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Teaching Statement
February 29, 2024

Teaching Philosophy and Methodology

I firmly believe that effective teaching serves as the cornerstone for inspiring future researchers. As an educator, I aspire to instill excitement and critical thinking in my students, drawing from the inspiration I've received from colleagues in the industry and professors during my *M. Tech* and *Ph.D.*, which sparked my interest in continuing my research in computer science and engineering. Teaching is a profound passion of mine, offering a stimulating experience that I find rewarding. I view teaching as a *mutual learning* process, particularly in a research-oriented environment where we continually push the boundaries of knowledge. It's my conviction that separating research from teaching would diminish the potential for fruitful outcomes, a principle applicable to both undergraduate and graduate teaching. Teaching necessitates the skillful abstraction of concepts to facilitate meaningful comprehension, aiding the instructor in gaining a deeper understanding of the subject matter. Teaching requires appropriate *abstractions* of concepts to enable meaningful learning – the process of forming such *abstractions* helps the teacher a great deal in understanding those concepts well. Ultimately, these abstractions help in a better understanding of the body of knowledge and hence facilitate expanding it through research on this subject or topic.

In undergraduate courses, I intend to focus on practical, hands-on projects, ranging from short assignments in introductory courses to more extensive projects in senior-level classes. These projects serve to solidify abstract concepts learned in class while promoting collaborative work and mutual learning among students. Drawing from my own positive experiences with such projects during my undergraduate studies, I aim to adopt a similar approach in my teaching. For senior-level and graduate courses, I plan to enrich students' perspectives by inviting guest lecturers and encouraging activities such as *short write-ups and presentations* to enhance communication skills. At the graduate level, my courses will incorporate a robust research component, covering *foundational and contemporary research* topics. Students will engage in significant design and implementation projects aimed at addressing research questions, alongside activities such as reading research papers, conducting student seminars, and participating in discussions to deepen their understanding and critical thinking skills.

Teaching Experience

During my stay at *CSIO, Chandigarh, India* (2008-2010) for my master's thesis, I assisted my guide *Dr. H.K. Sardana* to prepare courses on "Image Processing and Pattern Recognition". Here, apart from helping the students during lab sessions with their programming assignments, my duties involved holding a "discussion session". Furthermore, I also substituted for my professor in a few classes when he had other professional commitments.

Based on the teaching system in France, I could only teach the subjects where there exists teaching vacancy or requirement. Hence, most of the subjects that I taught mainly depended on the existing vacancy in the institute. During my post-doctoral research at *L3i, University of La-Rochelle, France* (2017-2019), I have designed many lab assignments, solve or discuss these assignments on board with the students and also took several theory classes in the classroom. The following are the courses which I taught during this period. Furthermore, during my post-doctoral research at "INRIA, Montpellier, France" (2019-2020), I also taught the undergraduate students at University of Montpellier, France.

During my teaching at *University of La-Rochelle, France*, I taught the undergraduate students, where the course curriculum is structured to prepare the students as software developers for companies and to teach them about various software platforms which are frequently used in companies. The module of *"Development of iOS and Objective-C"* which I taught is consisting of :

i. An overview of C-language and C++ language
ii. The description and explanation of Objective-C and iOS programming

For this module, I have participated in the following activities :

i. I taught in the classroom and explain programming techniques and concepts
ii. Prepare questions and corresponding answers (pseudo code) for different programming exercises and explain them on the board

Degree Level (No. of Students)	Year	Number of Hours			Subjects / Topics
		CM	TD	TP	
Under Graduate (28)	2017-2018	0	12	18	Programming of iOS and Objective-C
Under Graduate (16)	2017-2018	0	0	6	Enterprise application programming (Java Persistence API (JPA))
Under Graduate (24)	2017-2018	0	12	26	Human-Computer Interaction (programming of QT and C#)
Under Graduate (48)	2019-2020	12	3	23.5	Fundamentals of Computer Architecture and Operating Systems
Total		**113.5 Hours**			

iii. Prepare the questions of the programming examination and the carried out evaluation
iv. Prepare all teaching materials e.g. lessons, practical work and tutorials.

Whereas, for the module *"Enterprise application programming (Java Persistence API (JPA))"*, I used the slides and teaching materials, provided by the principal teacher, who was in charge of this module. I had principally helped students to solve and explain their queries during the practical session.
Furthermore, for the module of *"Human and Machine Interaction (QT and C# development)"*, I started by briefly introduce the C++ language then I mainly focused on the explanation of QT and the corresponding exercises. For this module, I have mainly participated in classroom teaching and explained the programming techniques and concepts. Before every practical sessions, I also explained and discussed the programming exercises on board to better interact with the students and get to know that students has correctly understood the logic to implement the code to solve any specific problem. Then during the practical session, I helped the students to solve the exercises on computer. I also helped the principal teacher for the assessment of the practical examination.

In the year of *2019 - 2020*, I participated in teaching activities (39.5 hours in total) at the department of "Computer Science & Software Management" of *PolyTech Montpellier, University of Montpellier, France* for 3rd year engineering students. I also participated and supervised the projects of 8 groups (each of 2 students). These projects involve utilizing *Raspberry-Pi* and different sensors and actuators (e.g. potentiometer, sound sensor, LED, accelerometer, motor etc.) to create simple and basic intelligent systems (using the Python language).

For this module, I have mainly participated in classroom teaching on the topics e.g. computer architecture by von neumann, representation of data in memory, data representation-integer & float arithmetic, logic circuits, boolean algebra etc. Before every practical sessions, I explained and discussed the programming exercises on board to better interact with the students and get to know that students has correctly understood the logic to implement the code to solve any specific problem. Then during the practical session, I helped the students to solve the exercises on computer.

I can teach a broad set of courses (also take corresponding lab), which are mentioned in the following table.

1. **Time Series Analysis :** In this course, I shall build upon my prior working experience and knowledge in this domain. In this course, I will start with the fundamental time series similarity measuring technique; e.g. "Euclidean Distance", followed by "z-normalized Euclidean distance (relation with Pearson correlation coefficient)", "motifs and discord discovery" (using "matrix profile", based on classical and z-normalized euclidean distance), other dynamic programming (DP) based similarity measuring techniques e.g. Dynamic Time Warping (DTW) and it's variants, Longest Common Subsequence (LCSS), Levenshtein Distance, some other advanced and latest DP based methods e.g. "Minimal Variance Matching (MVM)", Optimal Sequence Bijection (OSB), Flexible Sequence Matching (FSM), Exemplary Sequence Cardinality (ESC), etc. Furthermore, I will discuss multi-variate time series for the discovery of motifs and discords. Moreover, I will discuss several application domains e.g. time series classification, prediction, interpolation, etc. by using Convolutional Neural Networks (CNN), Auto-Encoders, Generative Adversarial Networks (GAN), and Long Short Term Memory (LSTM), etc.

Degree Level	Subjects or Topics	
Under Graduate and /or Post Graduate	i. Computational Engineering (CS1100) ii. Discrete Mathematics for Computer Science (CS2100) iii. Theory of Computation (CS2200) iv. Computer Organization (CS2600) v. Data structures and Algorithms (CS2800) vi. Advanced Data Structure and Algorithms (CS503L)	i. Software Engineering (CS3400) ii. Operating Systems (CS3700) iii. Object Oriented Analysis and Design (CS3900) iv. Artificial Intelligence (CS3800 / CS307L) v. Artificial Neural Networks (CS511L) vi. Machine Learning (CS303L/CS519L) vii. Deep Learning

2. **Recent Advances in Deep Learning :** In this course, I intend to carefully develop it by segregating or grouping the various models or architectures in deep learning. Thanks to my several years of research in deep learning, I am accustomed to the recent advancements. Furthermore, I intend to collaborate with other in-house and guest faculty members to properly formulate the course curriculum with the purpose of including the expertise and experience in variant topics or segments of recent machine learning models/architectures.

   CNN Based Model : In this module, I will talk about different recent architectures for image classification, object localization, object segmentation, and object tracking. I will discuss the models like VggNet, ResNet, MobileNet, DenseNet, Graph Neural Network (GNN), Fast-Faster RCNN, and YOLO (programming and deploying on edge devices e.g. Raspberry-Pi, NVIDIA-Jetson etc.)

   Auto-Encoder and GAN Based Model : Here, I will talk about different recent architectures like vanilla auto-encoder model (e.g. ResNet, VggNet based), Variational auto-encoder (VAE), beta-VAE, etc. For the GAN-based models e.g. vanilla GAN, conditional GAN, deep convolutional GAN (DCGAN), Wasserstein GAN (WGAN) Cycle-GAN, Pix-2-Pix model, Disco-GAN, Style-GAN, Info-GAN, Super-Resolution GAN, etc.

   LSTM and Transformer Model : In this module, I will start with an explanation, discussion, and mathematical derivations of Recurrent Neural Networks (RNNs), and vanilla LSTM. Then, I will discuss other advanced topics e.g. Bidirectional LSTM, Gated Recurrent Unit (GRU), Bidirectional GRU, and LSTM with attention mechanism. I will also discuss the recent popular architecture i.e. "Transformer Model" (concepts like "self-attention", "residuals", "stacked encoder-decoder" etc.) and its variants in the computer vision domain, such as "Vision-Transformer (ViT)", "Data-efficient Image Transformer (DeiT)" "BERT pre-training of Image Transformer (BEiT)" "Self-supervised Vision Transformer (DINO)" etc.

I believe that universities have an important social responsibility to train and mentor students to have "open minds" and to think rationally. Though I have not directly mentored students for long periods of time, my interactions with junior colleagues and students, and my personal positive experiences of being mentored, lead me to believe that I am qualified to do so.

I have taught all of my courses in French (which I am fluent in). To access all of my courses, please see: (click here).