SpaceSUITE

GNSS Data Processing: Theory & Practical Exercises

A 3-day in-person professional training for upskilling and reskilling in GNSS

25 - 27 June 2024, UPC, Barcelona, Spain

Training includes lectures followed by practical sessions and workshops focusing on:

- The concepts and techniques used in the positioning by means of the GNSS.
- Standard and Precise Point Positioning (SPP, PPP) with the focus on the instrumental use of the concepts and techniques of GNSS navigation, intended to include all the elements need to understand how the system works and how to work with it.
- The processing algorithms implemented through guided exercises in laboratory sessions.
- The different terms involved in modelling the pseudoranges (relativistic effects, atmospheric troposphere/ ionosphere and instrumental delays, clock synchronism, etc.), arise and navigation equations are solved by Least Squares estimation and by Kalman filtering.

The practical sessions are made with different programs designed specifically for the course to implement different processing modules!

Instructors:

Jaume Sanz Subirana,
Full Professor at the UPC
Department of Mathematics

Adrià Rovira García,
Serra Hunter Associate professor
with the UPC Department of Physics

+ more speakers to be announced soon!

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Theoretical topics:

➢ Fundamentals of GNSS Positioning
- GNSS Architecture: segments
- GNSS Positioning Concept
- GNSS Signals and Applications

➢ Overview of GNSS Positioning techniques
- GNSS Standalone positioning
- Code based differential positioning (DGNSS)
- Carrier based differential positioning (RTK, PPP)

➢ Code Pseudorange Modelling
- Linear model and prefit-residuals
- Example of computation of modelled pseudorange.

➢ Solving Navigation Equations
- Navigation equations system
- Predicted accuracy (DOP)
- Parameter estimation: Least Squares and Kalman Filter

➢ Precise Point Positioning (PPP)
- Precise Satellite Orbits and Clocks
- Precise modelling for PPP
- Carrier phase ambiguities: Floating vs Fixing

Practical lectures:

- GNSS Data Processing Laboratory Exercises: the gLAB tool suite
- Model components Detailed Analysis
- Solving Navigation Equations: Kinematic satellite LEO orbit estimation

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Instructors and Speakers

Jaume Sanz Subirana

UPC Department of Mathematics

Jaume Sanz Subirana is Full Professor at the Department of Mathematics at the UPC in Barcelona, Spain and founding member of the research group of Astronomy and Geomatics (gAGE) since 1988. He has published over 100 papers in peer-reviewed journals and more than 200 works in meeting proceedings related with GNSS. He is a co-author of five patents on GNSS and four books on GNSS Data Processing..

Adrià Rovira García

UPC Department of Physics

Adrià Rovira García is a Serra Hunter Associate professor with the Department of Physics at the Universitat Politecnica de Catalunya (Barcelona, Spain). He co-authors 33 papers in peer-reviewed journals, two book chapters and over 50 works in meeting proceedings, with one best presentation award from the US Institute of Navigation. His research interests are focused on high-accuracy navigation, integrity systems, ionospheric modelling and scintillation.

Miquel Garcia Fernadez

Robukun

Miquel Garcia-Fernandez, co-founder and Chief Technology Officer of Rokubun. With over 20 years of experience in GNSS research engineering, Dr. Garcia-Fernandez holds a PhD focused on GNSS data processing for ionospheric monitoring from the Polytechnic University of Catalonia (Spain). Prior to Rokubun, Dr. Garcia-Fernandez worked at JPL/NASA, contributing to GNSS data processing and developing models for the next-generation GPS control segment. He also held roles as scientific staff at the Research Center of Sustainable Humanosphere (University of Kyoto, Japan) and the German Aerospace Center. Currently, at Rokubun, Dr. Garcia-Fernandez leads the technological strategy and roadmap of the company and manages GNSS- and navigation- related projects funded by various European institutions such as ESA, EUSPA and the European Commission.

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Instructors and Speakers

Deimos Ibañez

Galileo Service Centre

Deimos Ibañez is a L2 maintenance engineer at the Galileo Service Centre. Previously, he was s a system engineer in "La Caixa", a researcher in the gAGE research group, where he developed deep understanding in GNSS positioning while developing new functionalities for gLAB tool (SBAS 1F, SBAS DFMC, full multi-constellation and multi-frequency support, PPP and Fast-PPP or fast convergence with high precision). He was also an SBAS system Engineer in EPO (EGNOS Project Office), where he supported the development of the tools for EGNOS V3 (new EGNOS version with single and dual frequency), provided support on the validation of the validation of the tools and algorithms.

Matteo Paonni

Joint Research Centre /Europena Commission

Matteo Paonni is currently a Team Leader within the Directorate for Space, Security, and Migration with the Joint Research Centre of the European Commission, Ispra, Italy. Under his position, he coordinates the scientific and policy support to DG DEFIS and EUSPA on the EU GNSS Programmes. His main focus is on GNSS signal design and optimization, GNSS security, compatibility, and signal processing. From 2007 to 2013, He was a Research Associate with the University of the Federal Armed Forces, Munich, Germany.

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