DEEPAK SAMUEL

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ABOUT MYSELF

I am an experimental high energy physicist, with over ten years of experience in simulations, high performance computing, statistical analysis and instrumentation with a new found interest in machine learning.

I love coding and my analysis codes have been used to perform fast analysis of large cosmic-muon datasets, some of which have resulted in interesting discoveries.

I have been teaching quantum mechanics, electronics and nuclear physics for about 8 years and have striven to lay emphasis on developing an intuition for the subjects than on laborious derivations.

EXECUTIVE POSITIONS

Member, Executive Council, Central University of Karnataka	Jun 2020-Now
Member, Academic Council, Central University of Karnataka	Jun 2020-Now
Member, Court, Central University of Karnataka	Jun 2020-Now
Dean, School of Physical Sciences , Central University of Karnataka	July 2020-July 2023
Head, Department of Physics, Central University of Karnataka	Jun 2020-Jun 2023

WORK EXPERIENCE

Associate Professor, Central University of Karnataka — Jan 2020-Now
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Associate Professor, Saha Insitutute of Nuclear Physics (DAE), Kolkata — Jul 2019-Dec 2019
A short tenure, working in the field of neutrino physics and dark matter.

Assistant Professor, Central University of Karnataka — Mar 2014-Jun 2019
Taught quantum mechanics, electronics and nuclear physics to M.Sc and B.Tech students in addition to research guidance.

Postdoc, Harvard Medical School/ UCL, Belgium — Jun 2012-Mar 2014
Researcher in the field of proton therapy - designed the complete workflow for a novel range-verification system and also performed the data analysis.

Postdoc, TIFR, Mumbai — Jun 2008-May 2011
Researcher in the field of neutrino physics - worked for the India-based Neutrino Observatory and designed the data acquisition system in addition to writing the analysis code for cosmic muon analysis.

EDUCATION

University of Bonn, Germany — 2002 - 2008
PhD Physics. *Magna-cum-lauda*

Madras Christian College, Chennai — 2001
M.Sc Physics. *First class*

Madras Christian College, Chennai — 1999
B.Sc Physics. *First class*

TECHNICAL SKILLS

- C, C++, Python, R
- Operating Systems: Linux,Windows
- Libraries: openMP, openACC, CUDA, Geant4, ROOT, Keras, scikit-learn
- Instrumentation: VME, CAMAC, FPGA

RESEARCH PROJECTS

- Project scientist in the DAE-DST funded Rs. 2000 crore project of India-based Neutrino Observatory.
- Principal Investigator in the DST-SERB sponsored project titled Proton Computed Tomography for Mitigating Range Uncertainties in Proton Therapy for Cancer Treatments (Rs. 20 Lakhs)
- Principal Investigator in the UGC sponsored project titled Study of Range Uncertainties in Proton Therapy for Cancer Treatments (Rs. 6 Lakhs)

- Member, study group constituted by TIFR to determine physics potential of a Deuterated Liquid Scintillator based detector - a proposal to be submitted for the Mega Science Vision.
- Member, Institutional Board, Electron Ion Collider at BNL, USA
- Collaborator, J-PARC muon *g-2* experiment, Japan

Mentoring

- 3 PhD students (1 awarded + 1 submitted + 1 ongoing, joint supervision)
- Every year, about 5 M.Sc students work under my supervision towards their project work, many of them now placed in national and international laboratories like CERN and BNL

Conference presentations (selected only, presented at more than 25 conferences)

- ML-based classification and regression problems in particle physics. Faculty development programme at REVA University, Bengaluru, 2022.
- Neutrino Oscillations, Science City Kolkata for Vigyan Samagam organized by Department of Science and Technology, Govt. of India. 2019.
- Neutrino Oscillations for the Layman, IIT Madras. 2018.
- Performance Metrics of a GPU base Track Fitting Code for the INO Prototype Stack, XXII DAE-BRNS High Energy Physics Symposium, University of Delhi. 2016.
- Workflow for the *in vivo* Range Verification in Proton Therapy, American Association of Physicists in Medicine Annual Meeting, Indianapolis, USA. 2013.
- High Performance Proton Radiography Device Using Dose Measurements, 52nd Annual Conference of the Particle Therapy Co-Operative Group, Essen, Germany. 2013.
- VME-based DAQ system for the INO prototype detector, X International Workshop on RPCs and Related Detectors, Darmstadt, Germany. 2010.
- Results of a Real-Time DAQ under Windows XP for the TRIC Experiment, Deutsche Physikalische Gesellschaft Spring Meet, Koeln, Germany. 2004 .

Selected publications (Google Scholar Profile)

- Murgod, L., D. Samuel, and S. Dutta. Performance of machine learning algorithm for predicting muon multiplicity in the INO-ICAL prototype. 37th ICRC. 12-23 July 2021. Berlin. 2022.
- Alaka, B. G., D. Samuel, and E. Bentefour. Prediction of WEPL Image in Proton Radiography Using Deep Learning. Medical Physics. Vol. 48. No. 6. Wiley, 2021.
- Samuel, Deepak, et al. Deep Learning-Based Energy Reconstruction of Cosmic Muons in mini-ICAL Detector. XXIII DAE High Energy Physics Symposium. Springer, Singapore, 2021.
- Samuel, D., et al. Machine learning-based predictions of directionality and charge of cosmic muons—A simulation study using the mICAL detector. Journal of Instrumentation 14.11 (2019): P11020.
- Samuel, Deepak, and Karthik Suresh. Artificial neural networks-based track fitting of cosmic muons through stacked resistive plate chambers. Journal of Instrumentation 13.10 (2018): P10035.
- Samuel, Deepak, et al. Performance Metrics of a GPU Based Track Fitting Code for the INO Prototype Stack. XXII DAE High Energy Physics Symposium. Springer, Cham, 2018.

Languages

- Tamil, English, German, French (basic), Kannada (spoken), Hindi (basic)