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Development of Artificial Pancreas to manage Diabetes

Cifha Crecil Saldanha Dr.

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RESUME

Dr. CIFHA CRECIL SALDANHA

“FELICITAS”,

NEAR CHAWLIKERE, BARKUR,

BRAHMAVAR (Tq),

UDUPI (Dist).

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Objective

Aim to develop professional skill through exposure to challenging activities and consistently increasing responsibility, thereby striving to work towards the achievement of organizational goals by being true team member.

Educational Profile

- **Ph.D. from the department of Instrumentation and Control Engineering**, Manipal Institute of Technology, Manipal Academy of Higher Education, Manipal with **9.6 CGPA** in course work -January 2021.
- **M.Tech in department of Instrumentation and Control Engineering**, Manipal Institute of Technology, Manipal Academy of Higher Education, Manipal in the Subject- **Control Systems** (2011-2013)
Secured Distinction with **8.76 CGPA**.
- **B. E. in department of Electrical and Electronics Engineering**, St. Joseph Engineering College, Vamanjoor, Mangalore, India. (2004-2008)- **First Class with Distinction**

Professional Experience

- Currently working at NMAMIT NITTE as **Assistant Professor Grade III** in the Department of Electrical and Electronics from 10/12/2020 to present.
- **Research Scholar under the Dr. T.M.A Pai Scholarship** in department of Instrumentation and Control Engineering, MIT, Manipal from 01/07/2016 – 08/08/2020.
- Worked as **Assistant Professor Grade II in Electrical and Electronics Engineering**, NMAMIT, NITTE, Karkala from 15/07/2013 – 30/06/2016.
- Worked as **Lecturer in Electrical and Electronics Engineering**, St. Joseph Engineering College, Vamanjoor, Mangalore, from 01/07/2009 – 06/05/2011.
- Worked as **Technical Support Associate**, at IBM India Pvt.Ltd , Bangalore, from 05/09/2008 – 19/06/2009

- **Total experience: 11 years** - Research (4 years), Teaching (6.5 years) and Industry (10 months)
- **IEEE Member: 97567190 : IEEE Women in Engineering Membership, IEEE Young Professionals**
- **Exe com Member for Mangalore Sub Section 2022 and WIE Member**
- **Exe com Member for Bangalore Section 2022 in WIE.**

Journal Publications

1. Dias Cifha Crecil and Kamath Surekha and Vidhyasagar Sudha , “Blood glucose regulation in diabetes mellitus patients: a review on mathematical plant model and control algorithms”. s International Journal of Bioinformatics Research and Applications, 14 (1/2). pp. 23-29. ISSN 1744-5485, (2018), DOI: [10.1504/IJBRA.2018.089229](https://doi.org/10.1504/IJBRA.2018.089229) .
2. Kamath S, Dias C.C., Pawan Kumar K., Budhiraja M. (2018) Comparitive Study of Bergman and Augmented Minimal Model with Conventional Controller for Type 1 Diabetes. Advances in Computing and Data Sciences. ICACDS 2018. Communications in Computer and Information Science, vol 906. Springer, Singapore.- Lecture Notes, DOI: <https://doi.org/10.1007/978-981-13-1813-948> .
3. Dias Cifha Crecil, Surekha Kamath, and Sudha Vidyasagar. "Blood glucose regulation and control of insulin and glucagon infusion using single model predictive control for type 1 diabetes mellitus." IET Systems Biology Volume: 14.3 (2020): 133-146, DOI: [10.1049/iet-syb.2019.0101](https://doi.org/10.1049/iet-syb.2019.0101)
4. Dias Cifha Crecil, Surekha Kamath, and Sudha Vidyasagar, “ Time Series Prediction Arma Model For Predicting Blood Glucose In Artificial Pancreas” International Journal of Psychosocial Rehabilitation”, Volume 24, Issue 2 : 4725-4735,(2020), DOI: [10.37200/IJPR/V24I2/PR2020911](https://doi.org/10.37200/IJPR/V24I2/PR2020911)
5. Dias Cifha Crecil, Surekha Kamath, and Sudha Vidyasagar. "Design of Dual Hormone Blood Glucose Therapy and Comparison with Single Hormone using MPC Algorithm" IET Systems Biology, 15th September 2020 Volume 14 Issue 5, [10.1049/iet-syb.2020.0053](https://doi.org/10.1049/iet-syb.2020.0053)
6. Surya, S.; Saldanha, Cifha Crecil ;Williamson, S. Novel Technique for Estimation of Cell Parameters Using MATLAB/Simulink. Electronics 2022,11, 117. <https://doi.org/10.3390/electronics11010117>.
7. Co-Author, “Computational Analysis of Non-Newtonian Transient Blood Flow Across the Tortuous and Bifurcated Coronary Arteries”, Computers in Biology and Medicine, Submission ID: CIBM-D-22-01771. In Review
8. Corresponding Author “ "Secured Energy efficient Authentication method using Elliptic Curve Cryptography (SEA-ECC) for Smart Device Communication", Journal of Network

Conference Proceedings

1. Dias Cifha Crecil, Surekha Kamath, “ Sign Stability Concept of ecology for Control Design- A Review”, CISCON-12, Manipal Institute of Technology, Manipal, 2012.
2. Dias Cifha Crecil and Kamath, Surekha and Vidyasagar, Sudha (2016) Blood Glucose Regulation in Diabetes Mellitus Patients: A Review on Mathematical Plant Model and Control Algorithms. In: International Conference on Innovative Systems, 16/12/2016, Signature Resort Club Devanahalli, Bangalore. Scopus.
3. C. Dias, S. Kamath and S. Vidyasagar, "Statistical analysis using Bland-Altman agreement for technical methods of measuring blood glucose," 2017 International Conference on Electrical, Electronics, Communication, Computer, and Optimization Techniques (ICECCOT), Mysuru, 2017, pp.1-6. doi: 10.1109/ICECCOT.2017.8284592, Scopus.
4. Dias Cifha Crecil and Kamath, Surekha and Vidyasagar, Sudha, ” Simulation study of hovorka model with and without disturbance for type 1 diabetes.” ,International conference on Computational and Automation Engineering(ICCAE-2018), 07/02/2018, Amity University.
5. Dias Cifha Crecil and Kamath, Surekha and Vidyasagar, Sudha, ”Simulation Study of Composite Bergman Minimal Model and its Augmented Model for Type 1 Diabetes”, International Conference on New Trends in Engineering and Technology, 07/09/2018, GRT Institute of Engineering and Technology Chennai. Scopus.
6. C. C. Dias, S. Kamath and S. Vidyasagar, "Modelling and Simulation Study of Glucose Insulin Control in Type 1 Diabetic Patient Used for Developing Artificial Pancreas," 2019 Amity International Conference on Artificial Intelligence (AICAI), Dubai, United Arab Emirates, 2019, pp. 653-658. doi: 10.1109/AICAI.2019.8701401. Scopus
7. Dias Cifha Crecil and Kamath, Surekha and Vidyasagar, Sudha, ”Simulation of physical dynamics and steady state analysis of comprehensive models of type 1 diabetes to develop model based algorithm”,. In: International conference on Affordable Strategies for Health and Environment, 23/05/2019, NMAMIT Nitte.
8. Dias Cifha Crecil and Kamath, Surekha and Vidyasagar, Sudha, ” Time Series Prediction Arma Model For Predicting Blood Glucose In Artificial Pancreas”, 2019 December, 14th & 15th, 2019::International Conference on Research & Developments in Engineering & Technology, Management and Sciences- ICRDETMS-2019 . CHENNAI, TAMIL NADU, INDIA.
9. Cifha Crecil et.al, “Room Light Intensity Control with Temperature Monitoring System Using Arduino”, 2021 IEEE International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics (DISCOVER) 19-20 Nov. 2021, 05 January 2022, 10.1109/DISCOVER52564.2021.9663580, Scopus.

Funding Ideas:

1. Project Title: for Start up development of Prototype :Development of Automatic Artificial pancreas for Type 1 diabetic patients in India {Name of the prototype: Art-Pan “Manage your Diabetes:} Proposal Planned to Serb POWER in September 2022.
2. Title: Early detection of Diabetic Foot using Machine Learning. Research Planned
3. Title: Early detection of Thyroid Cancer using Machine Learning. Research Planned
4. Title: Data security for Self driving Cars\ Electric Vehicles.
5. Title: Core Temperature detection and Control for BMS in EV.

Poster Presented

1. Cifha Crecil Dias," MPC for Dual Mode of conveyence of Insulin and Glucagon to regulate Blood glucose", ICASET 2017, association with NGUYEN TAT THANH University, Vietnam held at Manipal Institute of Technology July 2017. **Second Prize and BEST POSTER AWARD**

Awards Received

1. Recipient of **Dr. TMA Pai scholarship** for full time Ph. D under Manipal Academy of Higher Education, Manipal.
2. **Best poster award** in ICASET 2017, association with NGUYEN TAT THANH University, Manipal Academy of Higher Education, Manipal, July 2017.
3. **Certificate of Praise** for the year 2017-2018, from MIT Manipal for Publication and Research award incentive for Students to Excel.
4. **Reviewer** for IEEE Region 10 Humanitarian Technology Conference, R10HTC- September 30- October 2, 2021, IEEE Bangalore Subsection, Bangalore.
5. **Reviewer** for IEEE Region 10, 7th International Conference on Electronics, Computing and Communication technologies, IEEE CONNECT- July 9th -11th 2021, IEEE Bangalore Section.
6. **Reviewer** for IEEE Region 10 2021 IEEE Discover November 19-20, 2021 NMAMIT NITTE
7. **Technical Core Committee for 2021 IEEE Discover** Conference at NMAMIT Nitte
8. **Reviewer** Elsevier Journal: Biomedical Signal Processing And Control
9. **Resource Person** at AICTE-ISTE Sponsored Refresher program on Health care Driven Technology held at Palakkad Kerala at JCET college.
10. **Coordinator for IEEE PES Student congress** held at NMAMIT Nitte November 2021.
11. **Publication Core Committee : 2022 IEEE Discover** Conference

Research Interest

- Control Systems and Application
- Model Predictive Control and Application
- System Modelling and Design
- Artificial Intelligence and Machine Learning

- Biomedical Control and Signal
- System Biology
- Sensors, Monitoring and Medical Devices
- Process Control
- Electric Vehicles design

Technical Skills

Languages : C, MATLAB/ SIMULINK, VHDL, Pspice.

O/S : WINDOWS

Software's : LATEX, ORIGIN.

Subjects Taught

- **Under Graduates (B.E):** Basic Electrical Engineering, Electrical Network Theory I and II, Linear System Theory, Programmable logic Controllers, Electrical Power Generation, High Voltage Engineering, VLSI, VHDL, Circuit Simulation Laboratory, Control System and Power Electronics Laboratory, Circuit Measurement Laboratory, Microcontroller Laboratory, Analog Electronic Control Laboratory, Digital Electronics Laboratory, Power System Analysis Laboratory, General Basic Electrical Laboratory for 1st year, Instrumentation and Measurement, Physiological Control System.
- **Post Graduates (M.Tech):** Advance Control Theory, Optimal Control Theory, VHDL.
- **Electives Opted at M.Tech:** Advanced Digital Signal Processing, Robust and Optimal Control, Robotics and Automation, Physiological Control.
- **UG Projects Handled:** 05.

Administrative Experiences

Institute Level:

1. NIRF Institute lead Receiver Committee head: 2021 to present.
2. AICTE CII Coordinator from 2021 to present
3. Organizer for 2022 Women's Day at NMAMIT : Arranged Medical Camp.
4. ISO 9001:2008 Internal Auditor at NMAMIT, NITTE.
5. Handled responsibility of NBA and NAAC selected member of department at NMAMIT, NITTE.
6. Committee member in organizing the Women's Day 2016 at NMAMIT.
7. AICUF Assistant Coordinator for AICUF Unit of Youth commission 2008-2010.

8. NSS and RED Cross Units Assistant Coordinator 2008-2010.
9. Co-chaired for different committees at College day program and Sports day.
10. Master of Ceremony for the College day 2010 and Sports day 2008,2009,2010.
11. Compered and Member for VTU- Inter-Collegiate Single Zone Women's Volleyball Tournament on March 23, held at St. Joseph Engineering College Mangalore in 2010.

Department Level:

1. ISO Coordinator from January 2021 to present.
2. Placement Coordinator January 2021 to present.
3. Project Based Learning Coordinator for Microcontroller Subject.
4. Electric Vehicle Lab Coordinator January 2021 to present to setup new lab.
5. Mini project Coordinator January 2021 to present.
6. CDCS Coordinator January 2021 to present.
7. ISO Coordinator for 3 years in the department 2013-2016.
8. Student Monitoring cell head for 2 years 2014-2016 and Present.
9. Placement coordinator of E&E department for a period of 2 year.
10. Seminar coordinator for B.E E&E stream from 2015- 2016.
11. Department NBA and NAAC- Teaching and Learning Practices, PO and CO for subject.
12. BOE (Board of Examination) member from department- End Sem Question paper Verification and Finalising- 2 years.
13. Question Paper setting – 11 B.E Subjects, 1- M.Tech.
14. Valuation B.E- 15 Subjects.

Workshop Attended

1. Three days workshop on High Impact Teaching Skills by WIPRO, Mission 10X. 26th July 2010, SJEC Mangalore.
2. Three days workshop on “Introduction to Therapeutic Counselling For Engineering Teachers”, NMAMIT, NITTE on 2nd June to 5th June 2014.
3. Four day workshop on “ theory and modelling of VSC Based facts and HVDC Controllers”, NMAMIT, NITTE on 21st to 25th July 2014.
4. NCAEE-15, “Smart Grid and Energy Storage Systems”, NMAMIT, NITTE, 2nd April 2015.
5. NCAEE-16, “Advances in Emerging Trends in Engineering”, NMAMIT,NITTE, 9th April, 2016.

6. Two days workshop on “ Modelling Simulation and Implementation using MATLAB/SIMULINK”, MIT, Manipal on 3rd August 2017.
7. Two weeks workshop AICTE Sponsored FDP, “H-Infinity Robust Adaptive and Optimal Control”, on 17th June 2019 at MIT Manipal.
8. One day workshop on “ Advance author Workshop” by Springer Nature at MAHE, Manipal on 11th September 2019.
9. Five Day FDP (online): Biomedical Instrumentation at University BDT College of engineering Davanagere from 7th December 2020 to 11th December 2020, AICTE .
10. Five Day FDP (online): Biomedical Instrumentation: Research Challenges at Amal Jyothi College of Engineering, Kanjirappally from 22.02.2021 to 26.02.2021, APJAKTU sponsored.
11. One week AICTE-ISTE sponsored Induction /Refresher programme phase -2(online) on "Accreditation: An Accelerator for Quality Improvement in Engineering Education" 18th to 24th February 2021, organized jointly by the department of ECE & EEE, SDMCET, Dharwad.
12. IEC 62353 compliant Electrical safety testing for patient monitors and ventilators part 1 March 15, 2021 This webinar is eligible for 1 CE credit from the ACI Webinars by Fluke Biomedical.
13. IEC 62353 compliant Electrical safety testing for patient monitors and ventilators part 2 March 16, 2021 This webinar is eligible for 1 CE credit from the ACI Webinars by Fluke Biomedical.
14. Five Day FDP Online Elementary FDP on "Application of IOT in Agriculture" from 2021-07-06 to 2021-07-10 at Gandhi Institute For Technology (GIFT) Bhubaneswar, AICTE Atal Sponsored.
15. Five Day FDP Online Elementary FDP on "Gender Equity: Challenges And Opportunities For Women In Decision Making" from 2021-07-26 to 2021-07-30 at NMAM INSTITUTE OF TECHNOLOGY, AICTE ATAL Sponsored.
16. Five Day FDP Online Elementary FDP on "Revolution & Advances in E-Vehicles" from 30/08/2021 to 03/09/2021 at GOVERNEMENT POLYTECHNIC,HARAPANAHALLI, AICTE ATAL Sponsored
17. One Week AICTE sponsored online Short Term Training Programme (STTP) on Application of Machine Learning and Artificial Intelligence Techniques for Control of Future Grid organized by the Department of Electrical & Electronics Engineering, NMAM Institute of Technology, Nitte during 02-07 August 2021.

Training Program Attended

1. “ISO 9001:2008 Internal Audit Training Program”, at NMAMIT,NITTE 28th -29th December 2015.

Certificate Course

1. “Fully Accredited Professional Counselling Diploma Course”, by Udemy, Certified on 29th

May 2020. (General counselling Course)

2. **Introduction to Artificial Intelligence (AI)**, Coursera, September 2020 Grade: 70%
<https://www.coursera.org/account/accomplishments/certificate/Y7R3SXKTTUWW>
3. **IBM Introduction to Machine Learning Specialization**, Coursera , January 2021,
<https://www.coursera.org/account/accomplishments/specialization/3LYP5ZWSUEEB>
4. **Exploratory Data Analysis for Machine Learning**, Issuing Organization: Coursera ,
December 2020 , Grade: 95%
<https://www.coursera.org/account/accomplishments/certificate/JEU7RCJUUT67>
5. **Supervised Learning: Classification**, Coursera January 2021 Grade: 93%,
<https://www.coursera.org/account/accomplishments/certificate/QKF4N539YRW2>
6. **Supervised Learning: Regression**, Coursera January 2021 Grade: 96%,
<https://www.coursera.org/account/accomplishments/certificate/MY32M7YBBE9C>
7. **Unsupervised Learning** January 19, 2021 Grade: 85%,
<https://www.coursera.org/account/accomplishments/verify/ZXL9NW775C2W>
8. **Python for Data Science AI & Development**, February 15, 2021, Grade :74%,
<https://www.coursera.org/account/accomplishments/verify/AB776HDWTAT4>
9. **Sensors and Sensor Circuit Design March** ,13, 2021, Grade Achieved: 96.00%
<https://www.coursera.org/account/accomplishments/verify/DJKL3BGRT4FE>
10. **Introduction to Systems Biology** , June 30, 2021, Grade Achieved: 72.19%
<https://www.coursera.org/account/accomplishments/verify/ECKVLUEKP7KU>
11. **Machine learning with Phyton, December 2021**
<https://www.coursera.org/account/accomplishments/verify/QYBVR6J5JUBV>

Academic Project Details

Ph. D Research Work:

Project Title: Model Predictive Control Strategy For The Dual Mode Of Conveyence Of Insulin And Glucagon To Regulate Blood Glucose.

Language of Implementation: MATLAB/SIMULINK

Description: The main emphasize is on developing an efficient Controller for biomedical application like blood glucose regulation. We aim at identifying a proper methodology for the infusion process of insulin and glucagon for diabetic patients using an efficient model predictive control. A synthesis of patient model of the above automatic controller is analyzed and synthesized. In Type I diabetes the patient is dependent on an external source of insulin alone to be infused at an appropriate rate to maintain blood glucose concentration which cannot eliminate the risk of hypoglycemia. Hypoglycemia has short term effects which can lead to diabetic coma

and possibly death, while hyperglycemia has a long term impact that has been linked to nephropathy, retinopathy and other tissues damage.

In this process insulin or glucagon is administrated through an infusion pump as a single injection. The pump is controlled by the automatic control say model predictive control which is more efficient compared to the conventional Controller. This is of primary importance where the processes are too complex to be analyzed using the conventional one. The designed controller is MPC Controller which manages the control of both insulin and glucagon. The blood glucose level is monitored a Mathematical Plant Model Sorensen Model. This efficient controller model will surely be a boon to the diabetic patients. The controller is efficient and robust that it should maximize the time spent within the desired normal range depending on the patient's body.

M.Tech Project:

Project Title: Sign Stability Concept of Ecology for Robust Controller design for a Typical Winged Re-Entry Vehicle – Done at **ISRO-VSSC** Thiruvananthapuram.

Societal Interest

1. Resource Person for “Career Guidance” for 9th , 10th standard students : Mount Rosary English Medium School Millagres, St. John’s English Medium School Shankerpura, St.Lawrence School Moodbelle, Jeevan Jyothi Camp By Udupi Diocese for High School Students.
2. Resource Person and Trainer for Jeevan Jyothi Camp By Udupi Diocese organized by SUPATHA Udupi for- “CIVIL Service Examination”.
3. Resource Person for “How to Prepare for 10th Examination” for 9th , 10th standard students : Mount Rosary English Medium School Millagres, St. John’s English Medium School Shankerpura, St.Lawrence School Moodbelle, Jeevan Jyothi Camp By Udupi Diocese for High School Students.
4. Resource Person and Keynote Speaker at Milagres College Kallianpur, Udupi for Science Club Inauguration on 3rd March 2021.
5. Resource Person at Karkala Attur Catholic School Children on 29th August 2021 on Career Guidance .

Personal Profile

Husband’s name	:	Rajesh Saldanha.
Date of Birth	:	17/02/1987
Marital Status	:	Married
Languages Known	:	English, Hindi, Kannada and Konkani.
Nationality	:	Indian

Current Location : Barkur/ Soon Shifting to Udupi

References

Name and Address	Occupation	Email Id	Phone Number
Dr. Santhosh K V	Associate Professor Dept of ICE, MIT Manipal	santhosh.kv@manipal.edu	9880817144
Dr. Nagesh Prabhu	Professor Dept of EEE NMAMIT Nitte	prabhunagesh@nitte.edu.in	9448081488

Declaration

I certify that the aforementioned information is correct and complete to the best of my knowledge and belief.

Date: 05/04/2022

Place: Udupi



Signature
Dr. Cifha Crecil Saldanha