Potluri Vachan Deep

Ph.D. research scholar, IIT Bombay

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https://vachan-potluri.github.io/

Skills

Programming languages	C++, Python, MATLAB/Scilab
CFD software	OpenFOAM, SU2, deal.II, FLEXI/FLUXO
CFD-related software	ParaView, SALOME, Gmsh
Other software/tools	Git/GitHub, Linux, LaTeX, SOLIDWORKS

Education

Ph.D. Mechanical Engineering | IIT Bombay — Jul '18 – present

Thesis topic	Development and analysis of discontinuous Galerkin computational framework for high order simulation of hypersonic shock-boundary layer interaction
Key electives	High Performance Scientific Computing, Galerkin Methods for Fluid Dynamics, Magnetohydrodynamics and its engineering applications
CPI	9.86

B.Tech. Mechanical Engineering | IIT Bombay — Jul '14 – Jul '18

CPI	9.72
Key electives	Numerical Methods for Conservation Laws, Computational Fluid Dynamics and Heat Transfer, Finite Element and Boundary Element Methods, Essentials of Turbulence, Fuels and Combustion, Introduction to Thermoacoustics

Related experience

- **Development and analysis of discontinuous Galerkin simulation framework for compressible flows** — Jul '19 – present
  Ph.D. thesis | IIT Bombay
  - **Developed a solver** PLENS implementing a DG subcell limiter using deal.II C++ FEM library
  - **Performed an extensive computational study** and demonstrated superior accuracy/DoFs of high order solutions even in presence of shocks
  - **Proposed and validated an extension** of the subcell limiter for its use in hypersonic regime
  - **Conducted a performance comparison** of an equivalent solver FLUXO with OpenFOAM and SU2 and illustrated its higher accuracy/cost and accuracy/memory
- **High performance parallel programming task** — Jan '19 – Apr '19
  Course project | IIT Bombay
  - **Developed and tested** OpenMP, MPI and CUDA versions of a 2D cartesian inviscid compressible flow solver
- **Development of high resolution schemes for compressible flows in OpenFOAM** — Dec '16 – Apr '18
  B.Tech. project | IIT Bombay
  - **Modified an existing solver** rhoCentralFoam to use TVD-RK3 time integration scheme
  - **Introduced a new solver** ausmPlusUpFoamRK3 to implement AUSM$^+$-up flux scheme along with TVD-RK3 time integration method
  - **Presented a comparative study** of these two solvers by performing simulations of several 1D and 2D test cases to identify vulnerabilities of the flux schemes
    - Kurganov-Tadmor: stationary slip lines
    - AUSM$^+$-up: strong multidimensional expansions

Other experience

- **Guest Lecturer** — Apr '21 – Apr '23
  Prime Minister's Research Fellowship deliverable | VJTI, Mumbai
  - **Taught** gas dynamics and incompressible potential flow as part of M.Tech. fluid dynamics course
  - **Delivered software demonstrations** of OpenFOAM and Scilab as part of B.Tech. CFD lab

- **Unified 2D Finite Element development** Mar ‘18 – Apr ‘18
  Course project | IIT Bombay
  - **Implemented and validated a subroutine** in FORTRAN77 library FEAP for a new combined Plane Stress, Plain Strain and Axi-symmetric linear Elasto-static element
- **Stair climbing chair project** Jul ‘17 – Dec ‘17
  Course project | IIT Bombay
  - **Designed a mechanism** for a passive chair capable of climbing stairs using a companion’s force
  - **Built a full-scale basic functioning prototype** costing less than INR 10,000 in 2 months
  - **Demonstrated the prototype effectiveness** on 2 different stair geometries
- **GE90 HPC airfoil durability analysis** May ‘17 – Jul ‘17
  Internship | John F. Welch Technology Center, General Electric, Bangalore
  - **Modified existing mesh** of GE90-115B high pressure compressor stage-9 rotor blade, to model
    1. Three kinds of damaged blades by making notches at different locations on the leading edge
    2. Defectively manufactured blades by changing leading edge thickness according to manufacturing tolerance
  - **Generated Campbell Diagrams** by simulating the vibration response in ANSYS and **recalculated fatigue factor of safety** at critical locations of undamaged, damaged and defected blades for 3 different materials

Publications

Journal articles

[1] V. D. Potluri, B. P. Puranik, and K. V. Bodi. “High order discontinuous Galerkin simulation of hypersonic shock-boundary layer interaction using subcell limiting approach”. In: *Journal of Computational Physics* 485 (2023), p. 112117.

[2] V. D. Potluri, B. P. Puranik, and K. V. Bodi. “The effect of basis polynomial degree on the performance of discontinuous Galerkin simulations of compressible flows”. In: *Computers & Fluids* (Under review).

Conference proceedings

[1] V. D. Potluri, B. P. Puranik, and K. V. Bodi. “Effect of polynomial degree on discontinuous Galerkin simulation of Euler equations”. In: *24th International Shock Interaction Symposium*. Springer Nature, 2022.

[2] V. D. Potluri, B. P. Puranik, and K. V. Bodi. “A performance comparison of OpenFOAM, SU2 and FLUXO for simulation of shock boundary layer interaction”. In: *14th Asian Computational Fluid Dynamics Conference*. Extended abstract submitted.

Honours

- Awarded **Prime Minister’s Research Fellowship** (PMRF) to pursue Ph.D. in high order numerical methods for hypersonic flows — May ‘18
- **Scored 829** in Graduate Aptitude Test in Engineering (GATE) 2018 — Mar ‘18
- **Secured All India Rank 129** in JEE Advanced 2014 in general category — May ‘14
- Offered **Kishore Vigyanik Protshahan Yogana** (KVPY) fellowship by Indian Institute of Science (IISc), Bangalore — Dec ‘13
- **Secured position among top 1% students** of former Andhra Pradesh who appeared for National Standard Examination in Physics (NSEP) — Dec ‘13

Extracurricular activities

- **Grade 6 Guitar musician** certified by Trinity College London — Sep ‘11
- **Grade 8 Piano musician** certified by Trinity College London — Nov ‘10

References

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