**Important Terms**

A diagram of a flowchart

AI-generated content may be incorrect.**Hidden Markov Model:** A statistical model for analysing sequential/time series data where the system of interest is characterized by a finite set of unobservable hidden states (e.g. behaviours) assuming the Markov property. These hidden states relate to the observed data through probabilistic relationships.

**Markov property:** The immediate future depends only on the present. In other words, the probability of being in a specific state at time (t+1) depends only on the state at time (t) and not on the states at previous time points.

**Conditional Independence property:** Observations depend on the current state only. They are independent of all previous observations and states.

**Observation process (or State-dependent process):** This is the process that governs the probability distributions of observed data within each hidden state.

**Hidden state process (or Latent state process):** This is the process governing the unobserved states on which your observations depend. The process can be described by a Markov chain consisting of a finite number of states whose switching dynamics are described in a transition probability matrix.

**Initial distribution (or Initial state probabilities):** The probabilities of starting in each hidden state

**Transition Probabilities:** The probabilities of switching between states or remaining in the same state. They are stored in a transition probability matrix.

**State-dependent distribution (or Emission distribution):** Probability distribution that describes how the observed data is generated within a given state.

**Maximum Likelihood Estimation (MLE):** A technique that seeks to find the best parameter estimates for a probability distribution, given the observed data. This is often done through numerical optimization.

**Global decoding:** Determining the most likely sequence of states given your observed data. This is typically done using the Viterbi algorithm.

**Local decoding:** Determining the probability of being in each state at each time step.

**Temporal autocorrelation:** The non-independence of points in a time series. For example, if I measure the temperature of my swimming pool every minute for a week, it’s likely that the recorded temperatures within a given hour will be more similar to each other than those recorded on different days, since large volumes of water are slow to heat or cool.

**Pseudoresiduals:** Diagnostic tool used to assess how well an HMM fits the data.

**Data streams:** The observed data or signals being used to fit your models.

**Step length:** distance between two consecutive locations

**Turning angle:** the angle between three consecutive locations.

**Overall Dynamic Body Acceleration (ODBA):** Absolute sum of acceleration in all three axes of movement (Heave, Sway, Surge), having first removed the acceleration resulting from gravity and body position. Often a proxy for overall activity levels or metabolic rate.