Ph.D. program and stands a good chance in gaining an accelerated Ph.D. (subject to all IISc norms and regulations)

How to Apply: Interested candidates may send their resume by email to: konduriadi@iisc.ac.in (preferably in pdf format, with subject marked "Advertisement No. CDS/KA/SERB-SRG/DEC2020/RA"). Candidates should also complete the programming task and send the link to the git repository of the solution with the mail. In the resume, provide evidence to meeting the essential qualifications listed above.

Programming Task: Complete the programming task given in the next page.

Online Interview: Based on the applications, candidates will be called for online interviews.

Last Date for Application: Rolling advertisement until the position is filled.

Contact Details:
Dr. Konduri Aditya
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Indian Institute of Science
Bangalore - 560012
Website: FLAME Lab

Programming task

Solutions of diffusion equation

Consider the problem of 1-D unsteady diffusion equation ($u_t = u_{xx}$) in the domain [0,1] with periodic boundary conditions. Let the initial condition be $u(x, 0) = sin(2\pi x)$.

(a) Derive the analytical solution for the above problem.

(b) Obtain a equation using explicit Euler (time derivative) and second order central difference (space derivative) schemes.

(c) Develop a Fortran/C/C++ code and perform the numerical simulations for various grid resolutions.

(d) Using a timestep of 0.00001, plot the solution at 0, 100, 500 and 1000 time steps for 128 grid resolution.

(e) Compute the average error in the domain at each timestep.

Please include the code, input files in your git repository. Prepare a report with plots attached and all the parameters clearly mentioned.