HAMISH MCPHEE

PhD. candidate: Signal Processing and Timing in a Swarm of Nanosatellites

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Specialised experience in **navigation**, **timing**, **robust estimation**, and **space systems**. Confident **presenting** work to diverse and **international teams**. Comfortable with **uncertainty and continuous learning**, and capable of **adapting ideas** as needed.

EXPERIENCE

PhD candidate: Autonomous and Robust Timescale Algorithm for a Swarm of Nanosatellites

TéSA, cofunded by CNES

October 2021 – October 2024 (prévu) Toulouse, FRANCE

- Familiarisation with satellite clock modeling and methods of computing time scales for synchronisation in a satellite constellation.
- Study of robust estimation and anomaly detection methods for Kalman filtering, Maximum Likelihood Estimation, and machine learning.
- MATLAB implementation of new algorithm that applies robust estimation to simulated clock data with anomalies.

Research assistant

ISAE-SUPAERO Department of Electronics and Optronics Signal Processing

June 2020 – September 2021 Toulouse, FRANCE

- MATLAB simulation, using synthetic GNSS and radar signals to perform simultaneous delay, Doppler, and acceleration estimation for a GNSS receiver.
- Verification of estimators to ensure optimal performance according to derivations of lower bounds for the parametric signal model.
- Derivation of misspecified estimation limits to analyse losses if acceleration is neglected in receiver architecture.

PUBLICATIONS

A Robust Time Scale for Space Applications Using the Student's t-distribution
Submitted to Metrologia (Accepted), August 2024

Misspecified Cramér-Rao Bounds for Anomalous Clock Data in Satellite Constellations,
to be presented at EUSIPCO, August 2024

Exploiting Redundant Measurements for Time Scale Generation in a Swarm of Nanosatellites
European Frequency and Time Forum, June 2024

A Robust Time Scale Based on Maximum Likelihood Estimation
ION Precise Timing and Time Intervals, January 2023

On the Accuracy Limits of Misspecified Delay-Doppler Estimation
Signal Processing, November 2022

LANGUAGES

English: Native
French: Conversational
Spanish: Elementary

HOBBIES

Tasting new foods,
Wing Chun and martial arts,
Making creative gifts

HIGHER EDUCATION

M.Sc. in Aerospace Engineering

ISAE-SUPAERO

Sep. 2018 – Dec. 2020 Toulouse, FRANCE

Thesis: Robust GNSS for space applications.
Research project: Lunar ISRU.
Major: Space Systems.

B.Deg. (Honours) in Mechanical and Aerospace Engineering

University of Adelaide

Sep. 2015 – Jul. 2019 Adelaide, Australia

Thesis: Mars Expedition Resupply Nodes. Presented at IAC 2018. Specialisations: Aerospace, robotics, and control

IT SKILLS

Programming languages
MATLAB | Python | C++ | Java

Software
CATIA | Fusion 360 | Simulink | Android Studio | Arduino | LaTeX

ACHIEVEMENTS

Group winner: My thesis in 3 minutes
Journées Jeunes Chercheurs CNES

Space Innovation Fund Space skills training scholarship, South Australian Space Industry Centre 2018-2019
For pursuing graduate degree overseas

International Space University, Defence SA Scholarship 2018
Summer school for space science and applications

NASA Space Apps 2017 Local People's choice award, Adelaide
Proposal of 'gameified' energy management for the home