

# 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	ParaView, SALOME, Gmsh
Other	Git/GitHub, Linux, L <sup>A</sup> T <sub>E</sub> X, SOLIDWORKS

## Education

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

Thesis title 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 subcell limiter using the 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

◆ **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<sup>+</sup>-up flux scheme along with TVD-RK3 time integration scheme
- **Presented a comparative study** of these two solvers by performing simulations of several 1D and 2D test cases to draw conclusions relevant to the flux schemes

## 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 a subroutine** in FORTRAN77 library FEAP for a new combined Plane Stress, Plain Strain and Axi-symmetric linear Elasto-static element, and validated the subroutine using simple test cases

## ◆ 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 10,000 INR 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 types of damaged blades by making notches at different locations on the leading edge
  2. A defectively manufactured blade by changing thickness of leading edge 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