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|  | **Topic** | **Morning Topic (Theory and Mechanisms)**  **1.5 hour**  **9am-11:30 CST** | **Late Morning - Case-Studies**  **1 hour [C&N]**  **12-1pm CST** | **Afternoon Lab**  **3 hours [C&N]**  **2:30-5pm CST** |
| **Mon** | Course introduction; Review model fitting | Course introduction; maximum likelihood estimation and uncertainty | R refresher, simulation, optimization | Maximum likelihood estimation of single parameter and associated uncertainty. |
| **Tues** | Linear models | Linear models theory and application  Project time: proposals and scope | Estimating uncertainty: standard errors, likelihood profile, bootstrapping. | Maximum likelihood estimation; using lm() and RTMB |
| **Wed** | GLMs | Generalized linear and non-linear models | Index standardization (normal, poisson, overdispersion, zero-inflated). Estimation in R (glm, RTMB) | Bootstrap and delta method  Project time |
| **Thu** | Random effects | Hierarchical linear models | Types of mixed effects models (random slopes and random intercepts); Marginal maximum likelihood; Case study | Project time |
| **Fri** | Beyond GLMMs | Beyond GLMMs (GAMS & Spatio-temporal models) | Case study: spatial ecology and distribution estimation sdmTMB and mgcv | Project time |