AI Usage Statement

In completing this project, **we** made substantial use of generative AI tools (notably ChatGPT) to support various stages of our work. Below is a detailed description of how, when, and why we used AI, along with assurances of how we maintained academic integrity in doing so.

Tools and Tasks Where AI Was Used:

- We used ChatGPT for **brainstorming** possible modelling strategies (e.g., choice of drift mechanisms: aging, calibration, thermal) and outlining alternative stochastic models (random walk, ARIMA, etc.).
- We employed ChatGPT for **debugging** of code: identifying syntax and logic errors, helping configure Simulink blocks (e.g., guidance on matrix sizes, observability, G-matrix dimensions).
- We also consulted AI to clarify definitions and concepts—such as error metrics (RMSE, MAE, drift rate), Kalman filter theory, state-space modelling—to ensure our theoretical basis was correctly stated.

Tasks where AI Was *Not* Used or Minimally Used:

- Core mathematical derivations (e.g., formulation of the random walk, state-space matrices, measurement models) were done independently.
- Simulation design, parameter selection (choices of σ_d, σ_v, N, etc.), plotting and figure creation were authored without using AI to generate final code or figures.
- Interpretation of results, comparisons (before vs after), and writing of conclusions were done using our own analyses and logic, supplemented by literature sources.

Verification, Review, and Integration:

- Outputs from AI were always **critically reviewed**: we checked any definitions or suggestions against published literature or textbooks. Any suggestion from AI that conflicted with a reliable source was discarded or modified.
- We ensured that any factual claims or parameter values used (e.g., "sensor aging drift of $\sim$0.5% per year" or humidity sensor drift figures) are backed by peer-reviewed sources or manufacturer datasheets.
- We have revised AI-assisted code, fixed configuration errors, and validated outputs by plotting error curves, checking estimates $\hat{d}_k$ vs d_k, and ensuring metrics such as RMSE and MAE make sense numerically.

In Line with Academic Integrity:

- We acknowledge all AI contributions and have included this statement to ensure transparency.
- We understand that AI output may contain hallucinations or errors, hence we did not accept any AI-generated content without verification.
- All code, derivations, graphs, and final report content are our own, or are clearly cited when external (including AI) contributions were used.
- We confirm that all AI usage is consistent with our institution's policy on academic integrity and AI tools (e.g., guidelines at UNIMELB and Newcastle University which recommend disclosure of how, when, and why AI tools were used).

By using AI as a tool rather than a crutch, we believe we have enhanced the quality of our work without compromising originality or ethical standards. Should any part of this work be questioned, we are ready to provide draft versions, prompt logs, and literature sources to document our process.