

# Omar Alfredo Castaño

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LinkedIn | CV (Spanish version) | CV (English version)


## PROFESSIONAL SUMMARY

Senior Electronic Engineer with over **40 years of experience in Telecommunications and Spectrum Engineering,** with a distinguished career in key regulatory bodies in Argentina (ENACOM and its predecessors AFTIC, CNC, and SECom) and in the private sector.

Expert in radio spectrum planning, allocation, coordination, and management, as well as in the design and deployment of terrestrial and satellite radio networks (in geostationary and non-geostationary orbits).

Notable track record in leadership roles such as Engineering Coordinator, Chief Engineer, and Operations Manager, leading consulting, design, and implementation of complex telecommunications projects for major private companies and for the Argentine System of Digital Terrestrial Television (SATVD-T). Also served as Laboratory Manager and Antenna Factory Manager, managing the complete lifecycle (R&D&I, design, production, quality, installation, and maintenance) of low, medium, and high-power antennas and radiating systems.

**Currently, I focus my experience on the architecture and decisive application of Generative Artificial Intelligence (GenAI) systems for optimizing technical and creative processes in telecommunications, engineering, and education.** As a conceptual developer of **CognitiveOS** -a system currently under development for AI-assisted learning, based on controlled reasoning and knowledge distillation- my goal is to define how AI can be integrated rigorously, verifiably, and usefully in highly demanding technical environments.

## KEY TECHNICAL SKILLS

- ✓ **Spectrum Engineering**
- ✓ **Antennas and Radiating Systems**
- ✓ **GIS Software, Tools, and Geospatial Data**
- ✓ **Generative Artificial Intelligence (GenAI) Systems**
- ✓ **Radiocommunications**
- ✓ **Technical Management and Consultancy**
- ✓ **Regulations and Standards**
- ✓ **Cognitive Systems Architect (CognitiveOS)**

## PROFESSIONAL EXPERIENCE

### Innovation and Generative AI (GenAI) Ecosystems Consultant — 09/2025 – Present

**GenAI Ecosystem and Process Automation:**

- Implementation of advanced workflows based on latest-generation LLMs (ChatGPT, Google Gemini, Claude, Grok, DeepSeek, Qwen (Alibaba), Yi (01.AI), MiniMax) for exhaustive technical analysis and automated generation of complex regulatory documentation.
- Design and deployment of autonomous AI agents for automating technical processes using LangChain, n8n, and Google AI Studio. Evaluation of emerging tools such as Antigravity and specialized platforms like Alibaba Cloud Model Studio for AI workloads in alternative cloud environments.
- Design of hybrid research workflows leveraging NotebookLM for rapid cloud-based synthesis alongside SurfSense - a China-origin open-source alternative supporting local LLMs (Ollama, Llama 3) and private deployment - for contextual knowledge extraction across sensitive technical repositories.
- Knowledge Engineering: Epistemological Distillation, Directed Ingestion Architectures, and Structured External Memory Systems (Obsidian and its Chinese equivalent, SiYuan Note).
- Cognitive Systems for AI-powered Education: Development of RAG (Retrieval-Augmented Generation) systems focused on information fidelity and hallucination mitigation in cognitively demanding learning environments.

**Digital Editing and Multimodal Production:**

- Development of comprehensive digital video and audio editing solutions (CapCut, DaVinci Resolve, Audacity) powered by AI for effective communication of engineering and technical projects.
- Production of high-fidelity multimodal audiovisual resources, including professional voice synthesis and creative composition AI for audio/music generation: ElevenLabs, Suno, MiniMax Music 2.5, Mureka V8, and AI for video generation: Sora 2 (OpenAI), Veo 3.1 (Google), Grok Imagine 1.0 (xAI), Movie Gen (Meta), ElevenLabs, Runway, Midjourney, LTX Studio, Seedance 2.0, Kling 3.0, MiniMax / Hailuo 2.3, WAN 2.6.

**Senior Professional, Satellite and DTT Technical Support, Directorate of Planning and Convergence (DINAPYC), National Communications Agency (ENACOM)** 07/2015 – 08/2025

- Technical leadership in the development of advanced methodologies, software applications, and regulatory frameworks for Satellite services (GSO and Non-GSO), broadcasting, and mobile services.
- Update of GMC Regulation No. 64/97: Procedures Manual for Coordination between Earth Stations (GSO and Non-GSO) and Fixed Service Stations within MERCOSUR countries (in the frequency bands between 100 MHz and 174.8 GHz).
- Development of methodologies for EMC analysis between Fixed Service (Point-to-Point DFRS) and NGSO FSS Earth Stations in E Band (71 - 76 GHz and 81 - 86 GHz), including orbit prediction of Non-GSO satellites (e.g., Starlink Gen2 satellite constellation) and calculation of coordination zones around NGSO FSS earth stations (e.g., Gen2 Starlink Gateway Site).
- Update of General Directive DG 61-03 for interference calculation in Fixed Services from 30 MHz to 174.8 GHz
- Development of methodology for antenna and radiating system measurement with 3D modeling, including planning and execution of flight plans (with autonomous operations) for measurement campaigns with Unmanned Aerial Vehicles (UAV/Drones) in the frequency range of 30 MHz to 44 GHz.
- Development of the regulatory framework for FM Radio (76--108 MHz, including extended band 76-87.8 MHz) aligned with MERCOSUR GMC Resolution No. 47/2022.
- Development of a software application tool for Point-to-Point (PtP) and Point-to-Area (PtA) radio link calculation (30 MHz - 6 GHz) based on ITU-R P.1546/P.1812, which determines coverage (or level) of desired/interfering signal for outdoor/indoor reception for services:
  - Analog systems: Open channel radio, single-channel systems, trunked systems (MPT1327), FM Radio, and VHF TV.
  - Digital systems: TETRA, DMR, UHF DTT (DVB-T/T2, ISDB-T/TB), Mobile Systems up to 5G.
- Development of methodology and software application tool for coverage simulation of Private Mobile Broadband System (LTE SPBAM) based on ITU-R P.1812.
- Development of methodology for prediction of desired and interfering signals (co-channel/adjacent) in UHF SFN networks (470 - 698 MHz, Channels 14 - 51) for the calculation of ISDB-T/TB DTT coverage in Argentina's Open Digital Television (TDA).
- Analysis of the LeoLabs Inc. S-Band Phased Array Offset-Fed Reflector (PAFR) Space Radar for detection and tracking of objects and debris in LEO: Impact on Space Situational Awareness (SSA) and Space Traffic Management (STM). Case studies of real satellite tracking (e.g., SAOCOM 1A and STARLINK-1347).
- Assessment of the impact of directive receiving antennas in UHF DTT MFN networks.
- Development of methodologies and specifications for UHF DTT receiving antennas.
- Development of methodologies and specifications for a Single High-Power Antenna System for FM Radio and VHF/UHF DTT transmission.
- Planning of MVDDS services in 12.2-12.7 GHz, including: development of coverage tools, interference assessment with DBS/DIRECTV, technical supervision and survey of the actual system of MM Comunicaciones S.A.

**Engineering Coordinator, Advisory Council of the Argentine Digital Terrestrial Television System (SATVD-T), Ministry of Planning, Public Investment and Services (MinPLAN)** 03/2010 – 06/2015

- Led the comprehensive technical coordination of the nationwide deployment of SATVD-T (ISDB-T/TB standard), from technology assessment to network optimization.
- Managed DTT (Digital Terrestrial Television) network planning in Multi-Frequency Network (MFN), Single Frequency Network (SFN), and mixed MFN-SFN topologies, including infrastructure design, UHF spectrum optimization, and system administration.
- Supervised the generation of over 2300 technical documents (Reports, Technical Data Sheets for DTT Stations (EDTs), Standards, Simulations, GIS Maps).
- Made decisive contributions to key SATVD-T Technical Standards (NT 001 - 004, RE 003) and foundational Resolutions.
- Designed and specified over 240 DTT radiating systems (Types A/B/C/D/D+ High/Medium/Low Power (DTT) and Differential High-Power Types (DTT-FM): Ministry of Public Works (MOP) Building, Alas Building, Devoto, Florencio Varela, and Avellaneda Single Communications Tower (TUC) (Avellaneda (TUC)):
  - **DTT radiating systems (Types A/B/C/D/D+):**
    - **Type A** $H_{TOWER}$ = 153m and DTV Power = 12x1kW for $Coverage_{OUTDOOR}$ = 44km
    - **Type B** $H_{TOWER}$ = 81m and DTV Power = 12x1kW for $Coverage_{OUTDOOR}$ = 34km
    - **Type C** $H_{TOWER}$ = 45m and DTV Power = 12x0.5kW for $Coverage_{OUTDOOR}$ = 22km
    - **Type D+** $H_{TOWER}$ = 75m and DTV Power = 12x0.5kW for $Coverage_{OUTDOOR}$ = 21.9km
      FM Power = 4x1kW for $Coverage_{OUTDOOR}$ = 38.9km
    - **Type D** $H_{TOWER}$ = 45m and DTV Power = 12x0.3kW for $Coverage_{OUTDOOR}$ = 17km
      FM Power = 4x0.5kW for $Coverage_{OUTDOOR}$ = 13.1km

  Preliminary Design, Initial Coverage Prediction, Survey, Final Coverage Prediction, NIR Calculation, and Implementation of Phases I, II, and III of SATVD-T (deployment of >110 EDTs) and planning of Final Phases (>150 additional EDTs), including complex high-power differential (MOP, Alas, Devoto, Avellaneda (TUC)):
  - **For SATVD-T PHASE I (51 EDTs)**
    - 36 Type A EDTs
    - 13 Type B EDTs
    - 2 Differential High-Power EDTs:
      - **Alas Building** $H_{TOWER}$ = 170m
        DTV Power = 9x1kW
      - **MOP Building** $H_{TOWER}$ = 170m
        DTV Power = 6x5kW
  - **For PLANNED FINAL PHASES of SATVD-T (156 EDTs)**
    - 15 Type A EDTs
    - 24 Type B EDTs
    - 1 Type C EDT
    - 84 Type D EDTs
    - 29 Type D+ EDTs

- **For SATVD-T PHASE II (38 EDTs)**
  - 17 Type A EDTs
  - 10 Type B EDTs
  - 9 Type C EDTs
  - 2 Type D+ EDTs
- **For SATVD-T PHASE III (21 EDTs)**
  - 8 Type A EDTs
  - 3 Type B EDT
  - 1 Type C EDTs
  - 5 Type D+ EDTs
  - 1 Differential High-Power Type EDT:
    - **Devoto** $H_{TOWER}$ = 96m
      DTV Power = 4x6.25kW
  - 3 Differential High-Power Type EDTs:
    - **Puerto Madero** $H_{TOWER}$ = 180m
      DTV Power = 7x6.25kW + 1x1.25kW
      5x6.25kW + 4x3.125kW + 2x0.625kW
      FM Power = 2 x (10x15kW)
    - **Florencio Varela** $H_{TOWER}$ = 265m
      DTV Power = 8x6.25kW
    - **Avellaneda (TUC)** $H_{TOWER}$ = 368.5m
      DTV Power = 4 x (8x6.25kW)
      FM Power = 2 x (10x15kW)

(EDT: Digital Terrestrial Station)

- Performed over 2900 coverage/interference simulations, generated over 2900 thematic GIS/SDI maps, and executed NIR (far-field) calculations for all SATVD-T station types.
- Designed and developed the calculation methodology, along with a software application tool, for SDH 2 + 1 STM-1 (155.52 Mbit/s) Studio-Transmitter Links (STL) with combined space and frequency diversity (6-8 GHz / 11-13 GHz).
- Conducted interference analysis for SATVD-T and for the Federal Authority for Audiovisual Communication Services (AFSCA).
- Planned network optimization strategies (Phase IV), including the development of DSM/Clutter models and advanced propagation algorithms.
- Led strategic international technical commissions for the design of the Avellaneda Single Communications Tower (TUC), evaluating technologies and best practices through visits to leading manufacturers, specialized laboratories, antenna measurement fields, and emblematic transmission towers worldwide:
  - TECHNICAL MISSION (04/06/2013 – 15/06/2013):
    - AUSTRALIA: RFS (Radio Frequency Systems) and towers at TX Australia Pty Limited transmission sites Ornata Road and Eyre Road.
  - TECHNICAL MISSION (25/06/2010 – 09/07/2010):
    - BRAZIL: KATHREIN (Kathrein Broadcast GmbH), São Paulo Tower.
    - GERMANY: LS Telcom (LS telcom AG), R&S (Rohde & Schwarz GmbH), SPINNER (Spinner GmbH), KATHREIN, Wendelstein Mountain Tower, Munich Single Tower.
    - SPAIN: RYMSA (now Sener), MIER (Mier Comunicaciones S.A.), Torrespaña Radiotelevisión Española (RTVE), Collserola Tower.
- Visit to the CPqD Foundation, presentation on the Provision of Services and Tool for Spectrum Control in Argentina Related to Broadcasting Services (AM and FM) and Audio and Image (TV), for AFSCA (11/11/2013 to 14/11/2013)
- Factory visit to CONSULFEM S.A. and the Antenna Measurement Laboratory (LaMA) of the National Commission for Space Activities (CONAE) to perform the world's first validation of UHF DTT radiating systems with inclined polarization, an innovation proposed by Eng. Omar Alfredo Castaño (24/06/2013).
- Provided expert technical advice and design for the initial deployment of the National Digital Terrestrial Television Systems in Venezuela (SVTVD-T), Bolivia (SBTVD-T), and Paraguay (SPTVD-T).
- Technical Responsible for the Commissions for the Initial Deployment of the SATVD-T (Argentina) and SBTVD-T (Bolivia) Systems. Led the process of study, site selection, and coverage calculation for the installation of high and medium power DTT Transmitter Stations (similar to the EDTs used in the SATVD-T).
  - Bolivian Commission (Initial Phases of SBTVD-T) (03/06/2013 – 17/06/2013): Directed the technical analysis in all departmental capitals, as well as in other cities and strategic locations.
  - Argentine Commission (Initial Phases of SATVD-T) (01/03/2010 – 30/09/2010): Directed the technical analysis in all provincial capitals, as well as in other cities and strategic locations.

## CNC Technical Representative and Member of the Coordinating Committee for the CNC-CONAE Cooperation Project (PEC CNC-CONAE) — 10/2005 – 01/2009

- Management of the CNC-CONAE technical collaboration for Electromagnetic Compatibility (EMC) between Earth Exploration Satellite Service systems and the terrestrial Fixed Service.
- Coordination of exchange/integration of technical products (orbital prediction software, GIS, etc.).
- Development of Interference Simulation Software Tool for EMC analysis in shared bands (FS vs. Earth Stations operating with Earth Exploration Satellites (EESS)), for the CONAE Córdoba Earth Station (located at the Teófilo Tabanera Space Center (CETT), in Falda del Carmen) which operates with Argentine SAOCOM and SAC-A/B/C/D/Aquarius satellites, and international satellites such as Landsat, Spot, EROS, Terra, Aqua, NPP, NOAA, and GOES.

## Coordinator of the Spectrum Engineering Working Group (ETIE) — 10/2004 – 01/2009

- Leadership of a multidisciplinary team for the modernization of regulations and Technical Analysis tools.
- Development of methodologies and tools for radio spectrum engineering and management.
- Development of 7 volumes of the Radio Spectrum Engineering Manual (IER Manual).
- Development and specification of Digital Terrain Models (DEM/DSM).
- Analysis of GSO/Non-GSO Satellite Systems.
- Development of 11 Functional Specifications (EFs) for software.
- Development of the CNC-GIS.
- 27 Draft Technical Standards (PNT).

- Technical databases (Antennas, Equipment, Geoclimatic Factors).
- Training Courses (CCs).
- Development of 57 Technical Reports (ITs).

**Coordinator in Spectrum Engineering Affairs of the CNC Engineering Management** **05/2000 – 09/2004**
**Co-author of the Integrated Management System (SIA) and Technical Analysis Projects** **01/2004 – 09/2004**

- Update and development of new DGs/DTs, harmonizing technical criteria of the CNC Engineering Management.
- Development of technical standard: Digitization of the envelopes of Terrestrial Antenna Radiation Patterns operating at frequencies above 30 MHz to 60 GHz.
- Author of the technical project Expansion of the Coverage Area of the Cellular Mobile Radiocommunication Service (CMRS) for the City and International Airport of El Calafate, Perito Moreno Glacier, and Access Routes.
- Co-author of General Directives (DG 33, DG 36, DG 54, and DG 61) for the Fixed and Mobile Services.

**Head of the Non-Geostationary (Non-GSO) Sub-sector of the Space Services Area, CNC Engineering Management** **03/1997 – 09/2004**

- Technical analysis, coordination, approval, and assignment of GSO and Non-GSO space systems (Little LEO, Big LEO -MEO-, and Broadband LEO).
- Spectrum coexistence analysis in the Teledesic LEO satellite system (Non-GSO FSS), evaluating the network architecture (288 Broadband LEO satellites) to provide "Internet-in-the-Sky" services, spectrum sharing in Ka-band 18.8 to 19.3 GHz (space-to-Earth), interference analysis with Fixed Services (FS), concluding that coexistence is difficult and highlighting the Argentine decision (Res. 1608SC/98) to allocate the band exclusively to FSS to prevent interference.
- Representation of CNC as technical expert in ITU meetings. Presentations on the Space Services Area.
- Member of the commission to draft the Manual for Frequency Coordination of Earth and Terrestrial Stations (in C and Ku Bands) of MERCOSUR Working Group No. 1 "Communications" (GMC RESOLUTION No. 60/01) (1997 – 2001).
- Responsible for the coordination of pioneering Non-GSO earth stations:
  - Orbcomm (LEOTELCOM-1, Little LEO type) in the town of Justo Daract, San Luis Province.
  - Globalstar (HIBLEO-4FL, Big LEO type) in the town of Bosque Alegre, Córdoba Province.
- Responsible for the international coordination of the ICO Global Communications satellite network (non-geostationary intermediate circular orbit system, ICO) with Terrestrial Fixed Service Systems in the shared downlink band (space-to-Earth) 2185 - 2200 MHz.
- Responsible for the Validation of the FS/MSS Interference Simulation Program Version 2.00 for the international coordination of the ICO Global Communications satellite network with Terrestrial Fixed Service Systems, carried out at CPqD in Brazil.
- Participation in MERCOSUR commissions, and in the evaluation of the AFMS (Automated Frequency Management System) Computer System, and international delegations as an expert in Non-GSO Satellite Systems (ITU-R, WRC-2000, CITEL).

**Gerente de Operaciones (ENTESA) / Jefe de Ingeniería y Desarrollo (PCSA)** **03/1994 – 02/1997**
**Empresa de Nuevas Tecnologías S.A. (ENTESA)** **07/1994 – 02/1997**
**Professional Communications S.A. (PCSA)** (https://professionalcommunicationssa.com/) **03/1994 – 06/1994**

- Leadership and Management of multidisciplinary teams, comprehensive consultancy, and specialized support in advanced technological projects for key clients:
  - **EDEER S.A.:** Design and implementation of the Corporate Communications Plan.
  - **Gas Natural BAN S.A.:** Design and implementation of the Comprehensive Communications Plan (Data, Voice, SCADA).
  - **Petrolera Argentina San Jorge S.A.:** Design and implementation of telecommunication systems for SCADA in oil fields.
  - **Argencard S.A.:** Project and implementation of a data radio link.
- Feasibility, risk, and operational/commercial needs analysis.
- Diagnosis and design of technological solutions (SCADA, data networks, VHF/UHF mobile, Microwave).
- Evaluation and selection of technologies and suppliers.
- Design and engineering of complex telecommunications systems.
- Project and Tender Management.
- Research and Development (R&D) of Special Radiating Systems with innovative technology (applied in projects for Gas Natural BAN S.A. and EDEER S.A.), a precursor to later designs (UHF DTT Single Antenna Systems) carried out by the SATVD-T Advisory Council between March 2010 and June 2015.

**Head of Antenna Laboratory / Factory Manager (Acting)** **07/1986 – 11/1993**
**Antenas Profesionales S.A.** **07/1991 – 11/1993**
**AHF Antenas S.A.** **07/1987 – 06/1991**
**AMPO S.A.C.I.F.A.** **07/1986 – 03/1987**

- Head of the Antenna Laboratory for 8 years in three leading companies in the sector, integrally managing the technical life cycle of radiating systems.
- Technical Management: Laboratory Leadership; Quality Control and Tuning Supervision; Technical Project Management; and Technical Responsible in quality inspections and in public/private tenders related to radiating systems (AMPO S.A.C.I.F.A.).
- Design, Development, and Innovation (R&D) of radiating systems and components (with complete CAD manufacturing drawings) for various applications:

- TV VHF (Channels 2-13) and UHF (Channels 14-83) and FM Radio (76 to 108 MHz) radiating systems of low, medium, and high power (V/H/Circular polarization).
- Radiocommunication radiating systems for fixed/base stations in VHF and UHF, including omnidirectional and mobile antennas (dual 5/8λ UHF, cellular 800-900 MHz band).
- High gain parabolic antennas (grid reflectors of 2, 3, 4 m; collapsible / welded / semi-collapsible), and antennas with para-dihedral, plane, and dihedral reflectors, with their corresponding feeds for VHF/UHF.
- Low, medium, and high power RF components: Design and development of broadband harnesses (up to 26 ways), adjustable high power dividers (up to 8 ways), harmonic filters, and baluns for VHF/UHF.
- Design and dimensioning of the test field for VHF/UHF antennas, defining measurement methodologies and protocols.
- Technical Support, Consultancy, Production and Operations Management.

**Specialist Engineer (05/1983 – 06/1986) / Technician (04/1980 – 04/1983)** **04/1980 – 06/1986**

**Secretariat of State for Communications (SECom)**

- Progression from Technician to Specialist Engineer at SECom, supervising analysis, approval, and assignment of frequencies/systems for Fixed Service (single-channel and multi-channel in VHF/UHF/Microwave) and Mobile Service (single-channel in VHF/UHF) under national and international regulations (ITU).
- Development of methodologies for predicting desired and interfering signals for quality calculation in Fixed Service (FS) radiocommunication systems, operating at frequencies above 30 MHz within the VHF, UHF, and microwave bands. This work was carried out as a member of a joint working commission between SECom (through its Spectrum Engineering and Frequency Assignment Departments) and the Argentine Chamber of Electronic Industries (CADIE), with participation from its main member companies (TELETTRA ARGENTINA S.A.I.C., THOMSON-CSF ARGENTINA S.A.I.C., GTE INTERNATIONAL INC., and EASTEL S.A.I.C.).
- Acting Head of the VHF, UHF, and SHF (Microwave) Section).

## RELEVANT CONTINUING EDUCATION (Selection)

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|---|---|
| • Self-directed continuous learning in Management and Application of GenAI Systems. | 2024 – Present |
| • Self-directed continuous learning in R&D&i in Telecommunications. | 2024 – Present |
| • ITU Seminars / International Forums (Radiocommunications, VSAT, GMPCS, Satellites). | 1997-2008 |
| • .NET Development Courses. | 2005 |
| • Seminars on Space Systems and Interference. | 1998 y 2008 |
| • Courses on Satellite Link Calculation and Satellite Communications. | 1997-1998 |
| • Specialized Technical Courses: RF Measurements, TV Systems, and Communications. | 1983-1986 |

## EDUCATION

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|---|---|
| • **Postgraduate Degree in Digital TV - University of Palermo (2011).** | **2009-2011** |
| • **Electronic Engineer - Avellaneda Regional Faculty of the National Technological University (FRA-UTN) (1984).** | **1978-1984** |
| • **Técnico en Electrónica (Telecomunicaciones) – ENET № 3 "Dr. Salvador Debenedetti" (1976).** | **1970-1976** |

## KEY TECHNICAL SKILLS

- **Spectrum Engineering:**
  - Spectrum Planning, Allocation, Management, and Optimization.
  - National and International Coordination (MERCOSUR, CITEL, ITU).
  - Interference and EMC Analysis (terrestrial services, space services (GSO/non-GSO), and mixed scenarios (E-s/s-E)
  - Advanced Radio Wave Propagation Modeling (ITU-R P Series Recommendations).
- **Radiocommunications:**
  - **Terrestrial Broadcasting:** FM Radio, Analog VHF-Lo/Hi TV, VHF/UHF DTT (ISDB-T/TB, DVB-T/T2).
  - **Satellite Systems:** GSO (geostationary) and Non-GSO/NGSO (SSO/LEO/MEO/HEO). Key satellite services: FSS, BSS, DBS, EES, MSS, RNSS, etc.
  - **Fixed Terrestrial Systems:** Point-to-Point (PtP) and Point-to-Multipoint (PtMP) (VHF/UHF and Microwave (SHF/EHF)) including backhaul radio links for mobile networks (4G, 5G, and future 6G) high capacity in E Band.
  - **Mobile Systems:** IMT-2000 (3G), IMT-Advanced (4G LTE-A), IMT-2020 (5G NR), and IMT-2030 (6G) technologies).
  - **Specialized Systems:** MVDDS (Multichannel Video Distribution and Data Service) in Ku-band (12 GHz), Wireless SCADA (Supervisory Control and Data Acquisition) (VHF/UHF), (PAFR) Space Radar (SSA/STM) in S-Band (2.93-2.98 GHz), ILS (Instrument Landing System) (VHF/UHF), and others.
- **Antennas and Radiating Systems:**
  - Theory, Design, Simulation (2D/3D), Development, Prototyping, and Testing (Lab/Field).
  - Measurement and Technical Verification (Fraunhofer far-field and Fresnel intermediate-field regions, UAV/Drones).
  - Characterization, Production, Tuning, Quality Control, and Maintenance.
  - **Types:** Parabolic, Dihedral Reflectors, Flat Panels, Yagi-Uda, Dipoles with/without Reflector, Mobile, Simple Arrays, and Radiating Systems (omnidirectional, sectorial, and directional), including Single High-Power Antenna System for FM Radio and UHF DTT transmission (with linear, elliptical, and/or circular polarization).
  - **Parameters:** Patterns, Gain, Directivity, Polarization (Linear, Elliptical, Circular), Down Tilt, Null Fill, Zin, VSWR, etc.

- **Technical Management and Consultancy:**
  - Telecommunications Network Planning and Design (Fiber Optics, Radio Links (VHF/UHF/Microwave), Digital Trunked Radio System, Wireless SCADA System).
  - End-to-end technical project management).
  - Preparation of Technical Specifications and Tender Documents.
  - Technical-Economic Evaluation of Solutions and Supplier Selection.
  - Implementation, Operations, and Maintenance (O&M) Supervision.
- **AI Innovation**
  - **CognitiveOS (Conceptual Educational Architecture in development)**
    **Description:** CognitiveOS (AI-Powered Cognitive Educational System) is a comprehensive ingestion, memory, and reasoning architecture designed specifically for the educational field. The system automates deep research processes on high conceptual density sources (videos, academic documents, websites) and applies a verified semantic distillation pipeline. Each statement generated by the system is directly and audibly linked to its original source, completely eliminating the hallucinations common to conventional language models.
    **CognitiveOS does not merely answer questions:** it builds a structured and reusable memory of the processed knowledge, allowing students and educators to explore, question, and verify each result with total transparency. Furthermore, it guarantees privacy and intellectual property, establishing a scalable and reliable knowledge system.
    **Technical achievement:** Development of a Source-Bounded Reasoning Engine that restricts model inference solely to the internally pre-validated knowledge graph. This approach, combined with a mandatory source-verification RAG (Retrieval-Augmented Generation) system, guarantees zero hallucinations and total traceability in high-demand cognitive environments.
- **Engineering and Management Software:**
  - **Simulation and Design:** MATLAB, Pathloss, Radio Mobile, ICS Telecom, AutoCAD, MicroStation, DesignCAD.
  - **Geospatial Analysis and Management:** GIS (ArcGIS, MapInfo, ERDAS Imagine), Visualization (Google Earth), and ITU Radiocommunication Bureau (ITU-R) Tools (IFIC, GIMS, SpaceCap, SPS).
  - **Development:**
    - **Languages/Environments:** Visual Studio .NET, Python.
    - **Machine Learning/IA:** PyTorch, TensorFlow (currently in research and self-learning).
    - **Office Suite:** Microsoft Office Suite.
- **GIS and Geospatial Data:**
  - **Digital Terrain Model (DTM):** SRTM 3/1 arc-second (Shuttle Radar Topography Mission 3/1 arc-second (approx. 90/30 m resolution at the equator)), understanding that native SRTM data is a Digital Surface Model (DSM) used as a DTM substitute, in raster format (e.g., GeoTIFF - tif).
  - **Digital Surface Model (DSM):** Includes clutter data (information on land cover types -- e.g., urban, forest, suburban, rural, water -- and the height of obstacles above terrain, such as buildings and vegetation), in raster (e.g., GeoTIFF - tif) or vector (e.g., Shapefile - shp) formats.
  - **Building and Urban Fabric Cartography:** 3D buildings in vector format (e.g., Shapefile - shp).
  - **Cartographic Projections:** Geographic (latitude/longitude), GK (Gauss-Krüger), UTM, UPS.
  - **Reference System:** WGS84, EGM96.
- **Regulations and Standards:**
  - **National Argentina (ENACOM, CNC, SECom):** General and Technical Directives (DGs and DTs) and Resolutions.
  - **International:** ITU Radio Regulations (RR), ITU-R/ITU-T Recommendations, MERCOSUR/CITEL Agreements, ETSI, FCC, 3GPP Standards, etc.
- **Generative AI (GenAI) Ecosystem**
  - **Language Models (LLM):** ChatGPT (OpenAI), Gemini (Google), Claude (Anthropic), Grok (xAI), Meta AI, DeepSeek, Qwen (Alibaba), Yi (01.AI), MiniMax, and other leading LLMs.
  - **Development and Experimentation (Google Ecosystem):**
    - **Models:** Gemini, Veo 3.1, Imagen 3, Nano Banana Pro.
    - **Development Platforms:** AI Studio, Vertex AI, Antigravity (agentic IDE).
    - **Creative Tools:** Stitch (UI design), Whisk (visual remixing), Flow (filmmaking).
    - **Productivity & Research:** NotebookLM.
  - **Memory Management:** Obsidian para la visualización de gráficos de conocimiento en formatos abiertos (Markdown/YAML).
  - **Multimodal Generation:** Suno and Mureka (music), ElevenLabs (voice/dubbing/music), Luma Dream Machine (image/video), Kling AI (audio/image/video), MiniMax (audio/music/image/video).
- **Digital Editing and Multimedia Production:**
  Audacity (audio editing), CapCut and DaVinci Resolve (video editing), OBS Studio (live streaming/recording).
- **Other Competencies:**
  - **Verification of EMF exposure limits (ICNIRP) for the assessment of non-ionizing radiation in broadcasting, mobile, and fixed stations**, in accordance with current national regulations (Res. MS 202/95, Res. CNC 3690).
  - **Predictor Non-GSO satellite orbit predictor** using TLE according to Rec. ITU-R S.1503-3 and SGP4 (LEO) / SDP4 (MEO) models.
  - **Quality of Service (QoS) and Availability of Point-to-Point Digital Fixed Radio Systems (DFRS PtP)** (PDH 2/8/34/140 Mbit/s and SDH STM-1/STM-4/STM-16 networks) for frequencies up to 175 GHz and path lengths up to 60 km.