VISHAL SUBRMANIAN

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Research Interests

- Integrated Computational Materials
- Multiscale modelling of materials
- Phase-field Modelling
- High performance computing
- Additive Manufacturing
- Computational Fluid Dynamics

Education

Dual Degree (B. Tech + M. Tech) (2014 – 2019)

- Department of Metallurgical and Materials Engineering, Indian Institute of Technology Madras, Chennai, INDIA
- Minor : Foundations of Physics
- CGPA: 9.26/10 (Rank : 1)

Scholastic Achievements

- Awarded Institute Merit Prize for the **best academic performance** in the 4^{th} year of Dual Degree programme (2019)
- Secured **AIR 58** in Graduate Aptitude Test in Engineering (GATE) (2018)
- Recipient of **Ministry of Steel Scholarship** for securing $\mathbf{1^{st}}$ **rank** till 6^{th} semester of Dual Degree programme (2017)
- Awarded Sri Satish Pai Prize for the **best academic performance** in the 2^{nd} year of Dual Degree programme (2017)
- Secured **AIR 3836** in JEE (Advanced) (2014)
- Selected for **INSPIRE fellowship** for being among the **top 1%** in AISSCE (2014)
- Received **Merit certificate** for being among the **top 0.1% of candidates** in AISSE (2012)

Conference Presentations

- **Vishal S.**, Gandham Phanikumar, *Simulation of deep penetration welding using OpenCL on GPU*, NMD - ATM, Kolkata, 14 - 16 November 2018.
- Abhik Choudhury, **Vishal S.**, Gandham Phanikumar, Shyamprasad Karagadde, Abhishek G.S., *Prediction of microstructure and cracking susceptibility during additive manufacturing: State of the art and challenges*, NMD - ATM, Goa, 11 - 14 November 2017.

Workshop

- Attended DAE-BRNS workshop on **Laser Additive Manufacturing & Allied Technologies (LAMAT)** in Raja Ramanna Centre for Advanced Technology (RRCAT), Indore, India, 8-12 October 2018.
- Attended **ICME Approaches to Innovation in Biomedical Implants** in Indian Institute of Science (IISc), Bengaluru, India, 10-12 August 2018.

Research Experience

Modelling of solidification cracking in laser based additive manufacturing
Advisors: Prof. Gandham Phanikumar and Dr. Abhik Choudhury Aug 2018 - Ongoing

- **Developed codes in OpenFOAM** to model the heat transfer during additive manufacturing process
- **Calculated the residual stress** in the domain to predict the cracking susceptibility

Simulation of deep penetration welding using OpenCL on GPU
Advisor: Prof. Gandham Phanikumar Jan 2018 - Apr 2018

- Implemented **double enthalpy model** to model the solid-liquid and liquid-vapour interactions
- Included **OpenCL kernels** to parallelise the codes and achieved a significant performance upgrade

Hot cracking susceptibility of Ni-based superalloys during laser based additive manufacturing
Advisors: Prof. Gandham Phanikumar and Dr. Abhik Choudhury Dec 2016 - Jan 2018

- Computed the **thermal profiles and weld pool geometries** using Computatonal Fluid Dynamics (CFD)
- Performed **phase field simulations** using in-house codes to observe the evolution of microstructure

Study of grain growth characteristics in spark plama sintered MgO
Advisor: Prof. B S Murty June 2015 - July 2015

- Performed ball milling, spark plasma sintering, XRD and SEM analysis of MgO
- Optimised the sintering conditions to prevent grain growth in MgO

Flow in a channel with an obstacle
Course : Foundations of CFD Jan 2017 - Apr 2017

- Developed codes in C++ to model the flow of liquid in a channel over an obstacle
- Performed post processing and visualization in MATLAB

Calculation of Interfacial energies for θ' precipitates in Al-Cu matrix
Course : Atomisitc Modelling of Materials Aug 2017 - Nov 2017

- Proposed methodology to calculate the interfacial energy between a precipitate and the matrix
- Created supercell to calculate interfacial energy which is a useful input for Phase field modelling

Industrial Internships

Phase field modelling of microstructural evolution
John Deere, India May 2018 - July 2018

- **Developed codes** and integrated with FEM software to solve phase field equations
- Modelled the evolution of microstructure during **solid-solid and eutectic transformations**

Enhancing the hardness of 22 kt gold
TITAN Industries, India May 2016 - July 2016

- **Casted different alloy systems** to increase the hardness without compromising purity and aesthetics
- **Achieved increased hardness** (two times) which significantly improved the durability

Technical Projects

Waterfall Graphic Print in *Envisage*[1] *(Shaastra*[2] *)* Aug 2015 - Jan 2016

- Contributed to image processing and Arduino programming for the project
- Won the **most innovative project** award - CFI[3] awards 2016

Augmented Reality App in *Computer Vision* Jan 2015 - Apr 2015

- Part of a 3 member team for executed Image processing techniques
- Implemented OpenCV to get the desired results

Teaching Experience

- Teaching assistant for undergraduate course **Computational Materials Engg. Lab** (Aug - Nov 2018)

Computational Skills

- **Languages** : C/C++, Fortran, Python, MATLAB
- **Software** : Thermo-Calc, Quantum ESPRESSO
- **Parallel Computing** : OpenMP, Open MPI, OpenCL
- **Electronic platform** : Arduino
- **Computer Vision** : OpenCV, ImageJ
- **Continuum** : OpenFOAM, Abaqus
- **Visualization** : ParaView, VESTA
- **Scientific Tools** : Origin, X'Pert HighScore

Relevant Course Work

Computational Materials
- Atomisitc Modelling of Materials
- Foundations of CFD
- Computational Materials Thermodynamics
- Computational Materials Engg. Lab

Maths and Physics
- Mathematical Methods for Chemical Engg.
- Differential Equations
- Quantum Physics
- Probability, Statistics and Stochastic Processes

Materials Science
- Mechanical Metallurgy
- Stability of Microstructures
- Solidification Phenomena
- Micromechanics
- Electronic materials, devices and fabrication

Other Course Work

- Programming, data structures and algorithms using Python by Prof. Madhavan Mukund (NPTEL)
- Machine Learning by Stanford University on Coursera. Certificate earned at Friday, June 22, 2018 5:47 PM GMT
- Phase Field Modelling for Microstructural Evolution by Prof. Peter W. Voorhees (GIAN)

Position of Responsibility

Core - Events, Amalgam[4] 2018 Jan 2018 - Apr 2018

- Introduced new events ranging from coding, writing to quizzing and revamped the structure of Amalgam
- Handled all the logistics and requirements of events by coordinating with other teams

Deputy Placement Coordinator - Institute Placement Team 2015 Jan 2015 - Apr 2015

- Managed the logistics during the placement session for about 1200 aspirants
- Contributed to the department placement portal by uploading preparation material on a timely basis

Extra/Co-Curricular Activities

- Performed on stage for **Envisage**[1]**, Shaastra**[2] **2015** as a part of **Envisage Choreo Team**
- Won **Wodehouse-Agatha-Asimov** award for fiction writing competition in the humour category during AlumNite 2018
- Won **Ultimate Metallurgist**, **Group Discussion** and **Process Planning** in Amalgam[4] 2016
- **Star Volunteer** of the project "Computer literacy for all" under the **National Service Scheme**[5] for the year 2014-2015
- **Rajya Puraskar awardee**, the second highest stage of advancement of a Scout, in **Bharat Scouts and Guides**[6]

[1] India's largest student organized techno-cultural show in Shaastra
[2] ISO certified Annual Technical Fest of IIT Madras
[3] Centre For Innovation (CFI) is a forum for student innovation at IIT Madras
[4] Annual symposium conducted by the Dept. of Metallurgical and Materials Engg., IITM
[5] NSS, IIT Madras chapter under Govt. of India
[6] A voluntary, non-political, educational movement (www.bsgindia.org)