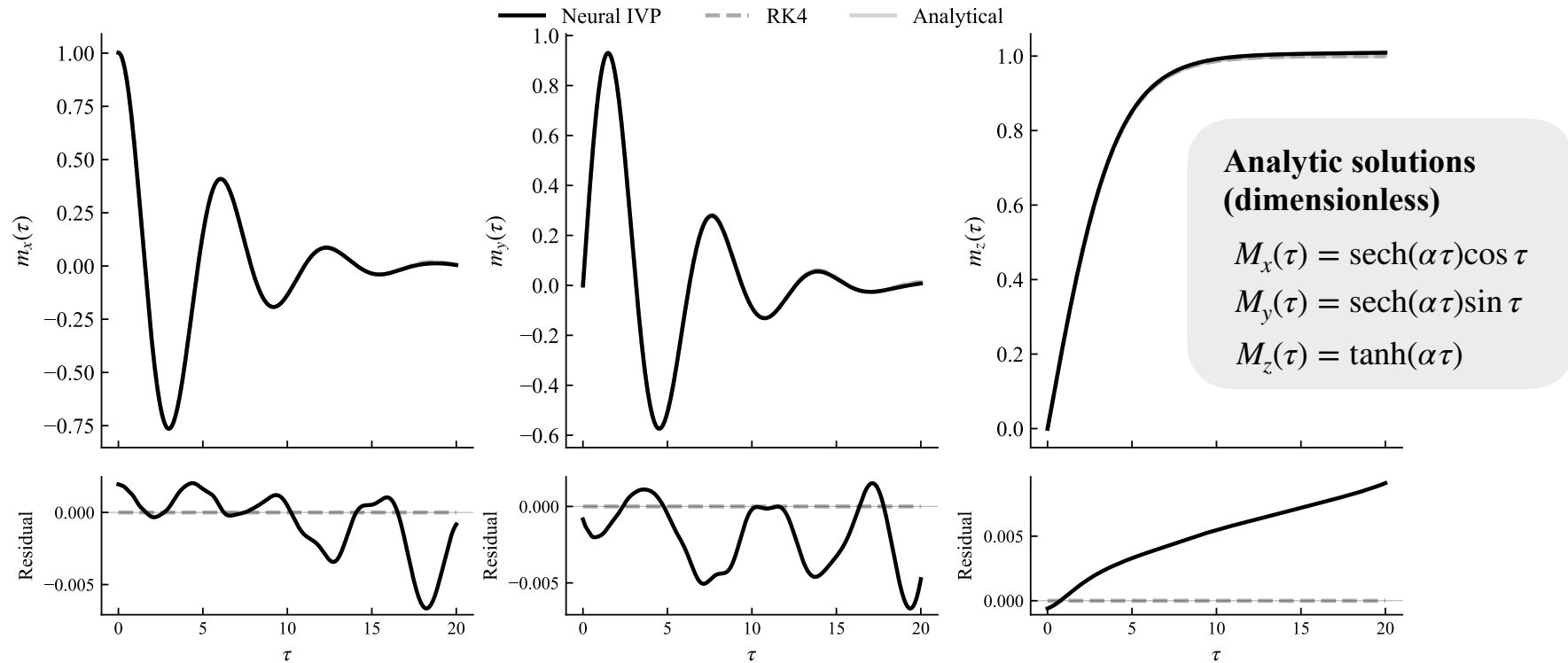


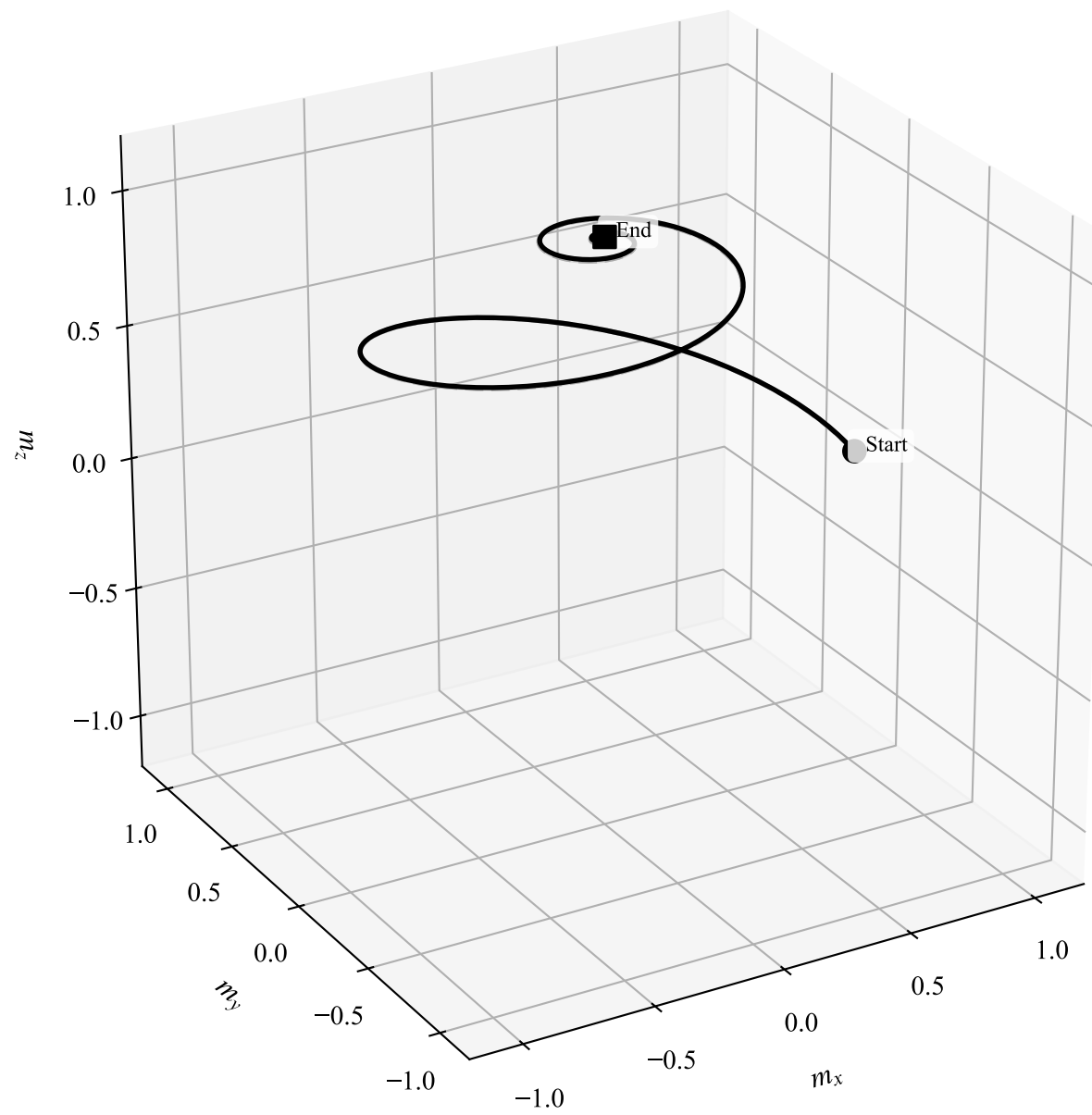
Landau–Lifshitz neural IVP

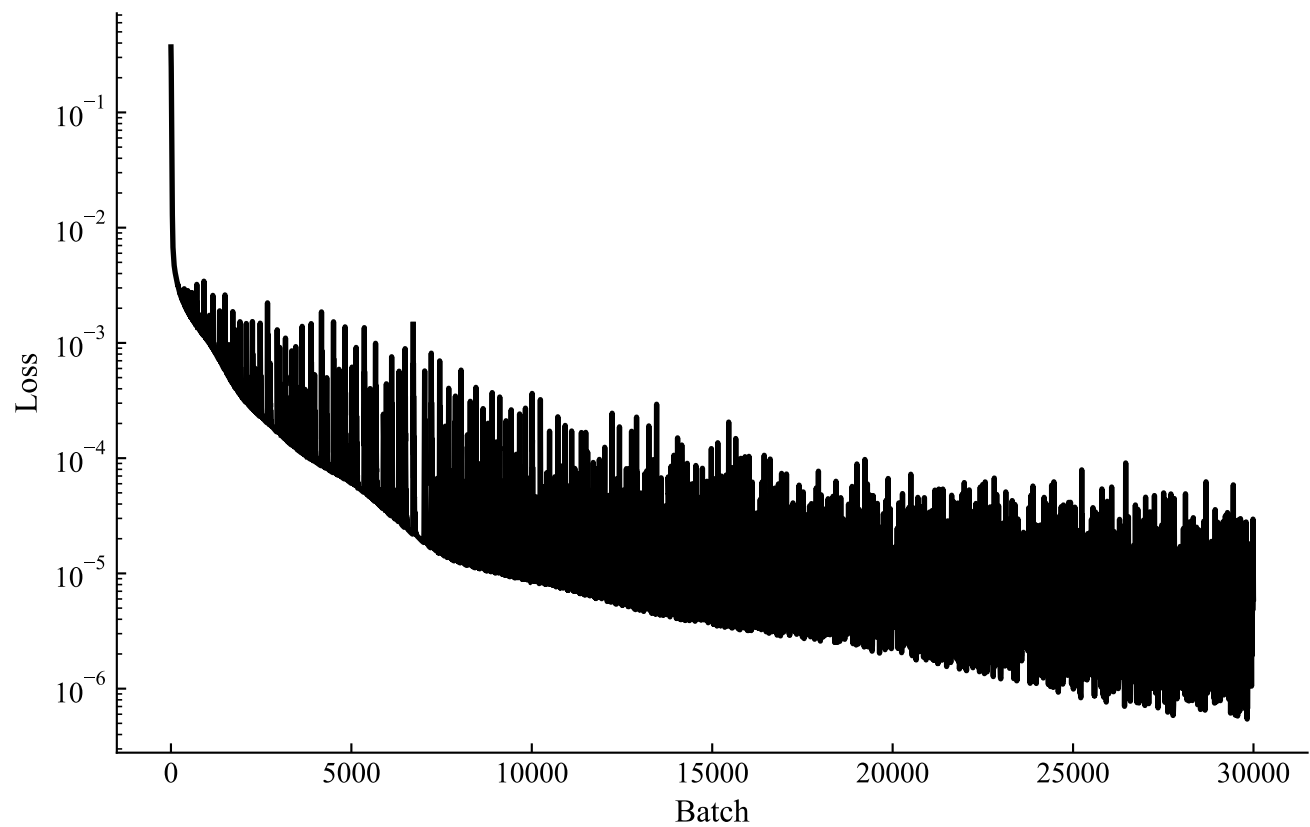
Analysis

Date revised
October 22, 2025



Top: Temporal evolution of the three (dimensionless) magnetisation components of $\mathbf{M}(\tau)$ for the Landau-Lifshitz equation with initial condition $\mathbf{M}(0) = \hat{\mathbf{e}}_x$, applied field $\mathbf{H}(t) = \hat{\mathbf{e}}_z$ and damping parameter $\alpha = 0.1$. The neural IVP solution (black, solid) is compared against the RK4 numerical integration (dark grey, dashed) and analytical solution (light grey, solid). The neural network successfully captures the oscillatory precession in the xy-plane and a monotonic approach to saturation in the z-direction. **Bottom:** The residual of the neural IVP solution and the analytic solution (black, solid) and the Runge–Kutta 4th-order solution and the analytic solution (dark grey, dashed). On both plots, time is presented in dimensionless form $\tau = \gamma H_0 t$.





Mean Squared Error vs Analytical Solution:

Neural IVP:	$mx=5.01e-06$	$my=8.52e-06$	$mz=3.25e-05$
RK4:	$mx=7.03e-15$	$my=5.09e-15$	$mz=6.65e-14$