Victor David Sánchez, Ph.D., IEEE Fellow Palo Alto, CA, USA

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OBJECTIVE

Senior Science and Engineering leading position commensurate with work experience and education. Accomplished, highly skilled & experienced (25+ yrs.) world-leading Engineering Professional with extensive breakthrough expertise in Artificial Intelligence incl. AIOps, Gen AI, Data Science and Engineering, Big Data, Analytics, Machine Learning, Image & Signal Processing, Computer Vision, Robotics, Systems Engineering, System/Architecture Design, Development, Verification, Validation, Test, Integration & Deployment of avionics, software, firmware, & hardware for Machine Learning, Artificial Intelligence, Robotics, Defense, Aerospace, Software, IT, Security, ASICs, SoCs, Biotech, Finance, Public Health, Telecom, Multimedia.

Proven ability to lead, research, design & hands- on develop & verify extremely complex engineering systems. Overwhelmingly successful experience with program management and product development at/with start-ups, international corporations, and national laboratories incl. the U.S. Space Force, NASA, ESA, DLR, CNES, DoD, Lockheed Martin, Boeing, Northrop Grumman, Raytheon, SAIC, Spacedev, Airbus, HP-Agilent, Intel, Broadcom, Conexant, Windriver, Siemens as well as federal and state governments in the USA and Europe. Proficient in requirements, project scheduling, technology planning & supervisory tasks. Outstanding problem-solving, analytical-critical-thinking, presentation, communication & collaboration skills.

EDUCATION

Swiss Federal Institute of Technology (EPFL) Lausanne, Switzerland
Functional Programming in Scala Specialization Certification (2018)

Stanford University Palo Alto, CA, USA
Advanced Computer Security Program Certification (2017)

University of California, Extension Silicon Valley Santa Clara, CA, USA
VLSI Engineering Program Certification (2015)

Nova Southeastern University Ft. Lauderdale, FL, USA
Ph.D. (2002) Computer Science

Karlsruhe Institute of Technology (KIT) Karlsruhe, Germany
Dipl.-Ing. (1986) Electrical Engineering

University of Applied Sciences Karlsruhe Karlsruhe, Germany
Dipl.-Ing. (1985) Telecommunications Engineering

HIGHLIGHTS

- Youngest IEEE Fellow ('Nobel' Prize in Engineering) in history worldwide
- Chief Scientist (15 yr, 50+ vol) of Elsevier Science journal in Machine Learning
- Artificial Intelligence(AI)Machine Learning(ML) expert: Computer Vision, NLP (Gen AI), Robotics.
- Definition and Execution of the First 8-yr Program in Machine Learning for the German Federal Ministry of Research and Technology
- Developing the Next Generation Overhead Persistent Infrared (OPI) program space vehicle avionics for the U.S. Space Force (Northrop Grumman, Lockheed Martin, Ball Aerospace, Raytheon), the world-best early missile warning satellite constellation as integral part of the US Golden Dome.

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- Designed and developed classified US DoD Spawar GPS flying vehicle & real-time machine learning, neurochips (Lockheed, SAIC)
- Developed encryption-multimedia-wireless Southern California, USA start-up technology, sold for $1/3 Billion within 1 year to Broadcom (Irvine, CA)
- Designed secure operating system at the highest level of trust (NSA, Harris)
- Developed NASA's new generation of fully autonomous space robotic systems & missions
- Decade long tenure as civil servant (Senior Research Scientist & Program Manager) of the German Federal Government at the German NASA (DLR), Robotics: Computer Vision, AI, Machine Learning; Communications: Satellite & Digital Networks
- Space Technology & Mission Development at DLR (Germany), NASA (USA at JPL in Pasadena, CA & MSFC, Huntsville, AL), with ESA (ESTEC, Netherlands)
- Design of NASA's most powerful launch vehicle (now SLS), development of DLR's space robot flown with NASA's Spaceshuttle & ESA's Spacelab, design of telecommunications and earth observation satellites, both operational in space
- Design and development of classified US DoD GPS flying vehicle & real-time machine learning, neurochips (Lockheed, SAIC)
- Design and Development of the fastest real-time Supercomputer (hardware, software, applications) of its time, beat the Cray, a real-time parallel distributed architecture which processed data pipelines for performing real-time predictive analytics, control of multi-media streaming data coming down from NASA's Spaceshutle

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EMPLOYMENT HISTORY

Brilliant Brains, Palo Alto, CA
Chief Technologist, Loc:U.S. Space Force/NASA Jet Propulsion Lab (JPL) Los Angeles, Pasadena, CA
January 2011 to Present

Space:

- since 2023, currently, hands-on working on mil space systems engineering, fw & interfaces to hw and flight sw for a U.S. Space Force program, on the design & verification of space SoCs/FPGAs of the U.S. next generation overhead persistent infrared (OPI) program mission-critical vehicle/payload, geo later polar (NGG/NGP), satellite constellation integral part of U.S. Golden Dome. Protection of U.S. & allies against incoming threats relies on accurate detection & tracking of ballistic & hypersonic missiles' signatures & the built-in vulnerabilities resiliency against counterspace & cyberattacks. Virtex-5QV, Siemens Mentor Questa.
- since 2022 systems engineering, designing & developing NASA's next generation of fully autonomous space robotic systems & missions including deep space, Mars autonomous aerial vehicles based on advanced, innovative system design, operational flight software, mission-critical, real-time custom System on Chip (SoC, FPGA) and hardware algorithmics to be flown with multiple missions. ARM, Qualcomm Snapdragon, TI TMS MCU, Microsemi ProASIC FPGAs, Linux, fprime.
- Applied standards/tools incl. DO-254, DO-178C, NPR 7150.2, UML, UVM, SystemVerilog, SiL, HiL.
- Planetary Defense: research and development of technology, systems and missions to address, mitigate, eliminate, the NEO/PHO impact hazard.
- Launch Vehicles: design of more powerful system architectures and research, analysis of necessary technology advancement incl. strategies, systems, components, in particular human-rated to

transport multitudes of people to different celestial bodies beyond current NASA SLS capabilities.
• Earth Observation Satellite System: launch of original design, built by Airbus, with Arianespace Vega (2016) which became operational.

Machine Learning, AI, Computer Vision, NLP (Gen AI), Robotics, Multi-cloud, Web, Big Data, IoT:
• Developed low latency production software incl. micro-services, data analytics, log processing, fraud detection, recommendations, real-time streaming, data warehousing, business intelligence, statistics, deep networks, text & image processing-recognition projects, feature/insight extraction, performance improvement, random experimentation vs statistical methods incl. A/B testing, AI-ML predictiveness-correlation-causality analyses for decision making. R&D quantum machine learning.
• Image Processing/Computer Vision: hands-on, extremely experienced in algorithm design and coding of image processing and computer vision in C, C++, Python, Matlab, IPT, OpenCV, LabView. One of my systems was used for a NASA spaceflight, processing streaming image data from space. For the semiconductor industry designed and coded in C/C++ image enhancement and compression algorithms for displays interfacing to multimedia & telecom chips, acquired by Broadcom for around 1/2 billion US dollars. More specifically, have coded algorithms for camera calibration, edge detection & thinning, image segmentation, stereo vision, visual 3-d reconstruction, object detection & tracking, lossy and lossless image compression incl. DCT, DWT(JPEG), Huffman coding, AI-based.
• R&D, hands-on, AGI, ASI, Gen AI, NLP, LLMs, NLP, RESTful APIs, tokenization, lemmatization, casing, NER, document-term matrix, document similarity measures, Euclidian distance, cosine similarity, word counts, one hot encoding, TF-IDF, Vector-space & Probability models, PCA, ENA, LDA, LSA, distributional hypothesis, keyed vectors, dimensionality reduction, SVD, Word2Vec, GloVe, fastText, Gensim, word sense disambiguation, polysemy, principal components, eigenvectors, BERT, tokenizer, WordPiece, context-free and contextual models, input, token, segment, position embeddings, lexical units, morphemes, words, tokens, transfer learning, fine-tuning, zero-, one, few-shot tasks, Hugging Face models, tagging, data labeling software, Label Studio, transformer, chatbots, LaMDA, Palm, Gemini, Bard, BLOOM, GitHub Copilot, ChatGPT, Open AI API, GPT-4.
• Developed/applied CI/CD pipelines, testing and deployment automation, unit test tools for distributed computing, SQL and NoSQL database systems, data repository ETL, vector, semantic, hybrid search, vector/graph db, Nearest Neighbor Search, kNN ANN, NLP, conversational UX, GenAI foundation models, LLM quantization, QAT, PTQ, model fine-tuning, PEFT, ICL, P-tuning, LORA, IA3, RAG, LLM orchestration with Langchain Pydantic, LlamaIndex.
• used AI techniques (ML, NLP, ...) to automate IT tasks and improve operational efficiency, well-versed in the automation, streamlining, and optimization of IT service management and operational workflows via AIOPS, leveraging big data, analytics, and ML capabilities. Applied related technologies to optimize the iIT resource utilization and to identify as well as resolve IT issues, and to provide real-time insights into IT operations. Collected and analyzed data from multiple sources, automated tasks incl. data backups, workload scheduling, and performance monitoring. By automating repetitive tasks, the staff experience and productivity was substantially improved.
• Integrated insightful data into compelling dashboards using COTS automation tools and languages incl. PHP, Python, R, JS, Java, Scala, etc. Created integration workflows by configuring individual steps (pre-built functions, step registry, i.e. available object list), combining data payload objects, connecting them laying out the order of operations, configuring logic, setting up branches, using the conditional wizard, including incorporating interfaces to Jenkins and others, analyzed timelines using tools incl. ScienceLogic's SL1, PowerFlow. Extended the capabilities of the PowerFlow deployment using PowerPacks to monitor and diagnose applications status and determine whether and why they failed, to perform health checking providing data to the PowerFlow Control Tower page. Written R-T detailed guides for task / procedure completion of IT ops (runbooks), to facilitate

business tasks and reduce management costs. Used API calls, the standard HTTP request/response protocols and XML/JSON data to integrate with external systems to programmatically exchange data with them, with database servers, admin portals, and all-in-one appliances.

• Developed and integrated software, models, pipelines in Scala, Java, C#, F#, Visual Basic, Python, R, Octave, C++, C, CUDA, bash, PowerShell, Node.js, Express, Pug, npm, MongoDB, Mongoose,ASP.NET, .Net, Ajax, Javascript, jQuery, Html, Css, Xml, Json, Angular, React, Spark, Dask, Hadoop, Map Reduce, Sqoop, Hive, Pig, Hbase, Yarn, Oozie, Flume, Kafka, Zookeeper under Linux & Windows, IntelliJ, Eclipse, Sbt, Maven, Gradle, SQL, MS SQL Server, NoSQL, Cassandra, MySQL, Oracle, Mesos, Docker, Kubernetes, Hortonworks, Cloudera, AWS, EC2, Databricks, Weka, Mahout, Numpy, SciPy, sklearn, Pandas, TensorFlow, PyTorch, Caffe, Keras, Mllib, XGBoost, H2O-AutoML, DAG, Airflow, Luigi, Prefect, DataBricks, SVN, Git, Jira,DevOps,Agile,Scrum,Cradle, Doors.

• Seasoned multi-cloud, big data, highly available, virtualization, integration, deployment, web using AWS, GCP, Azure, Cloudera, VSTS, Git, Visual Studio, Eclipse, DevOps, Microservices, continuous integration, delivery, deployment (CI/CD), Site Reliability Engineering (SRE), Virtualization platforms incl. VmWare Workstation Player, KVM, VirtualBox, Virtual PC, Hyper-V. Optimization for distributed frameworks incl. data, tensor, model parallelism DDP, FSDP, CUDA, NCCL.

• Developed/Simulated customized autonomous and teleoperated robots in dynamic environments using OpenCV, ROS, Gazebo, Rviz. Tasks incl. simulating sensors, actuators, mapping, planning, control, navigation and related architectures, algorithms, URDF models, forward & inverse kinematics, open & closed-loop control.

SoC, ASIC, FPGA, GPU, Multi-threaded Parallel Distributed Processing Design and Verification (7+ yrs. 5 proj. completed + on-going):

• Coded using UVM, UVMF, SystemVerilog (VCS, DVE, Magellan) direct test, constrained randomization, and formal methods (SVAs, ABV), VHDL, OSVVM, C/D-DDD, HD/CS, VVS

• Developed entire UVM (OOP) testbenches-DUTs, MAC, Cores, 100GE, Tx, Rx, FIFO, IO, Reg, DMA, bridge, switch, CPU, PCIe, DDRx. Coded in Verilog & VHDL

• Tools: Cadence,Synopsys,Siemens-Mentor,Aldec, Virtuoso,Incisive,SynplifyPro, Questa, Modelsim, Riviera Pro, Libero, Matlab, SimuLink, Icarus Verilog, GTKWave, Verilator, OrCAD, PSpice, PADS.

• AMD-Xilinx, Intel-Altera, Microchip-Microsemi FPGA development, Nvidia GPUs CUDA, GPGPU, OpenMP, MPI, Arduino incl. computer graphics, image processing, machine learning.

Epidemiology, Public Health:

• conceived, designed and developed advanced algorithms for predictive modeling and control as global solution for any epidemic & pandemic including covid-19.

• for the epidemiological targeted solution, integrated multiple approaches of previous programs and projects incl. predictive control of space robots in real-time, multi-resolution in computer vision.

• tested solution with data sets from all over the world including the U.S.A., Europe, Asia confirming remarkable results nowhere obtained before.

Secure Computer Systems:

• Mitigated vulnerabilities, developed adequate policies and secure code.

• Installed robust VPN for secure, reliable development servers. Enforced proper authentication.

• Implemented policies and best practices to avoid intrusion into mission-critical IT and DB systems.

State of California EDD
Program Representative San Jose, CA
August 2020 to November 2022

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- performed claim processing using multiple software systems including uio cpt, cubs, scdb, vcc, ...
- determined claimant eligibility for uei benefits
- responded inquires, conducted interviews
- ensured policy compliance
- conducted training, mentoring

MTA, Boeing Group at NASA MSFC
Subject Matter Expert Huntsville, AL
January 2008 to December 2010 (additional consultant work not included)

- Designed and developed (hw, flight sw) NASA CxP program's (ARES, now SLS) launch vehicle. Performed design reviews in different avionics & flight software committees
- Performed systems engineering, developed IV&V (Integrated Verification & Validation) requirements & plans (Cradle, Doors, NPR 7150.2, 1553,Ethernet,IP,UDP,DMA,PCI,CPU Test,BSP)

Broadcom, NASA JPL, Fiber Space, Falon (Lockheed Martin, SAIC), Conexant, Harris, Cybernetics
Senior (Head) Systems Engineer, Director of Engineering Pasadena, San Diego, CA; Ft. Lauderdale, FL
September 1995 to December 2007

- Developed encryption-multimedia-wireless(SoC, ASIC), acquisition at $ 1/3 Billion
- Designed & developed (hw&sw) NASA JPL's most advanced unmanned spacecraft
- Systems engineered & developed Electro-Optical systems (hw, sw) for laser comm equipment startup using patented Optical Phase Locked Loop and others from NASA JPL.
- Delivered to NASA design of a family of economic missions and spacecraft for Mars, also planned to be used for commercial missions to asteroids
- Delivered initial design of multi-functional earth observation satellite system (confidential) & separately a telecommunications satellite system, both operational
- Systems engineered & Developed DoD-classified GPS/INS multiproc/DSP avionics & flight sw with Lockheed Martin & SAIC using multiple innovative technologies/standards (AI/ML chips,1553,UML)
- Designed secure operating system at the highest level of trust (NSA, Harris)
- Developed highly-available R-T LAN/WAN. DBMS telecom workforce management (Cybernetics)
- Held Professor and Associate Professor positions at DeVry University, Pomona, CA, USA and the University of Miami, Coral Gables, FL, USA (EE, CS)

German Aerospace Center (DLR)
Senior Research Scientist, Program Manager Oberpfaffenhofen by München, Germany
January 1988 to August 1995

- Designed and developed real-time parallel distributed supercomputer to process computer vision, artificial intelligence, machine learning, robotics algorithms with interfaces to NASA's Spaceshuttle and ESA's Spacelab, used during STS-55 flight.
- Defined and developed Machine Learning Program (8 yr) for the German Federal Ministry of Research and Technology, consortia incl. DLR, Siemens Corporate R&D
- Supervised theses in (CE) for the Univ. of Appl.Sci., in (CS) for the Technical Univ., Munich (TUM), Germany. Topics included Machine Learning, Artificial Intelligence, Parallel Distributed Computation, Computer Vision, Robotics

Siemens AG, Automation Division
Development Engineer Karlsruhe, Germany

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January 1986 to December 1987

- Developed programmable controller hardware using ASICs and microprogramming
- Developed real-time multitasking OS
- Integrated development into multicomputer system

Karlsruhe Institute of Technology (KIT)
Research Scientist Karlsruhe, Germany
January 1985 to December 1985

- Designed and developed commercial VLSI-ASIC design tool, gate array design with former IBM management

German Aerospace Center (DLR)
Research Associate Oberpfaffenhofen by München, Germany
January 1984 to December 1984

- Designed domestic satellite communications system with Airbus, launched to space operation with Ariane IV launch vehicle.

Hewlett Packard-Agilent, Computer Division
Engineer Böblingen, Germany
January 1983 to December 1983

- Improved production of desktop computers based on Motorola processors

ADDITIONAL COURSEWORK

Stanford University:
Statistical Learning (2018),
Machine Learning (2018),
Databases: Relational Databases and SQL (2023), Databases: Modeling and Theory (2023),
Databases: Advanced Topics in SQL (2023).

University of California, Extension Silicon Valley:
The Internet of Things: Big Data Processing and Analytics (2017),
Hadoop: Distributed Processing of Big Data (2017).

Technische Universität München, Germany:
Web App Development with the Power of Node.js (2018).

TECHNICAL SKILLS

Python, Java, R, C++, JavaScript, SQL, NoSQL, Spark, Hadoop, AWS S3, DuckDB, TensorFlow, PyTorch, scikit-learn, Keras, OpenCV, NLTK, spaCy, MXNET, Caffee, Gensim, Theano, H2O-ai, Mahout, NumPy, Hugging Face's transformers, caret, e1071, Stanford NLP, Apache OpenNLP, Shark, mlpack, llama.cpp, GPT-4, LLaMA, predictive analytics, natural language processing (NLP), image recognition, chatbots, website recommendation systems, fraud detection, computer vision, robotics, gaming, Autonomous Vehicles (AVs), Unmanned Aerial Vehicles (UAVs), In-space servicing, assembly and manufacturing (ISAM), Virtual Reality (VR), Augmented Reality (AR), email spam classification, sales forecasting, disease diagnosis, Matplotlib, Seaborn, Tableau, SparkSQL, Flink, Arrow, GCP, PySpark, TorchGeo, torchvision, Torch Tune, QGIS, ArcGIS, GDAL, Machine learning models: supervised, unsupervised, reinforcement learning, deep learning, convolutional neural networks CNNs, recurrent neural networks RNNs, decision trees, support vector machines SVMs,

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graph neural networks (GANNs), state-space models (SSMs), long short-term memory models (LSTMs), transfer learning, parameter-efficient fine-tuning methods, alignment and adaptation, LoRA, QLoRA, Reinforcement Learning from Human/AI Feedback (RLHF, RLAIF) & with execution feedback (RLEF), Direct Preference Optimization (DPO), constitutional AI, prompt tuning, Proximal Policy Optimization (PPO), AWS, Azure, Google Cloud Platform, Bedrock, Vertex AI, Power Platform, AutoML, containerization, configuration, orchestration, Docker, Kubernetes, CI/CD Tools: Airflow, Cloud Build, Tekton, Security: regulations, encryption, General Data Protection Regulation GDPR, multi-party computation, differential privacy, homomorphic encryption, Generative Artificial Intelligence (GenAI), Conversational AI, Artificial General Intelligence (AGI), Artificial Super Intelligence (ASI), Foundation Models (FMs), Large Language Models (LLMs), Large Behavior Models (LBMs), Trust Region Policy Optimization (TRPO), Markov Chain, Markov Decision Process (MDP), actor-critic methods, imitation learning (IL), behavioral cloning (BC), inverse reinforcement learning (IRL), inverse Q-learning (IQL), Variational Auto-Encoders (VAEs), Generative Adversarial Networks (GANs), diffusion probabilistic models (DPMs), score-based diffusion models (SDMs), denoising diffusion probabilistic models (DDPMs), data, tensor, model parallelism DDP, FSDP, CUDA, NCCL, Scala, J2EE, C#, F#, Visual Basic, Octave, C, PHP, Perl, tcl/tk, Linux, Windows, bash, PowerShell, Dask, MapReduce, Sqoop, Hive, Pig, Hbase, Yarn, Oozie, Flume, Storm, Kafka, Zookeeper, IntelliJ, Eclipse, Sbt, Maven, Gradle, RDBMS, Relational Algebra, PHP, MS SQL Server, SQLite, MySQL, Oracle, Cassandra, MongoDB, AIOps, SL1, PowerFlow, PowerPacks, Runbooks, Mesos, Hortonworks, Cloudera, EC2, SVN, Git, Jira, DevOps, Microservices, Weka, SciPy, Pandas, H2O-AutoML, DAGs, Luigi, Prefect, Databricks, Mllib, XGBoost, OpenCL, OpenMP, MPI, Arduino, vxWorks, Linux, Windows, UVM, SystemVerilog, VHDL, OSVVM, SoC, ASIC, FPGA, Nvidia, GPU, CUDA, GPGPU, VisualStudio, Matlab, Node.js, Express, Pug, npm, Mongoose, ASP.NET, .NET, AJAX, jQuery, Html, Css, Xml, Json, Angular, React, SOA, Agile, SCRUM, UML, DO-254, DO-178C, NPR 7150.2, cFS, F Prime, Cradle, Doors, SiL, HiL, DDRx, PCIe, 100GE, Xilinx ISE, Vivado, Quartus II, ModelSim. Questa, Libero, Systems Engineering, Algorithms: Aerospace, Big Data, Data Analytics, IoT, Machine Learning, Computer Vision, Artificial Intelligence, Robotics, Image/Signal Processing, Parallel Processing, ROS, Gazebo, Rviz. R&D, Electro Optical Infrared (EO/IR), hands-on, RESTful APIs, tokenization, lemmatization, casing, NER, document-term matrix, document similarity measures, Euclidian distance, cosine similarity, word counts, one hot encoding, TF-IDF, Vector-space & Probability models, PCA, ENA, LDA, LSA, distributional hypothesis, keyed vectors, dimensionality reduction, SVD, Word2Vec, GloVe, fastText, word sense disambiguation, polysemy, principal components, eigenvectors, BERT, tokenizer, WordPiece, context-free and contextual models, input, token, segment, position embeddings, lexical units, morphemes, words, tokens, transfer learning, fine-tuning, zero-, one, few-shot tasks, Hugging Face models, tagging, data labeling software, Label Studio, transformer, chatbots, LaMDA, Palm, Gemini, Bard, BLOOM, GitHub Copilot, ChatGPT, Open AI API, R&D quantum machine learning, CI/CD pipelines, testing and deployment automation, unit test tools for distributed computing, SQL and NoSQL database systems, data repository ETL, vector, semantic, hybrid search, vector/graph db, Nearest Neighbor Search, kNN ANN, conversational UX, GenAI foundation models, QAT, PTQ, PEFT, ICL, P-tuning, LORA, IA3, RAG, LLM orchestration with Langchain Pydantic, LlamaIndex.

AWARDS: NASA Nation-wide Award (1999), AAAS Member (1997), IEEE Fellow Award (1995)

LANGUAGES German, English, Spanish