Karun G. Thanjavur
Curriculum Vitae

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Education/expertise specific to Ocean Sciences research and analysis

PhD in Physics (Astrophysics & Instrumentation), and dual Masters degrees in Mechanical Engineering (Robotics and Control Systems/ Combustion Engineering). Six years of post-doctoral research experience in astrophysical analysis and instrumentation. Advanced analytical skills, programming (Python, C, IDL, Fortran), image processing and *big data* management. Marine Engineer with mercantile marine companies for six years. Production and service engineering industrial experience (over 5 years) working in specialized technical teams with ambitious goals and strict timelines. Well versed in mechanical design, plus production and machine shop practices (including CNC). Thermal design and CFD analysis and software expertise from Masters degree in Combustion Engineering. University instructor for microprocessor based digital control (mechatronics), pneumatic/hydraulic sensors and actuators, and CAD/CAM to senior mechanical engineering undergraduates. Mid-level management experience including selection and training of highly skilled technical team members.

Education

University of Victoria — Sept. 2004 – Oct. 2009
Victoria, BC, Canada
PhD in Physics & Astronomy
Thesis project: "Cosmic Applications of Gravitational Lens Assisted Spectroscopy (GLAS)"
Supervisors: Dr. David Crampton (NRC-HIA/ UVic), & Dr. Jon Willis (UVic)

University of Victoria — Sept. 2002 – Aug. 2004
Victoria, BC, Canada
MSc in Physics & Astronomy (Transferred to PhD)
Supervisor: Dr. David Crampton (NRC-HIA/ UVic), & Dr. Arif Babul (UVic)

Concordia University — Sept. 1994 – Aug. 1997
Montreal, QC, Canada
M.A.Sc. in Mechanical Engineering (Robotics)
Thesis project: "Generic dynamic modeling and model-based trajectory tracking control of wheeled mobile robots (WMRs)"
Supervisors: Dr. Ramesh Rajagopalan & Dr. Richard M.H. Cheng

Madras University — Sept. 1986 – Apr. 1988
Chennai (Madras), TamilNadu, India
M.E. in Mechanical Engineering (Internal Combustion Engineering)

Madras University — Sept. 1974 – Apr. 1979
Chennai (Madras), TamilNadu, India
B.E. in Mechanical Engineering

Astrophysics Instruments Expertise

***ALTAIR* Postdoctoral Fellow** Feb 2013 - Present
UVic, Victoria, B.C., Canada.
As the PDF with the Airborne Laser for Telescopic Atmospheric Interference Reduction (ALTAIR), research ranges over all aspects of the project including theoretical modeling of the atmosphere plus telescope, balloon payload development, calibration of laser sources, photodiodes and other instrumentation, as well as field testing and analysis of science data. Team member in an international collaboration primarily from UVic, McGill, U of Toronto, NRC, Harvard, Dartmouth College, STScI, NIST and Pan STARRS Corpn.

Resident Astronomer Apr 2010 - Jan 2013
CFHT Corpn., Kamuela, Hawaii.
As member of the complement of astronomers at CFHT, responsibilities included support of observatory operations, PI support, queued service observing (QSO), and new instrument development. Additional engineering projects included image quality (IQ) improvement and the dome venting initiative, as well as Automated Service Observing (AI based successor to QSO).

Instrument Scientist, WIRCam @ CFHT Aug 2010 - Jan 2013
CFHT Corpn., Kamuela, Hawaii.
Fully responsible for all operational aspects of the **W**ide-field **I**nfra**R**ed **Cam**era (WIRCam), the 20x20 arc.min near-infrared imager at CFHT. Responsibilities included full PI support (Phase 1 proposal preparation/evaluation, Phase 2 observations preparation/evaluation, data processing, verification, stacking and distribution), *I'iwi 2.1* processing pipeline development (implementing processing algorithms including photometric calibration), improving instrument calibrations (flat fielding, astrometric and photometric corrections), and incorporating novel observational techniques (staring mode for milli-magnitude differential photometry). Partnered with the WIRCam Instrument Engineer in ongoing maintenance and improvements to instrument performance.

Project Scientist, SPIRou @ CFHT April 2011 - Jan 2013
CFHT Corpn., Kamuela, Hawaii.
Active member of the science team within the international collaboration involved in the design and development of **S**pectro-**P**olarimeter dans l'**I**nfra**Rou**ge (SPIRou), the high resolution, infrared spectro-polarimeter planned for first light at CFHT in early 2018. Contributions included the development of the data simulator, the mock survey, integration time calculator, and the data processing pipeline.

Ground based wide field imaging
Proficient in multi-CCD, wide field optical and near infrared imaging, calibration and data reduction, specifically with CFHT WIRCam and MegaCam imagers. Incorporated several improvements to the WIRCam pipeline, and led the migration from IDL to C/C++ based processing.

Ground based optical/nIR spectroscopy
Specialized in modern multi-object (MOS) and optic fiber-fed (IFU) optical and near-infrared spectroscopic observations and data analysis, principally with Gemini GMOS and GNIRS. Active member of several ongoing large surveys, of note the MaNGA IFU survey (PI K. Bundy) as part of After Sloan 3 (AS3), targeting 10,000 nearby galaxies for evolutionary studies. Active member of the Palomar XD survey (PI R. Mason), a near-infrared, Gemini-GNIRS spectroscopic survey of 60 Seyferts and LINERs from the Palomar catalog to advance our knowledge of AGN physics and lifecycle.

***Big Data* analysis and computational methods**
Proficient in Python, IDL, C/C++, Fortan programming, in astronomical data analysis (IRAF), control system modeling (Matlab) softwares, and in SQL databases and HTML programming. Played a lead role in the development of WIRCam data processing pipeline, both IDL as well as C/C++ based. Developed several analytical algorithms including a Singular Value Decomposition method for velocity dispersion measurement, and a novel galaxy cluster detection algorithm. Experienced in C-based interfacing of digital instrumentation and control hardware.

Mechanical Engineering Research and Industrial Experience

Instructor for Mechatronics, CADCAM and Fluid Controllers Sept 1993 - Aug 1997
Dept. of Mechanical Engineering, Concordia University, Montreal, Canada.
Specialized in instruction and development of control engineering lab courses, specifically Microprocessor based controls, Computer Aided Design and Manufacturing (CADCAM) and Fluid Power Controls (Hydraulics and Pneumatics). Expert in computer numerically controlled (CNC) machine tool programming and operation. Experienced in microprocessor programming and system integration. Fully competent in design and programming of ladder-logic based fluid power controllers.

Research Assistant in Industrial Robotics and Controls Jan - Aug 1993
Supervisor Dr. R. M. H. Cheng, Concordia Center for Industrial Control, Concordia University.
Expert in the programming and operation of Yamaha Zeta-1 deburring robot. Developed advanced robotic applications for the manufacturing industry. Designed and successfully built a wheeled mobile robot with a dynamics model based real time controller as part of my Master's thesis research.

Research Assistant in Combustion Engineering studies Jan - Sept 1992
Supervisor (Late) Dr. A. J. Saber, Aero-Space Propulsion Lab., Concordia University.
Experienced in CFD analysis and thermal design of combustion systems including high temperature sensors. Responsible for the operation of the nano-second pulsed dye laser and associated optics used for laser induced fluorescence to trace combustion radicals in the high speed flows of aerospace propulsion systems. Project terminated due to the tragic death of Dr. Saber in Aug 1992.

Professional Engineering Experience

Marine Engineer/ Mechanical Engineer 1979 – 1992
Over 11 years combined industrial experience in India and Canada in various positions as Merchant Marine Engineer, Service Engineer, Project Engineer, and Process Control specialist. Operated and serviced specialized mechanical, electrical and control systems. Proficient in machine shop practices and production techniques including Computer Numerically Controlled (CNC) cutting tools. Participated in large industrial installation projects. Supervised and trained skilled technicians.

Teaching Experience

Instructor for 'Extragalactic Astronomy' Jan – Apr 2015
Dept. of Physics and Astronomy, UVic.
Instructor for Astr 303, a senior course in astrophysics. Responsible for course instruction and all aspects of student evaluation.

Instructor for 'Introduction to General Relativity & Cosmology' Jan – Apr 2009
Dept. of Physics and Astronomy, UVic.
Instructor for Phys 415, a honors course in Physics. Responsible for course instruction and all aspects of student evaluation.

Volunteer Rural Mechanics Instructor Aug 1998 – July 2001
Lukulu Vocational Training Center, Zambia, Africa.
Voluntary Service Overseas (Canada) placement as instructor in basic mechanical, automotive and electrical technology for disadvantaged youth in a rural setting.

Senior Lab Instructor Sept 1994 – Sept 1997
Mechanical Engineering Department, Concordia University.
Responsible for experiment design and instruction of five senior level lab-related courses, namely, Microprocessors and controls, Computer Aided Design and Manufacture (CADCAM), Fluid Power Control, Gas Dynamics, and Heat Transfer.

Volunteer Tutor at the Center for Disabled Students Jan 1992 – Aug 1997
Concordia University.
Volunteer tutor in mathematics and physics for students with physical and learning challenges.
