SATHSARA DIAS

Clarkson University, CU Box 5815 -8 Clarkson Ave, Potsdam, NY 13699, St Lawrence, USA
Tel: +1(585) 775-4728 (Cell)
E-mail: diassl@clarkson.edu

CAREER OBJECTIVE

I am currently a Graduate Research Assistant (started in August 2018) of the Department of Mathematics at Clarkson University, NY, USA. With the utmost interest that I'm having in applied mathematics and the knowledge that I have acquired so far in applied mathematics, I am focusing on establishing an academic career that involves research in dynamical systems for the most part.

EDUCATIONAL QUALIFICATIONS AND TRAINING

- **PhD in Applied Mathematics**
  Clarkson University, Potsdam, New York, USA (August 2018 – Present)

- **Master of Science in Applied Mathematics**
  Clarkson University, Potsdam, New York, USA (May 2020)
  GPA – 3.735 / 4.0

- **Master of Science in Industrial Mathematics**
  University of Peradeniya, Sri Lanka (December 2013)
  GPA – 3.47 / 4.0

- **GTA Boot Camp-Summer School for teaching**
  (Undergraduate level STEM courses) SIGTA Clarkson University, USA

- **Bachelor of Science**
  University of Colombo, Sri Lanka (2011)
  (Physics, Applied Math., Pure Math. and Computer Science)

- **Sun Certified Programmer for the Java 2 Platform, Standard Edition 5.0 (SCJP)**

- **Sun Certified web Component Developer for Java EE Platform (SCWCD)**

HONORS AND AWARDS

- 2020 Best Poster Presentation Award at the 4th Mathematics Conference and Competition of Northern New York (MCCNNY).

- 2020 Best Audience Choice for Best Graduate Poster Presentation at the Fourth Annual Spring Research and Project Showcase.

PROFESSIONAL EXPERIENCE

- **Graduate Research Assistant (January 2019-present)**
  Clarkson University, USA, Department of Mathematics

- **Graduate Teaching Assistant (August 2018- December 2018)**
  Clarkson University, USA, Department of Mathematics

- **lecture of Astronomy (January 2005 – May 2018)**
  Astronomy and Space study Centre (ASSC), Subodhi, Piliyandala, Sri Lanka

- **Instructor of Physics, Pure Mathematics and Applied Mathematics (January 2014 - May 2018)** Mahinda Rajapaksha College, Homagama, Sri Lanka

TALKS AND POSTER PRESENTATION

- **Poster presentation: -** April 2019 - 3rd Annual Summer Research and Project Showcase (RAPS), Clarkson University

- **Participant: -**February 2019 - Institute for Pure and Applied Mathematics (IPAM) Workshop on Operator Theoretic Methods in Dynamic Data Analysis and Control, UCLA, 460 Portola Plaza, Los Angeles, CA 90095

- **Poster presentation: -** January 2020 - Dynamics Days 2020 An international conference on chaos and nonlinear dynamics, Hilton, Hartford CT, USA

- **Poster presentation: -** February 2020 - 4th Mathematics Conference and Competition of Northern New York (MCCNNY), Clarkson University, USA.

- **Poster presentation: -** April 2020 - 4th Annual Spring Research and Project Showcase (RAPS), Clarkson University, USA.

- **Poster presentation: -** July 2020 - GAMM Juniors' Summer School on Applied Mathematics and Mechanics (SAMM): Learning Models from Data Model Reduction, System Identification and Machine Learning.

- **Conference Talk: -** Presented in 73rd Annual Meeting of the APS Division of Fluid Dynamics, Session K06:6: Nonlinear Dynamics: General, 23rd November,2020

RESEARCH INTERESTS

- Dynamical Systems
- Data Driven Analysis of Complex Systems
- Machine Learning
- Linear Algebra
- Numerical Analysis
- Data Science and Data Analysis
- Weather Forecasting, Weather Patterns, Earth Science
- High Pressure Science/Geophysics

MEMBERSHIP IN PROFESSIONAL SOCIETIES

- Society for Industrial and Applied Mathematics (SIAM)

- American Physics Society (APS)

RESEARCH EXPERIENCE

- **Project Title: "**Predicting the onset of shock-induced buffet using Dynamic Mode Decomposition**"** - (January 2019-Present).

  Advisors: -
  Prof. Marko Budišić
  Department of Mathematics, Clarkson University,
  Potsdam, USA

  Prof. Pat Piperni
  Department of Mechanical & Aeronautical Engineering, Clarkson University,
  Potsdam, USA

  Prof. Brian Helenbrook
  Department of Mechanical & Aeronautical Engineering, Clarkson University,
  Potsdam, USA

Description: - During transonic flight aircraft can experience a shock-induced buffet, an oscillation felt by the pilot and the aircraft structure which poses a significant constraint on the aircraft design. In idealized 2D flows buffet is linked to a Hopf-type bifurcation, although realistic flow configurations additionally contain a range of background flow features. In this talk we show how Koopman analysis and Dynamic Mode Decomposition (DMD) techniques can be used to predict the onset of the buffet by tracking decay of transients in pre-buffet simulations generated by a Reynolds--Averaged Navier--Stokes code on unstructured meshes. DMD algorithms decompose a sequence of snapshots into a sum of modes; to predict the buffet bifurcation we track the primary mode associated with the buffet across the threshold of stability. We demonstrate how the approach performs when applied to time-resolved simulations and simulations without physically accurate time stepping. The results show that in the idealized time-resolved case the bifurcation could be predicted by tracking the change in time constants, although duration and resolution of input data affect the accuracy of the prediction. An additional challenge in realistic flows is identifying the primary mode among other components of the flow.

- **Project Title: "**Dynamic Mode Decomposition Uncovers Hidden Oceanographic Features Around the Strait of Gibraltar**" -** (November 2018-Present).

    Working with: - Sudam Surasinghe, Kanaththa Priyankara, Erik Bollt, Marko Budišić at Clarkson University, Larry Pratt at Woods Hole Oceanographic Institution, Jose Sanchez- GARRIDO at University of Malaga

    Description: - Oceanic flow around the Strait of Gibraltar comprises dynamic sub-mesoscale features arising due to topographic and tidal forcing, instabilities, and strongly nonlinear hydraulic processes, all governed by nonlinear equations of fluid motion. The purpose of this study is to isolate dominant features from 3D MIT general circulation model simulations and to investigate their physics. To this end, we use the Dynamic Mode Decomposition (DMD) that decomposes the sequence of simulation snapshots into a sum of Koop- man modes: spatial profiles with well-defined exponential growth/decay rates and oscillation frequencies. To identify known features, we correlate identified DMD modes with the tidal forcing and demonstrate that DMD is able to non-parametrically detect the prominent waves known to occur in the western Mediterranean. Additionally, the analysis reveals previously undocumented Kelvin waves and demonstrates that meandering motions in the Atlantic Jet entering the Mediterranean Sea are associated with the diurnal tidal forcing. The DMD thus recovers the results obtained by classical harmonic analysis of tidal constituents, and also highlights features that have eluded attention so far, suggesting that DMD could be a useful part of an oceanographer's toolbox.

- **Project Title: "**High pressure experimental techniques on hydrogen**" —**Summer 2016

  Advisor: -
  Dr. Ranga Dias
  Department of Physics, Lyman Laboratory of Physics, Harvard University,
  Cambridge, USA
  Description: - I have learned to performed diamond anvil apparatus to generate very high pressure at helium temperatures using open cycle cryostat. We have used hydrogen as our sample. I have used 300-micron culet size diamond anvils and loaded hydrogen at 15.5K. We have collected the Raman spectrum of solid hydrogen.

- **Project Title:** "Rainfall forecasting using artificial neural networks"— 2012-2013

  Advisor: -
  Dr. P. Ekanayake
  Department of Mathematics, University of Peradeniya, Peradeniya,
  Sri Lanka
  Description: - Employing feed-forward back-propagation architecture based Artificial Neural Networks, a modern approach has been attempted for forecasting the rainfall. This research has been based for making successful predictions from the available data, not on incorporating the physical aspects of the atmosphere nor the actual process of rainfall occurrence. A unique method of short-term forecasting has been attempted with ground level data collected by the meteorological station in Colombo, Sri Lanka. Three Neural Network models were developed for the 'one-day-ahead' model for predicting the rainfall occurrence of the following day for 3 networks. First network was 'May- September' which was able to make 95.9% training and predictions with a 77.4% accuracy and overall percentage of 72.9% with accuracy. The layer combination (10 20 20 8) for this was whereas the average correlation coefficient was 0.81999. Next was 'October- April' and it made 78.0% training and predictions with a 68.5% accuracy and overall percentage of 57.9% with accuracy. In this there were (10 20 10 8) layer combinations with the average correlation coefficient of 0.81403. The last was 'No Separation' which made 97.2% training and predictions with a 26.2% accuracy and overall percentage of 88.8% with accuracy. There were (10 15 15 10 8) layer combinations with the average correlation coefficient of 0.72441 with regards to this. It was determined that by using a dual network for forecasting would yield more accurate results that just running a single network. This was a major learning point of this research.

- **Project Title:** "Lightning Casualties/Hazards in Sri Lanka"— 2010-2011

  Advisor: -
  Prof. Chandana Jayaratne.
  Department of Physics,
  University of Colombo, Colombo 3,
  Sri Lanka

Description:- Lightning is a discharge of electricity accompanied by thunder, though the lightning occurs all over the world, it is difficult to carry out an overall study of lightning in everywhere but some countries where lightning hazards occur very much. Sri Lanka as a country which is usually succumbed to lightning hazards, carry out such a study is great important. Therefore study of the lighting hazard in Sri Lanka from 1958 to 2009 to identify the periods (months, years) and province most incidents occurs, the curse for the hazard and whether incident occurred in indoor or outdoor is carry out. Study also aims to identify the possible correlation between Rain fall and the lightning. According to data, highest number of incidences occurs during the months of April, May, October and November and most incidences occur while people stay outside. Direct lightning account for most number of deaths followed by incident occurs during listening to radio. When compare to other parts of the country areas south west to the central hills reports most of the incidence.

- **Project Title**: Online Allocation System for Advanced Digital Multimedia Technology Centre in UCSC (Intranet)

  Role   - Team Leader
  Team Size   - 5 Members
  Period   - 2 Months (Oct 2006 - Dec 2006)
  Back-end   - PHP, MySQL, JavaScript, CSS and HTML
  Description   - This project is submitted in partial fulfillment of CS2001 course
                                  unit in The Degree of B.Sc. Degree Program

EXTRACURRICULAR ACTIVITIES

- **Astronomy & Space Study Center**

  - Vice President   2002 - 03
  - President   2004/05

- **Mathematical and Astronomical Society of University of Colombo**

  - Vice President   2006 – 08