



Figure 4: Summary statistic fits of models to the PEERS free recall dataset (Healey and Kahana 2014). **Top:** CRU with free pre-experimental context-to-feature memory ( $\alpha$ ,  $\delta$ ), primacy gradient ( $\phi_s$ ,  $\phi_d$ ), and start context integration rate ( $\beta_{\text{start}}$ ) parameters. **Middle:** CRU with free item-to-context learning rate ( $\gamma$ ), primacy gradient ( $\phi_s$ ,  $\phi_d$ ), and start context integration rate ( $\beta_{\text{start}}$ ) parameters. **Bottom:** CRU with free item-to-context learning rate ( $\gamma$ ), pre-experimental context-to-feature memory ( $\alpha$ ,  $\delta$ ), primacy gradient ( $\phi_s$ ,  $\phi_d$ ), and start context integration rate ( $\beta_{\text{start}}$ ) parameters – equivalent to CMR. **Left:** Probability of starting recall by serial position. **Left:** Probability of starting recall by serial position. **Middle:** Conditional response probability as a function of lag. **Right:** Recall probability by serial position.

**Alt Text.** Nine mini-plots arranged in a  $3 \times 3$  grid compare *model* (blue) to *human data* (orange) for three increasingly complex CRU/CMR variants. Rows (top  $\rightarrow$  bottom) show, respectively: (1) CRU + pre-experimental support + primacy gradient, (2) CRU + feature-to-context learning + primacy gradient, (3) Full CMR (all mechanisms enabled). Columns (left  $\rightarrow$  right) display three benchmark statistics for 16-word free-recall lists. Left column: Recall-initiation curve. Y: probability the first recall comes from each study position. High right-end values illustrate the recency effect (participants often start with the last-studied word), whereas smaller left-end bumps reflect primacy (some start with the first word). Middle column: Lag-conditional response probability (lag-CRP). X: positional lag between successive recalls; Y: conditional probability. The sharp forward spike at +1 and the gentler backward spike at -1 indicate a short-lag contiguity bias; people tend to move to temporally adjacent items, more so forward than backward. Right column: Serial-position curve (SPC). Y: overall recall rate for each study position. The U-shape reprises primacy (higher accuracy for early items) and recency (late-item advantage after a dip in the middle). Error bars show  $\pm 1$  SE. Progressing down the rows shows that adding each CMR mechanism successively narrows the gap between model curves and orange data points: the forward and backward peaks in the lag-CRP grow taller, and the SPC’s early-item accuracy rises, demonstrating better fits to primacy, recency, and short-lag phenomena.