Development of Machine Learning based Optimization Techniques for Antenna Design in Wireless Communication Systems

Developing machine learning (ML) based models to optimize key antenna parameters such as gain, bandwidth, directivity, and efficiency is crucial for designing antennas suited to next-generation wireless communication systems (e.g., 5G, 6G, IoT). Designing high-performance antennas involves a complex trade-off between parameters like gain, bandwidth, directivity, and efficiency. Traditional electromagnetic (EM) simulations (e.g., with HFSS, CST) are computationally expensive and time-consuming. ML provides a way to learn the relationship between antenna geometry/materials and performance metrics, enabling faster design and optimization. And Implementing machine learning (ML) optimization techniques to automatically generate and evaluate novel antenna geometries and material compositions focuses on achieving performance goals like minimizing return loss and maximizing radiation efficiency. Design innovative antennas that meet strict performance criteria (e.g., return loss < -10 dB, high radiation efficiency) by exploring complex design spaces that are difficult to navigate manually or via traditional simulation-based methods. Designing ML driven optimization frameworks for MIMO (Multiple-Input Multiple-Output) antenna arrays involve leveraging machine learning techniques to optimize antenna performance parameters, specifically: Maximizes isolation between antenna elements (to reduce interference), Minimizes mutual coupling (to prevent signal degradation), and enhances overall system capacity (via spatial multiplexing and better channel conditions). Applying reinforcement learning (RL) and optimization techniques to reconfigurable antennas allows for real-time dynamic adaptation of antenna parameters in response to environmental and operational changes in wireless networks (e.g., user mobility, interference, or channel fading). Hence it is a research requirement to design an optimized efficient antenna using machine learning optimization techniques for the modern wireless communication systems.

S. VEERASAMY CHETTIAR COLLEGE OF ENGINEERING AND TECHNOLOGY

S.V.Nagar, PULIANGUDI - 627 855

[Approved by : AICTE, New Delhi (No. 732-52-401(E)/ET/2001)]

Affiliated to Anna University, Chennai]

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web:www.svccollege.in   Ph. 04636 - 234749

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Reg No RO 91/4342

Prof. P.Shankara Ramalingam B.E.(Mech), M.E.(Thermal), (LLB), C.E.A., M.B.A., M.L.M., MISTE, S.M.E., MIE, D.I.Psy., D.T.U.M., D.M.M., P.G.D.P.M, F.I.V., Ph.D.

Principal

SVCET/EC/04-03/2007   18-04-2007

EXPERIENCE CERTIFICATE

This is to certify that **Ms.S.Vanitha**, D/o.Mr.P.Sankaran residing at 42N, Karuppasamy kovil north street, Krishnapuram (PO), Kadayanallur, Tirunelveli Dist, was working as a **Lecturer** in the Department of **Electronics and Communication Engineering** of our Institution from **02-01-2006** to **17-04-2007**.

She is good and competent in her profession and possesses the potential to serve in an independent capacity in any post. Her performance is exemplary.

PRINCIPAL

Prof. P SHANKARA RAMALINGAM,
B.E.(Mech),M.E. ... M.L.M, D.I.Psy.
D.T.U.... D.M.M, P.G.D.P.M, MISTE, MIE, FIV, Ph.D.
Principal
S. Veerasamy Chettiar College of Engg. & Tech,
S. V. NAGAR, PULIANGUDI - 627855.

Date 18.04.07
PULIANGUDI - 627 855

MEENAKSHI COLLEGE OF ENGINEERING

(RUN BY MEENAKSHI AMMAL TRUST)

Approved by AICTE, New Delhi and Affliated to Anna University, Chennai.

A.I.C.T.E. : F. No. 732-52-388 (E)/ET/2001, New Delhi.

No.12, Vembuliamman Koil Street, West K.K.Nagar, Chennai - 600 078, Tamilnadu.

Ph : 044 - 23640773, 23642728, Fax. No : 044 - 23644774.

Website : www.mce_edu.com & E-Mail ID : mce_edu@yahoo.co.in

Ref :   Date: ....

MCE/Estab/Ser Cert/2009   10.08.2009

SERVICE CERTIFICATE

This is to certify that **Ms.S.Vanitha**, was working as Lecturer in the Department of Electronics and Communication Engineering at Meenakshi College of Engineering, Chennai – 78, from 09.07.07 to12.12.2008.

She bears ......Good...... Conduct and Character.

PRINCIPAL

Dr. S. SUYAMBAZHAHAN M.E., Ph.D. (IIT)
PRINCIPAL
MEENAKSHI COLLEGE OF ENGINEERING
NO 12, VEMBULIAMMAN KOIL STREET,
WEST K.K NAGAR, CHENNAI - 600 078.

Tagore Engineering College

(Accredited by NBA & NAAC)
Rathinamangalam, Vandalur (Post), Chennai - 600 048.
Phone : 27409725, 27409726 Fax : 27409730

Date 31.10.2011

RELIEVING ORDER AND EXPERIENCE CERTIFICATE

Ms.S.Vanitha has worked in our College in the following faculty positions in the **Department of Electronics and Communications Engineering** from 18.12.2008 to 31.10.2011.

Lecturer	:	From 18.12.2008 to 31.07.2011
Assistant Professor	:	From 01.08.2011 to 31.10.2011

We accept her resignation dated 29th September 2011 and relieve her from her duties and responsibilities on her own request with effect from the closing hours of **31.10.2011**.

She was sincere in her work during the tenure of her service. Her character and conduct are good.

We wish her all success in her future endeavors.

PRINCIPAL
PRINCIPAL
TAGORE ENGINEERING COLLEGE
CHENNAI - 48.

Copy to : Accounts/Dept./PF.

TO WHOM-SO-EVER IT MAY CONCERN

It is our pleasure to write on behalf of **Mrs.S.VANITHA** has worked as an **Assistant Professor** in our **Training Centre** From Nov 2011 to May 2013.

During this tenure of her work **Mrs.S.VANITHA** remained involved in her work dedicated. We found her pretty active in whatever task we have provided her. She is hard-working and a devoted staff. She has the motivation to take initiative tasks and we are gratified that she had been helpful in the advancement of our organization.

She is leaving her job only on her own decision and for attempting opportunities with a better profile.

We wish her every success in her future.

We wish her all the best.

Regards

Yours sincerely

Omer Gadim Mohamed

Human Resources General Manager

P.B. College of Engineering

Campus Address :
Irungattukottai, Chennai - Bangalore National Highway
Sriperumbudur Taluk, Kanchipuram Dist., Chennai – 602 117.
Cell : 9940026861, 9600112733
E-mail : pbce@pbce.co.in Website: www.pbce.co.in

Administrative Office :
3/117, Brahmin Street, Karambakkam, Porur,
Chennai – 600 116. Tel. : 044-24766386, 24766941
Cell : 9600113031
E-mail : admissions@pbce.co.in

Date: 30-06-2022

EXPERIENCE CERTIFICATE

This is to certify that **Mrs. S.Vanitha,** has worked as **Assistant Professor** in the Department of **Electronics and Communication Engineering** in our institution from **03.06.2021 to 30.06.2022.** During her service, she performed well in all the academic activities. We wish success in all her endeavors.

Chairman

CHAIRMAN
P.B. College of Engineering
Irungattukottai, Sriperumbudur,
Chennai - 602 117.

Date: 27.09.2023

To

Mrs. S. Vanitha,

C/o. P. Arumugam

Vembar Nagar,

Elathur

PROVISIONAL APPOINTMENT ORDER

Based on the Interview and recommendation of Staff Selection Committee, you are appointed as **Assistant Professor** in the department of **Electronics & Communication** in our College in accordance with the terms and conditions stipulated by the Management for Staff Appointment.

Correspondent

J.P. College of Arts & Science
Ayikudi - 627 852
Tenkasi Tk. & District.