Marcos A. Santos

Software / Hardware / Firmware Developer

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This profile lists the activities carried out during the last 20 years as a systems developer and architect using software and hardware engineering procedures. Such activities had the necessary technical and theoretical foundation in the research and industrial areas built over another 20 years of intense work in technical support and consultancy to several companies in different countries and cultures.

- The data presented in this profile is supported and interrelated to a base of source code of applications and engineering diagrams used as a demonstration of instruments and systems developed and in operation on laboratory benches today.
- Once reviewing the document, use the internal links in the skills panels to navigate to the activity (blue numbers as ①), project (green numbers as ①) or certifications (red Greek letters as κ). There you will find information that supports the declared skill.
- From there, you can use the external links to access the respective source code repositories / engineering diagrams, course completion certificates, and published peer-reviewed work that support the activity. Links to results on self-training and assessment sites (such as HakerEarth's CodeMonk for code challenges and Aptitude for general and behavioral validations) will be provided if relevant to the activity.

As the task of balancing between precision and synthesis in describing 40 years of intense work in several technical areas is enormous, two documents are provided. This the compact version .

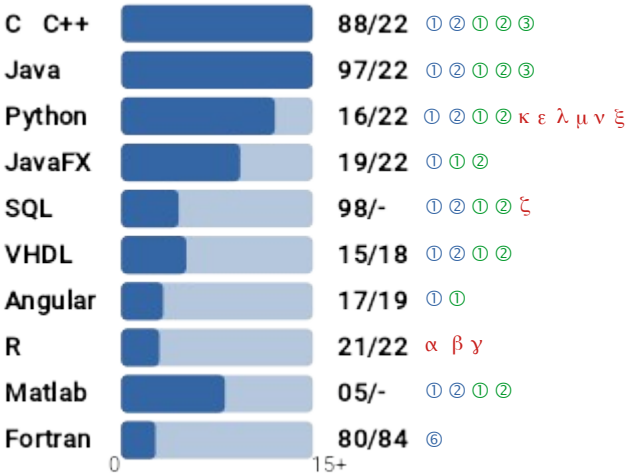
More info : Please use this link to download a detailed report.

More info : Please use this link to go to the portfolio page

Skills

Embedded Systems ①②①②③
Machine Learning ①① κ β λ μ ν ξ
Cloud ①① η
Statistical Analysis ①②①② α γ η
Data Science ①②①② η ζ ε
Analytics ①②①② γ ζ
Algorithms ①①③
Linux Kernel ①②①
Trading Strategies θ ι
Blockchain δ
Analog Circuits ①②①②③
CAD PCB Design ①②①②③
Reverse Enginnering ①②①②③
FPGA ①①③
ARM Cortex ①②①②③
Six Sigma ① γ ο π ρ
Quality Control ① γ ο π ⑥
Reliability Check ① ③④⑥⑩

Programming Languages



Background & Last Certifications

Johns Hopkins University — coursera

Data Science, Statistics, and Machine Learning Specialization

α Statistical Inference - May 2022 - Certificate
Published Assignment - Simulation Exercise
Published Assignment - Inferential Data Analysis

β Pratical Machine Learning - July 2022 - Certificate
Published Assignment - Modeling Exercise

University of Amsterdam — coursera

Data Analytics for Lean Six Sigma

γ Six Sigma Data Analytics - September 2022 - Certificate

Curso Técnico Integrado – Engenharia Elétrica / Eletrônica
Escola Técnica Padre Landell de Moura Feb. 75 – Nov. 78

Please click here to go to other certifications

Frameworks & Development Tools

Sckit-learn ①① κ
Pandas ①① ε
R Caret α β γ
Flask / Django ①①②
Solidity Geth δ
OpenCV ①②①
Spring ①
GIT / Maven ①②①②
JTAG Probes ①②①②③
Docker Kubernetes ①① η
MongoDB ①① ζ
Jupyter ①① ζ
Selenium / Scrapy ① ②
Google Cloud ① ① ζ η
IDA Disassembler ①②①②
Wireshark NMAP ①②①
I2C / CAN Sniffers ①②①②

Languages & General Info

Portuguese Mother tonge - Native

English First foreigner language.
Travel 10+ years and living 2 years
EF SET B2+ (85%) on EF Set assessment

Spanish Sister language to travel in neighborhood.

German Second foreigner language.
Basic classes during the stay (2 years)
Good as usualy written.

Mode Hybrid in São Paulo area, Remote elsewhere
Full time -- Pacific, Eastern, Europe TZ.

Type Prefer Contract but hire (Brazil CLT) would be no problem. -- Visa : Neither W2 nor GC

Experiences

❶ System Architect – Development Manager

Opus Equipamentos Eletronicos e Opticos Ltda. July 2008 -> Now

The activities at Opus, continuing the path of achievements built by understanding the needs of customers over the last 30 years, created a series of instruments and systems[1] based upon some architectural concepts as listed below. Let's highlight demands, solutions and value gains of them :

- **RELIABLE O.S.** -> [demand:Costly downtime due to unwanted updates by the O.S. manufacturer] -> solution: Construction of a robust and customized operating system for analytical & high reliability tasks. The ruggedized O.S. Debian/Linux created has reduced downtime to close to zero and offered:
  - Freedom (no recurrent activation / no third parties)
  - Trust (all source code available / no possible eavesdropping)
  - Simplicity and speed (no useless gadgets or drivers loaded)
  - Low latency (Use of the real-time/fast event response kernel services need by instrumentation control tasks)
- **EFFICIENT USER INTERFACE (UI/UX)** –> [A clean and fast working environment] -> An instrument-oriented window/canvas manager increased analyst efficiency by:
  - Innovate without being disruptive by keeping what the analyst is used to working with (Android's activity system and Material screen like on his cell phone)
  - Use of the same Android design channels – Java(FX Quantum/Prism) and C++ in the direct interface with the Linux video server (XLIB)
  - System at the service of the user and not the other way around via a distraction-free look and feel and (configurable) error detection & automatic suggestions
- **A DEDICATED INTELLIGENCE CORE** -> [better accuracy and inference on data processing tools] -> A server specialized in analytical processing was able to reduce analysis times to approx. half (e.g. project ASVP from 1h to 32 min) by :
  - Provide statistical inference, data analysis and machine learning services by implementing well known AI strategies.
  - Use of known and reliable Python libraries such as Scikit-learn, Pandas, Scipy, ScanPy, OpenCV interface and others.
  - On-the-edge processing and real-time ML modeling (not just Tableau dashboards or Excel spreadsheets)
- **RESEARCH PORTAL** –> [Researcher independence when translating theory into modeling and calculation routines] -> Reducing the need for technical assistance or intervention to implement new algoritms on the analytical chain was possible by creating:
  - An universally accessible scientific research server (browser based) using the well-known Jupyter Notebooks, and its dedicated IPython executor for direct connection to the above analytical core.
  - Possibility of installation on any Kubernetes cluster (k8s) in a cloud to interface with data services on Google Cloud.
  - Enable the researcher to use dashboards or databases of his choice by building channels like Instrument->Portal API->Jupyter->Dash/Plotly or MongoDB Atlas
  - Joint work with researchers in implementing robust and well-documented API's for efficient access to the analytical core
- **RELIABLE HARDWARE** -> [Low downtime and maintenance costs] -> Extend substantialy the MTBF index is essentialy a preventive view, so it was possible using :
  - Good development resources (Quality tools and IDE's – JetBrains, Eclipse, Valgring/GDB/Jlink, Android Studio + NDK).
  - Focus on using known and stable CPUs (ARM Cortex NXP cores – M4 for non-MMU and A8/A12 iMX for Linux kernels).
  - Stable build tools (open source GNU GCC / Linker EABI or LLVM/Boost when needed) and test (HIL/emulation) frameworks.
  - FPGA RTL (VHDL) when needed (Xilinx & Intel/Altera with ISE & Quartus).
  - Adequate analog components having good development tools and data (Texas Instruments analog tools & simulators).
  - Good simulation and research environment (Matlab Simulink - Scilab Xicos), Pspice for electronic modeling and HFSS for radiofrequency.
- **REVERSE ENGINEERING** -> [maintain legacy functionality] -> To do the legacy hardware and code research & documentation (hard) tasks :
  - IDA Hex-Rays and JTAG Probes for reverse code in C/Assembler - Wireshark and S010 Editor for code breaking tasks in protocols.
  - Protocol sniffers on TCP/IP, I2C, CAN and 802.11/GPRS channels (among other HIL procedures)
  - Understanding the inner workings of linking, memory mapping and U-Boot processes of various operating systems (linux, android sunxi / radxa, qemu / qnx / zephir) as well as the processes of changing the microcode of some CPUs was invaluable
  - Use of assembler programming when necessary.

Note 1 Please refer to the open source codes at projects ❸ Project LGT8(LGT8 page), ① Project ASVP(MiddleStripB) and ① Project PP200(PP200) for user application systems. See also repositories CLIServer, Virna7, ASVPServer, SorptionLab Server, MongoDB Server for some system servers, microcontrollers firmware, PCB & CAD Design and general hardware development.

❷ Senior Developer

Antrax Tecnologia Ltda. July 2000 -> July 2008

The activities below created the foundation needed to perform a safe and efficient development structure for various systems and solutions :

- **Design (JAVA and C or C++) of applications and libraries** to work under real-time, critical mission, or MISRA standard constraints, like state machines, multi-threaded executors, dedicated database entity managers, and class loaders among others.
- **Use of the Netbeans Platform API** (version 8.0) as a development foundation for new applications. Many fully functional (including hardware interface) systems to analytical instruments are serving customers today – See for instance ② Project Autodensity(Picno2) and others
- **Use of the Android API** (until level 21 / Lollypop / Material) and Android Studio 3.0 as support (human interface) to analytical software (e.g.: UI /sensors I/O with NDK / native drivers on the underlying Linux / Device JTAG & Bootp procedures, etc). See ③ Project LGT8(LGT8 Page)
- **Build and use several Unix kernels**, systems, and custom device drivers since 1997.
- **Gluelogic and SOCs** using Xilinx Spartan 3E FPGA (Xilinx ISE IDE + VHDL). See projects ③ Project LGT8(LGT8) and ⑧ Project Iris(Iris) to Intel / Altera with Quartus / Modelsim code.
- During the years, the goal of being proficient in the following tools was achieved :
  - **Printed circuit board PCB design** (Proteus 8) – See projects ⑥ Vehicle Dynamics(Board Snapshot) , ⑤ Centauro(Board Snapshot) and others
  - **CAD & CAE design** with SolidWorks and his interface with Electrical. - see assy & parts modeling on ⑤ Project Centauro(Centauro Snapshot)
  - **Design of microwave cavities and waveguides** and RF coupling with the HFSS / Maxwell. See project ⑦ Project DGT100(DGT100)
  - **Optical systems design** with the Zemax. -- See project ⑧ Project Iris(Iris)
  - **Simulation and math modeling** with MATLAB / SIMULINK (INRIA SciLab / Xicos) and SPICE - See project ① Project ASVP(MiddleStripB)

Past experiences and achievements - Please use this link to see better details

❸ Field Service Engineer and LATAM Operations Manager – Thermo Instruments --- Dec 1995 - Jul 2000
Technical operations (commissioning and maintenance support of gamma neutron spectrometers) in South America, Africa, and the Middle East.

❹ Service Operations Manager – Divec Vácuo e Equipamentos Ltda. --- Dec 1991 - Mar 1994
Management of all service tasks, including calibration/certification, sales of spare parts, and consumer items to a pool of 420+ customers
Work with Optical UV, Flourescence & Energy Dispersive RX and Mass spectrometers – High Vacuum Devices – Gas analysis.

❺ Field Service Technician – Mesbla Aviação e Equipamentos Ltda. --- Mar 1986 - Mar 1991
Factory based (in Germany) customer support and consulting, sales support, instrument quality control and optical alignment.
Work with UV & ICP spectrometers, Thermal Analysis and Optical alignment.

❻ Service Technician Level II – CIA do Metropolitano de São Paulo METRO. --- May 1980 - Feb 1986
Corrective and Preventive maintenance on High Power Propulsion and Energy Conversion, Automatic Train Control and Railway Track Signaling.

Projects & Creations

Most relevant projects and instruments created from 2000 to 2021

Click here to browse the projects repositories or **Here to download a detailed PDF**

1. ASVP Project - OPUS - requested by ACP Instruments --- Aug 2019 - Now
   Development of a system to provide all needs to manage analytical instruments such as surface area by gas adsorption and particle size by laser scanning according with ISO 9277:2010. Code and engineering references are here : Desktop Application - ASVP Calc Server - Reliability Test Data Simulator - MongoDB Entity Manager & Compiler - SorptionLab WEB app and Interface to Instrument Calc Server
2. Autodensity Project - OPUS - requested by ACP Instruments --- April 2015 - June 2017
   Provide hardware, firmware, and analytical user interface to operate a pycnometer able to measure density on ores/cement by gas volumetry compliant to standard ASTM D-2856 and ASTM D-6683. References are here : PP200 Desktop Application - ARM Cortex Firmware to the stand alone instrument - Support libraries to the dedicated window manager - Controller PCB Design
3. LGT8 Project - OPUS - requested by Acil Instrumentos Ltda. --- Apr 2014 - Feb. 2016
   Provide hardware, firmware, and analytical user interface operating on a portable Android tablet to retrofit a Logitech precision lap&polishing machine Series LP (to geological samples). References are here : ARM Cortex M4 Controller Firmware - Controller PCB Design - Android Aplication - Operations and Analytical Core
4. Blaine PP200 Project - OPUS - requested by ACP Instruments - Feb 2013 - Oct 2014
   Provide hardware, firmware, and analytical user interface to operate a device able to measure powders' fineness by using a Blaine technique compliant to the standard ABNT 16372. References are here : Desktop Application PP200 - Support Libraries to the dedicated window manager
5. Centauro Project - OPUS - requested by Centro Tecnológico da Aeronáutica - Jun 2009 - Apr 2011
   Provide hardware to create a controlled atmosphere induction furnace to metal/ceramic materials capable of operating over 1500°C for extended periods of time. References are here : Engineering Drawings - PCB Design Snapshot - Documents Repository
6. Vehicle Dynamics Project - OPUS - requested by Vehicle Dynamics - Aug 2008 - Feb 2010
   Provide hardware, firmware, and analytical user interface to retrofit a Jurid instrument used to capture a vehicle's sensor network data. References are here : PCB Design - Controller Firmware - Analytical Interface Application Documents Repository
7. DGT100 Project - ANTRAX - requested by Provecto Analítica - Mar 2005 - Nov 2007
   Provide hardware and firmware to upgrade a microwave digestion device with a modern microcontroller and double the delivered power compared with similar devices. References are here : Documents Repository
8. IRIS Project - ANTRAX - requested by Acqualab Laboratórios - Mar 2002 - Apr 2003
   Refurbish an Inductively Coupled Plasma Spectrometer (ICP) Iris model from Thermo Jarrel, replace (and make compatible) his CCD Camera, and modify entrance optics (radial to axial) : Alignment Tool Desktop Application - Refurbish Process Pictures - Cryogenic Cooler Pictures
9. Antares Project - ANTRAX - requested by BSW Tecnologia - Aug 1998 - Jan 2001
   Provide hardware, firmware, and analytical user interface to coordinate a pool of 10 instruments able to execute long-term Metallurgical Creep Tests compliant with the standard ISO 204 / ASTM E039. References are here : Documents Repository
10. Medusa Project - ANTRAX - requested by BSW Tecnologia - Feb 1997- Jul 1998
    Provide ways to intercept, filter, and transform analytical results from instruments unable to talk to enterprise database managers. References are here: Documents Repository

Learning

Click here to see last Statistical Inference and Quality Control Certs.

Blockchain Specialization

- δ **Blockchain Basics**
  University at Buffalo – State University of New York – March 2022
- **Ethereum Blockchain Learning Path**
  Showing only 2 of 11 modules :
- σ **Supply Chain Smart Contract**
  LinkedIn Learning– Dec 2022
- τ **Integrating Non-Blockchain Apps.**
  LinkedIn Learning– Dec 2023

Business / Market & Trading Courses

- θ **A.I. and Business Strategy**
  LinkedIn Learning– July 2022
- ι **Algorithmic Trading and Stocks Training**
  LinkedIn Learning– April 2022
- Σ **Algorithmic Trading and Finance Models with Python, R, and Stata**
  LinkedIn Learning– Jan 2023
- Γ **Understandig Capital Markets**
  LinkedIn Learning– Feb 2023
- η **Google Cloud Big Data and Machine Learning Fundamentals**
  Google Cloud Training – March 2022

Applied Machine Learning Courses

- λ **Ensemble Learning**
  LinkedIn Learning– June 2022
- μ **Algorithms**
  LinkedIn Learning– June 2022
- ν **Feature Engineering**
  LinkedIn Learning– May 2022
- ξ **Foundations**
  LinkedIn Learning– May 2022
- κ **Machine Learning with Sckit-Learn**
  LinkedIn Learning– July 2022
- ω **Advanced Predictive Modeling**
  LinkedIn Learning– Feb 2023

Lean Six Sigma Courses

- ο **Six Sigma Green Belt**
  LinkedIn Learning– June 2022
- π **Lean Six Sigma Foundations**
  LinkedIn Learning– June 2022
- ρ **Six Sigma Foundations**
  LinkedIn Learning– June 2022
- υ **Advanced NLP with Python for Deep Learning**
  LinkedIn Learning– Jan 2023
- φ **OpenCV for Python Developers**
  LinkedIn Learning– Jan 2023
- χ **Advanced C - Integrating C and Assembler**
  LinkedIn Learning– Jan 2023

Math Refresh & Upskill Program

- Λ **Complete Linear Algebra : Theory and implementation in code.**
  Udemy - January 2023
- M **Become a Calculus II Master**
  Udemy - May 2023

Skill Badges & Challenges

- ψ **LinkedIn Skill Assesment Badge Python Language**
  top 5% of 4.1M people who took this.
- Π **MATLAB OnRamp**
  MathWorks Training– Jan 2023
- Ξ **Cryptography and Hashing in Python and Java**
  Udemy - January 2023
- ϵ **Data Analysis & Processing with Pandas**
  Educative Inc. - June 2022
- ζ **An Introductory Guide to SQL**
  Educative Inc. - March 2022