Vishal Tiwari

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EDUCATION

University of Massachusetts, Dartmouth — Physics Department, *Dartmouth, MA*
Master of Science, Physics *Sep. 2018 – Current.*
Advisor: Dr. Robert Fisher
GPA: 4.00 / 4.00

International Institute of Information Technology - Hyderabad, *Telangana, India*
Bachelor of Technology (Honours) & Master of Science in Computer Science and Engineering *Aug. 2010 – Jul. 2017*
MS Thesis: Geo-Visualization in 4D environment - Simulation of floods over an Urban Area
Advisor: Dr. K. S. Rajan

PUBLICATIONS

- **The Late-Time Light Curves of Single-Degenerate Type Ia Supernovae, Vishal Tiwari**, Or Graur , Robert Fisher, Yossef Zenati, Hagai Binyamin Perets, Oded Papish, Ivo Seitenzahl. (In preparation)
- **Three Dimensional Dynamically Driven Double-Degenerate Double-Detonation Simulations for Type Ia Supernova, Vishal Tiwari** , Robert Fisher , Rahul Kashyap , Pablo Lorén-Aguilar , Enrique García-Berro.(In preparation)

CONFERENCES AND TALKS

- *APS New England 2018 Fall section meeting, November 3, 2018* - Talk on **"Constraining Type Ia Supernovae with Models and Observations of Late-Time Light Curves."**
- *22nd Eastern Gravity Meeting, May 31st, 2019* - Talk on **"Dimensional Dynamically Driven Double-Degenerate Double-Detonation Simulations for Type 1a Supernova."**
- *High Performance Computing Day, UMass Lowell, May 21, 2019* - Poster on "**Three Dimensional Dynamically Driven Double-Degenerate Double-Detonation Simulations for Type Ia Supernova."**
- XSEDE HPC Workshop - Summer Boot Camp - June 3-6, 2019 from Boston University.
- **A Chan Vese based method of texture extraction for automated texture draping of 3D geospatial objects**, *2015 IEEE International Geoscience and Remote Sensing Symposium (IGARSS). July 26-31, 2015; Milan, Italy*, **Vishal Tiwari**, K. S. Rajan

SKILLS & OTHERS

Astrophysical Simulation Tools: FLASH, MESA, GIZMO
Programming Languages/Scripting: C/C++, Fortran, Python, Matlab , Java , Bash, Javascript
Data Analysis and Visualization Tools/libraries: yt, OpenGL, Processing
Debuggers: pdb, Arm DDT, gdb
HPC Skills: MPI, OpenMP
HPC Systems used: TACC-Stampede2, NASA-Pleiades , UMass Dartmouth-Carnie
Nuclear Reaction Networks: Skynet, XNet, Torch

RESEARCH/TEACHING EXPERIENCE

Research Assistant, *UMass Dartmouth, MA* *Jun. 2019 – Current.*
Working on the progenitor problem of Type Ia Supernova
- Continuing the work on late-time light curve study to constraint the progenitors of Type Ia supernova.
- Exploring GIZMO to make new initial conditions for Dynamically Driven Double Degenerate Double Detonation(D6) models for Type Ia.
- Explored XNetFlash, which is a highly paralleled nuclear reaction network which runs across multiple GPUs. We will couple it with our D6 simulation code which will be run on Summit.

First Year Doctoral Fellow, *UMass Dartmouth, MA* *Sep. 2018 – May. 2019*
Worked on the progenitor problem of Type Ia Supernova
- Worked on three dimensional numerical simulations to study the Dynamically Driven Double Degenerate Double Detonation Model for Type Ia supernova.
- Late-time light curve study to constraint the progenitors of Type Ia supernova.

Research Intern, *Indian Institute of Astrophysics , India* *Nov. 2017 – Mar. 2018*

- Worked on x-ray spectral analysis of Low Surface Brightness galaxies.

Teaching Assistant, *IIIT-Hyderabad , India*
Responsible for taking tutorial sessions, managing assignment portal and grading exams for the following Computer Science courses:
- Principle of Programming Languages *Aug. 2013 – Dec. 2013*
- Spatial Informatics *Aug. 2014 – Dec. 2014*

WORK EXPERIENCE

Technology Associate — Morgan Stanley, *Bangalore, India* *Aug. 2015 – Oct. 2016*
Worked with the Global Banking Team as a Java developer developing lending based services.

Software Development Intern — HackerRank, *Bangalore, India* *May. 2014 – Jul. 2014*
Worked on expanding width and depth of HackerRank Brahma Api and adding blog support for HackerRank users.

Software Development Intern — Google Summer of Code, *2013* *May. 2013 – Aug. 2013*
Worked for Open Source Geospatial Foundation (OSGeo).

PHYSICS PROJECTS

Constraining Type Ia Supernova progenitors using Late time Light Curve
Guide: Dr. Robert Fisher
- Late-time light curves provides an independent method to constrain the progenitors of Type Ia supernova. We explored the channel in which the late-time light curve is primarily powered by the slow radioactive decay of ^{57}Co. Using this we compared five near-by events (2012cg, 2011fe, 2015F, 2014J, 2013aa) with single-degenerate and double-degenerate simulation models.

Dynamically Driven Double Degenerate Double Detonation Model for Type Ia
Guide: Dr. Robert Fisher
- We performed three-dimensional simulations of the D6 model using the FLASH code. In this double-degenerate channel, the primary and secondary white dwarfs have thin helium shells, and a detonation in the helium layer of the primary can lead to a second detonation of carbon in primary's core leading to a normal Type Ia.

Gravitational Wave Data Analysis using Deep Neural Network
Guide: Dr. Scott Field
- Working on training a deep convolutional neural network classifier for precessing binary black hole systems. We are generating gravitational waveforms using the gwsurrogate models and will be training a CNN on this data as a classifier.

Exploration of Mass Distribution Function of Black holes and Neutron Stars using MESA
Guide: Dr. Robert Fisher
- Worked on calculating a mass distribution function of black holes and neutron stars. Made use of MESA to run one dimensional main sequence to pre-core collapse models to calculate the Fe core mass, Si shell mass. The total remanent mass was roughly estimated from the gas having outward velocities less than the escape velocities. I calculated a total of 100 models using a framework that I wrote, which could run multiple models in parallel on a computer cluster to explore the parameters space of masses and metallicity.

COMPUTER SCIENCE PROJECTS

Geo-Visualization in 4D environment
Guide: Dr. K. S. Rajan
- Worked on the rendering of large CityGML building data model. We simulated flood using GRASS GIS, and also implemented a depth filling algorithm. This simulated data is given to our visualization framework, which renders a dynamic surface. Our 4D GIS framework is built on top of NASA world wind virtual globe.

Sports Analytics from Broadcast Tennis Videos
Guide: Dr. C. V. Jawahar
- We were analyzing broadcast tennis videos to find player style patterns. First post-processing steps include the extraction of high-level features like ball paths, player location, event detection, court extraction, etc. Basic analysis of players court coverage, balls coverage were carried out.

Google Summer of Code 2013 with OSGeo — Adding Voronoi Diagram to GEOS
Guide: Sandro Santilli
- GEOS(Geometry Engine Open Source) is a port for JTS and the project aims to provide the functionality of constructing Voronoi diagrams to it. Also making a thread safe C-wrapper for the C++ apis that have been ported.