

# Vishal Tiwari

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## EDUCATION

**University of Massachusetts, Dartmouth — Physics Department, Dartmouth, MA**

*Master of Science, Physics*

Advisor: [Dr. Robert Fisher](#)

GPA: 4.00 / 4.00

*Sep. 2018 – Current.*

**International Institute of Information Technology - Hyderabad, Telangana, India**

*Bachelor of Technology (Honours) & Master of Science in Computer Science and Engineering*

MS Thesis: [Geo-Visualization in 4D environment - Simulation of floods over an Urban Area](#)

Advisor: [Dr. K. S. Rajan](#)

*Aug. 2010 – Jul. 2017*

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## PUBLICATIONS

- **The Late-Time Light Curves of Single-Degenerate Type Ia Supernovae**, Vishal Tiwari, Or Graur, Robert Fisher, Pranav Dave, Shing-Chi Leung, Ken'ichi Nomoto, Oded Papish, Hagai Binyamin Perets, Ken Shen. (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)

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## 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 Ia 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

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## 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

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## 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 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  $^{57}\text{Co}$ . Using this we compared five near-by events (2012cg, 2011fe, 2015F, 2014J, 2013aa) with single-degenerate and double-degenerate simulation models.(re-write)

#### **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.(re-write)

#### **Gravitational Wave Data Analysis using Deep Neural Network**

*Guide: Dr. Scott Field*

- Working on training a deep convolutional neural network classifier for preprocessing binary black hole systems. We are generating a the gravitational waveforms using the gwsurrogate models and will be testing it on the O1 and O2 LIGO datasets. (Re-write)

#### **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.(re-write)

## **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.