CHARLES CONSTANT

+447963391574 | charles.constant.18@ucl.ac.uk | https://charlesplusc.github.io/

EDUCATION

University College London Sep. 2022 - Ongoing

PhD Space Flight Dynamics and Geodesy, University College London *London, United Kingdom*

- Development of an operational near-real-time pipeline for atmospheric density inversion using POD data, currently running on the UCL Supercomputer cluster. | link
- Development of a novel GPU framework for high-fidelity physics-based differentiable spacecraft radiation force modelling.
- Implemented high-fidelity orbit determination and orbit propagation methods, with experience in Kalman filtering and probability of collision simulations for LEO spacecraft using both cooperative and uncooperative tracking data.
- Contributed to the ideation, bid writing, and development of the UK Space Agency funded UCL-NASA JPL collaboration, working on the interface between GipsyX and UCL's internal ray-tracing software | link
- Aided in the supervision of Masters and undergraduate research projects
- Peer reviewer for GPS Solutions journal

Imperial College London Sep. 2021 - Jun. 2022

*MSc Environmental Data Science and Machine Learning, Grade: **Merit*** *London, United Kingdom*

- **Thesis:** Aerodynamic Drag Force Modelling for LEO Mega-Constellations
- **Relevant Courses:** Computational Mathematics, Machine Learning, Advanced Programming.

University College London Sep. 2021 - Jun. 2024

*BEng Engineering, Grade: **First-Class*** *London, United Kingdom*

- **Thesis:** Emotion Detection using Convolutional Neural Networks.
- **Relevant Courses:** Modelling and Analysis, Materials and Fluid Mechanics, Structural Mechanics.

University of Reading Sep. 2015 - Jun. 2018

*BSc Physical Geography, Grade: **2:1*** *London, United Kingdom*

- **Thesis:** Linking Green Spaces to Stress Reduction via Remote Sensing.
- **Relevant Courses:** Remote Sensing, Climatology, Advanced Research Skills

WORK & RESEARCH EXPERIENCE

Visiting Researcher Sep. 2023 – Jan. 2024

Space Environment Technologies *Boulder, Colorado, United States*

- Developed and implemented a method to assimilate LEO POD data into the company's up-and-coming data-assimilative thermospheric density model.
- Created high-fidelity drag and solar-radiation-pressure models for LEO mega-constellation satellites

Consulting Sep. 2023 – Jan. 2024

University College London Consultants Ltd *London, United Kingdom*

- Research and production of a report for the UK General Lighthouse Authority on the future of LEO PNT technologies over the next 10 years.

Navigation Training Course Jun. 2023 – Jul. 2023

European Space Agency Academy *Belgium*

- Training in GNSS and Galileo system architecture, signal processing, and hands-on navigation exercises.

Researcher in Applied Machine Learning Jun. 2021 – Sep. 2021

University College London *London, United Kingdom*

- Awarded Departmental Grant to develop and validate methods developed in undergraduate thesis.

Founder and Team Lead Sep. 2020 – Sep. 2021

University College London Cubesat Design Team *London, United Kingdom*

- Led a team of 11 doctoral and undergraduate students to the final round of the Airbus/UKSEDS CubeSat design competition.

Undergraduate Researcher in Astrodynamics Jun. 2020 – Oct. 2020

University College London Space Geodesy and Navigation Laboratory *London, United Kingdom*

- Development of C++ and Python tools for astrodynamics. Characterization and analysis of solar radiation pressure time-series.

Semi-Professional Cyclist Jun. 2015 – Jun. 2017

Various teams *France/Italy/UK*

- Raced in 4 road cycling teams across Europe; Competed in two Ironman events

Journal and Conference Works

Differentiable Radiation Pressure Modelling
***Charles Constant**, Santosh Bhattarai,Marek Ziebart, Tobias Ritschel | Under Review*

Near-Real Time Thermospheric Density Retrieval from Precise Low Earth Orbit Spacecraft Ephemerides During Geomagnetic Storms
***Charles Constant**, Santosh Bhattarai, Indigo Brownhall, Anasuya Aruliah, Marek Ziebart | pre-print link*
Submitted to Space Weather

Orbit Domain Calibration in Sun Synchronous Orbits
*Felicia Peto-Madew, Indigo Brownhall, **Charles Constant**, Santosh Bhattarai*
Presentation at European Space Debris Conference 2025

Probing Thermospheric Response and Operational Impacts during the 2024 Mother's Day Geomagnetic Storm
***Charles Constant**, Indigo Brownhall, Laura Aguilar, Eliot Dable, Marek Ziebart, Anasuya Aruliah, Santosh Bhattarai*
Presentation at European Space Weather Week 2024. Paper In preparation

An Evaluation of Physics Based Force Model Performance in LEO: Implications for Next Generation Space Traffic Management
***Charles Constant**, Benjamin L. Hanson, Santosh Bhattarai, Indigo Brownhall, Marek Ziebart | presentation link*
Presentation at COSPAR 2024. Paper in preparation for Space Weather

Orbit Domain Calibration for Space Surveillance and Tracking
*Santosh Bhattarai, Indigo Brownhall, **Charles Constant**, Felicia Peto-Madew, Eugene Rotherham | presentation link*
Presentation at COSPAR 2024. Paper in preparation for Advances in Space Research

MOCAT-pySSEM: An Open-Source Python Library and User Interface for Orbital Debris and Source Sink Environmental Modelling
*Indigo Brownhall, Miles Lifson, **Charles Constant**, Giovanni Lavezzi, Maya Felice Harris, Richard Linares, Marek Ziebart, Santosh Bhattarai | paper link*
SoftwareX

Limitations of Current Practices in Uncooperative Space Surveillance: Analysis of Mega-Constellation Data Time-Series
***Charles Constant**, Santosh Bhattarai, Marek Ziebart | paper link*
Paper and Poster at AMOS 2023

Awards

Best Student Paper Award | *AMOS Conference* September 2023
- Awarded for the paper "Limitations of Current Practices in Uncooperative Space Surveillance: Analysis of Mega-Constellation Data Time-Series".

Outstanding Research Project Award | *Departmental Award for Dissertation* June 2021
- Award for best dissertation research project.

Scholarship Committee 3rd Year Project Prize | *Departmental Grant* June 2021
- Awarded a £5000 grant to further dissertation research over the summer.

UCL ChangeMakers Award | *University College London* March 2021
- Awarded £2000 for enhancing the learning experience of students at UCL.

Skills

Languages:Bilingual in French and English. B1 certificate in German. Basic Italian.
Software and Programming: Python(advanced), C++(intermediate), C# (beginner); MATLAB(intermediate), Orekit, GMAT, STK, FreeFlyer