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. 2015*
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.
- Using GIZMO to make new initial conditions for "dynamically driven double degenerate double detonation"(D6) models for Type Ia.
- Working with XNetFlash, which is a highly paralleled nuclear reaction network that 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"(D6) 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
Advisor: Dr. Robert Fisher
- Late-time light curves are thought to be powered by the radioactive decay of ^{57}Co and provide an independent method to constrain the progenitors of Type Ia supernova. During this work, I wrote a python framework that could extract the nuclear yields from a set of simulation models(which are in different file formats) and would compute and plot the 57/56, 55/56 which could be compared against observations.

Dynamically Driven Double Degenerate Double Detonation Model for Type Ia
Advisor: Dr. Robert Fisher
- We performed 3D simulations of the dynamically driven double degenerate double detonation"(D6) model for Type Ia supernova using the FLASH code. One of the major challenge was to make the code run on a new computer cluster, which had a different set of dependencies. My other major contribution was to write the refinement algorithm so that it refines only near the white dwarf and shocks, which helped in reducing the computational cost.

Gravitational Wave Data Analysis using Deep Neural Network
Advisor: Dr. Scott Field
- Working on training a deep convolutional neural network classifier for 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
Advisor: Dr. Robert Fisher
- Worked on calculating a mass distribution function of black holes and neutron stars. Made use of MESA to run a one-dimensional main sequence to pre-core collapse models to calculate the Fe core mass, Si shell mass. The total remnant mass was roughly estimated from the gas having speeds less than the escape velocities. I calculated a total of $\sim$100 models using a framework that I wrote, which could run multiple models in parallel on the UMassD local cluster to explore the parameters space of masses and metallicities.

COMPUTER SCIENCE PROJECTS

Geo-Visualization in 4D environment
Advisor: 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
Advisor: 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
Advisor: 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.