Mini Research Note on Animal Movement Modelling Tools

Simon Schiebel

November 10, 2025

With increasing access to telemetry data of animal movement many new methods to further investigate them are developed (see Florko et al. [2025], Butts et al. [2022], Wang et al. [2024], Rieber et al. [2024]). Of special interest are open-source tools such as the R packages *amt* [Signer et al., 2019] and *moveHMM* [Michelot et al., 2016] which make complicated statistical methods easily usable for a wide audience. Even in an easy digestible way like that many of these functions are still not easy to comprehend (see Fig. 1), but thankfully the authors of such packages are aware of that and also offer some very helpful guides such as Fieberg et al. [2021].

References

David J. Butts, Noelle E. Thompson, Sonja A. Christensen, David M. Williams, and Michael S. Murillo. Data-driven agent-based model building for animal movement through Exploratory Data Analysis. *Ecological Modelling*, 470:110001, August 2022. ISSN 0304-3800. doi: 10.1016/j.ecolmodel.2022.110001. URL `https://www.sciencedirect.com/science/article/pii/S0304380022001132`.

John Fieberg, Johannes Signer, Brian Smith, and Tal Avgar. A 'How to' guide for interpreting parameters in habitat-selection analyses. *Journal of Animal Ecology*, 90(5):1027–1043, 2021. ISSN 1365-2656. doi: 10.1111/1365-2656.13441. URL `https://onlinelibrary.wiley.com/doi/abs/10.1111/1365-2656.13441`. _eprint:

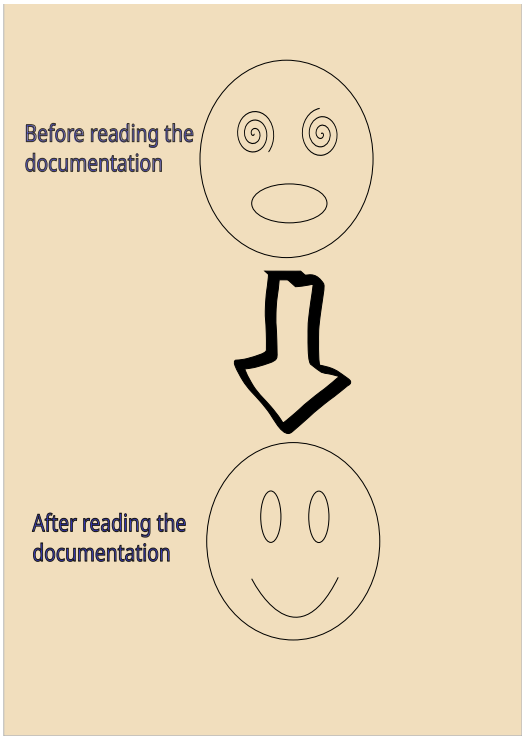

Figure 1: Visualization of the process while researching a well documented but very confusing R package.

https://besjournals.onlinelibrary.wiley.com/doi/pdf/10.1111/1365-2656.13441.

Katie R. N. Florko, Ron R. Togunov, Rowenna Gryba, Evan Sidrow, Steven H. Ferguson, David J. Yurkowski, and Marie Auger-Méthé. An introduction to statistical models used to characterize species-habitat associations with animal movement data. *Movement Ecology*, 13(1):27, April 2025. ISSN 2051-3933. doi: 10.1186/s40462-025-00549-2. URL https://doi.org/10.1186/s40462-025-00549-2.

Théo Michelot, Roland Langrock, and Toby A. Patterson. moveHMM: an R package for the statistical modelling of animal movement data using hidden Markov models. *Methods in Ecology and Evolution*, 7(11):1308–1315, 2016. ISSN 2041-210X. doi: 10.1111/2041-210X.12578. URL https://onlinelibrary.wiley.com/doi/abs/10.1111/2041-210X.12578. _eprint: https://besjournals.onlinelibrary.wiley.com/doi/pdf/10.1111/2041-210X.12578.

Camille J. Rieber, Trevor J. Hefley, and David A. Haukos. Treed Gaussian processes for animal movement modeling. *Ecology and Evolution*, 14(6): e11447, 2024. ISSN 2045-7758. doi: 10.1002/ece3.11447. URL https://onlinelibrary.wiley.com/doi/abs/10.1002/ece3.11447. _eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/ece3.11447.

Johannes Signer, John Fieberg, and Tal Avgar. Animal movement tools (amt): R package for managing tracking data and conducting habitat selection analyses. *Ecology and Evolution*, 9(2):880–890, 2019. ISSN 2045-7758. doi: 10.1002/ece3.4823. URL https://onlinelibrary.wiley.com/doi/abs/10.1002/ece3.4823. _eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/ece3.4823.

Tianxu Wang, Kyunghan Choi, and Hao Wang. Derivations of Animal Movement Models with Explicit Memory, December 2024. URL http://arxiv.org/abs/2412.20568. arXiv:2412.20568 [q-bio].