

MULTI-RATE POWER AMPLIFIER MODELING (3 MONTHS)

Supervisors : Germain PHAM, Chadi JABBOUR

Palaiseau (France), February 27, 2024

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Ref. :

Phone : +33 1 23 45 67 89

Duration : 3 months

Degree : Excellent students in their final Year of Bachelor or 1st Year of Master

Fields : (Computer Science, Electrical Engineering) Signal processing, Power Amplifier modeling

Start date : 2024-07-01

Webpage

You can find all the internship offers at: [Job & Internship opportunities at Télécom Paris](#)

The current offer is available at: [Multi-rate Power Amplifier modeling \(3 months\)](#) Please check the webpage for the latest information.

Introduction

In wireless communication systems, power amplifiers (PAs) are essential for amplifying low-power radio frequency (RF) signals to higher power levels for transmission. As the demand for higher data rates grows, and with the use of complex modulation schemes, the efficiency and performance of PAs become critical.

PA modeling is a fundamental tool for design and improvement of wireless communication systems. It is used for mimicking the behavior of power amplifiers under different operating conditions without performing actual hardware experiments.

The standard approach consists of performing actual measurements on the hardware device to be modeled. A (discrete-time) model, whose operating sampling rate is related to the available generation and acquisition hardware, is then extracted. Those measurements can be time-consuming and expensive.

Project description

This project aims to develop a multi-rate PA model that can handle different sampling rates. This will allow to use the same model for different hardware configurations and to perform quick simulations.

Required skills

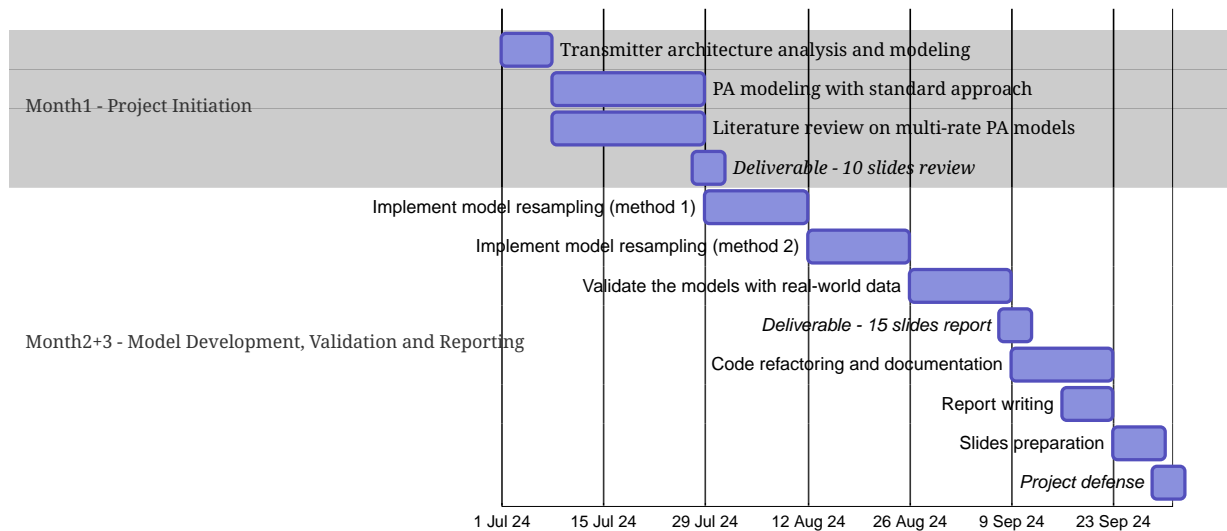
This project requires

- Mandatory
 - Signal processing (sampling, filtering, interpolation, decimation, ...)

- Optimization and numerical methods (least squares)
- Matlab programming experience
- Optional
 - Linux OS basics (usage of `terminal` command lines, `ssh`, `make`,...)
 - practical elements of Latex (writing equations)
 - practical elements of `git`
 - electronics and RF design basics

Workplan (3 months)

Master Internship: CNN for SID identification



Application

Please send your application to the internship supervisor (please see headings). Your application should include :

- a CV,
- a cover letter,
- your academic records,
- a recommendation letter from a professor or a previous internship supervisor.

Deadline for application: 1st May 2024.

Upon reception of your application, we will contact you for an interview. The interview agenda is usually as follows :

Duration	Activity
15 min	Presentation of the candidate's academic (and professional) background to highlight the skills, experiences and any element relevant to the internship
15 min	Presentation of the internship project and the host team by the supervisor
15 min	Open discussion
10 min	Short test on either signal processing or Matlab programming
10 min	Discussion on the short test



Location

School

Télécom Paris trains its students to innovate in today's digital world. Its training and research cover all fields of information and communication sciences and technologies with a strong societal foundation in order to address the major challenges of the 21st century. It offers engineering, PhD and professional degree programs, with international students accounting for 55% of its student body. Its research offers original, multidisciplinary world-class expertise in nine strategic areas: Data Science and Artificial Intelligence—Visual and Audio Computing, Interaction—Digital Trust—Innovation Regulations—Transformation of Innovative Firms—Cyber-Physical Systems—Communication Systems and Networks—Mathematics and Applications—Uses, Participation, Democratization of Innovation.

As a founding member of Institut Polytechnique de Paris and an IMT (Institut Mines-Télécom) school, Télécom Paris is a living laboratory that fosters practical solutions and applications while measuring their impact on society.

📍 Address: 19 place Marguerite Perey, 91120 Palaiseau, France

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Hosting laboratory

[Laboratoire Traitement et Communication de l'Information \(LTCI\)](#)

Research team

The **Circuits et Systèmes de Communication (C2S)** team is internationally recognized for its ability to integrate digital intelligence into AMS and RF SoCs such as analog-to-digital converters (ADCs) or RF receivers for cognitive radio. By combining its expertise in the physical realization of the CMOS chip with its experience in signal processing and its knowledge of the other network layers for which LTCI's skills are recognized, the group designs high-performance AMS and RF SoCs. The aim is to develop elements or "building blocks", enabling the system of connected objects to be interfaced on one side with the physical world via sensors, and on the other side with the system core via communications, in particular RF.

References

- [Gharaibeh11] Gharaibeh, K. M. (2011). Nonlinear distortion in wireless systems: Modeling and simulation with MATLAB. John Wiley & Sons. URL: <https://ieeexplore.ieee.org/book/6542367>
- [PAMatlabExpl] Power Amplifier Characterization - MATLAB & Simulink. <https://www.mathworks.com/help/comm/ug/power-amplifier-characterization.html>



FAQ

Will I be paid?

You will receive a stipend, the amount is approximately 350€/month.

How to accomodate my stay in France?

There are several student residences in the vicinity of the campus. Further information will be provided upon demand.