PRANAV SAMPATHKUMAR

Research Scholar (Department of Theoretical Physics) ⋄ Tata Institute of Fundamental Research, Mumbai, India

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RESEARCH INTERESTS

High Energy Physics and Cosmology with emphasis on numerical computations and Machine Learning.

EDUCATION

Tata Institute of Fundamental Research (TIFR), Mumbai, India   *Aug 2016 - Present*
M.Sc, Physics (Department of Theoretical Physics)
CPI: 72.52/100 (Presently)

SASTRA University, Thanjavur, India   *Jul 2011 - Jun 2016*
M.Tech (int), Advanced Manufacturing (Mechanical Engineering)
CGPA : 7.4/10

ONGOING RESEARCH PROJECTS

- **Cross corelation between GL and SZ maps to constraint Cosmological parameters**
  Supervisor: Subhabrata Majumdar
  TIFR, Mumbai   *Aug 2018- Present*
  The work involves understanding statistical analysis of data from a cosmology perspective. It also involves using libraries such as HealPy, PyFITS to manipulate the data (Part of Master's thesis)

- **Using Neural Networks to detect non-Gaussianities in the CMB**
  Along with: Tuhin S Roy, Rishi Khatri
  TIFR, Mumbai   *Dec 2018- Present*
  This work started very recently, tries to use neural network to detect non-Gaussianities in the CMB Sky map. The work involves finding novel methods to use neural networks on a spherical manifold.

PAST RESEARCH PROJECTS

- **Estimation of the mass gap in modified SYK hamiltonians**
  Supervisor: Gautam Mandal
  TIFR, Mumbai   *Aug 2018- Jan 2019*
  Worked on numerically estimating the massgap in Modified SYK hamiltonians. The work involved understanding the conformal limit in the SYK model and analytically computing the massgap in the conformal limit and numerically trying to compute the eigenvalues of large dimensional matrices to get as close to the conformal limit as possible.

- **Quark gluon discrimination using Deep Neural Networks**
  Supervisor: Tuhin S Roy
  TIFR, Mumbai   *Aug 2017- Jan 2018*
  Worked on building a convolutional neural network classifier to classify the quark jets from the gluon jets in particle accelerators. The work involved understanding the basics of neural networks and machine learning, build it using Tensorflow, make simulations of particle accelerators using Pythia, jet clustering using FastJet and understanding certain physics observables to classify jets the conventional way.

- **Rigidity percolation in wet granular systems**
  Supervisor: Purusattam Ray
  Institute of Mathematical Sciences (IMSc), Chennai   *Jun 2015 - Aug 2015*
  Worked on understanding rigidity transition by using percolation theory and modelling it similar to jamming transition in granular systems.

CONFERENCES & WORKSHOPS

- Cosmology - The Next Decade (School)   *Jan 2019*
  International Centre for Theoretical Sciences (ICTS) , Bangalore

- Nvidea Hands-on Workshop on GPU Programming,   *Dec 2018*
  TIFR, Mumbai

- Mumbai Pune Collider Meet   *Oct 2017*
  Indian Institute of Technology (IIT) Bombay, Mumbai

SEMINARS/TALKS

Neural Networks and Deep learning for Physicists   *Oct 2017*
Mumbai Pune Collider Meet, IIT Bombay, Mumbai

TECHNICAL SKILLS

Programming Languages	C, C++, Python, Bash Script
Softwares	Mathematica
Cpp-Libraries	ROOT, Pythia, FastJet, CUDA, OpenACC(Directives), OpenMPI
Python-Libraries	Tensorflow, PyFITS, HealPy, Matplotlib, NumPy

AWARDS AND SCHOLARSHIPS

- Research Scholar stipend at TIFR   *Aug 2016 - present*

- Summer fellowship at IMSc   *Jun 2015 - Aug 2015*

EXTRA-CIRRUCULAR

- Courses audited at TIFR: General Relativity, String Theory, Fluid Dynamics

- Represented SASTRA University in **SAE BAJA 2012 & 2013**

- Gave a series of talks in **Celeritas** (Physics forum at SASTRA University) teaching undergraduate physics for engineers.