

# Summary of Regression Modeling Concepts

## Contents

<b>1</b>	<b>Summary of Regression Modeling Concepts</b>	<b>1</b>
1.1	We use different probability models for different data types . . . . .	1
1.2	We use different link functions to connect these models with covariates . . . . .	1
1.3	We use maximum likelihood estimation to fit models to data . . . . .	2
1.4	We use asymptotic normality of MLEs to quantify uncertainty about models . . . . .	2
1.5	We use (log) likelihood ratios to compare models . . . . .	2

## 1 Summary of Regression Modeling Concepts

### 1.1 We use different probability models for different data types

- Binary outcomes: Bernoulli models
- Event rate outcomes: Poisson/Negative binomial models
- Time-to-event outcomes: Survival models
- Catch-all: Gaussian models

### 1.2 We use different link functions to connect these models with covariates

- Bernoulli models: logit link
- Count models: log link + offset
- Survival models: log link
- Gaussian models: identity link

Figure 1 sketches how the various models we have studied have analogous structures. To do: convert this sketch into a nicely formatted figure.

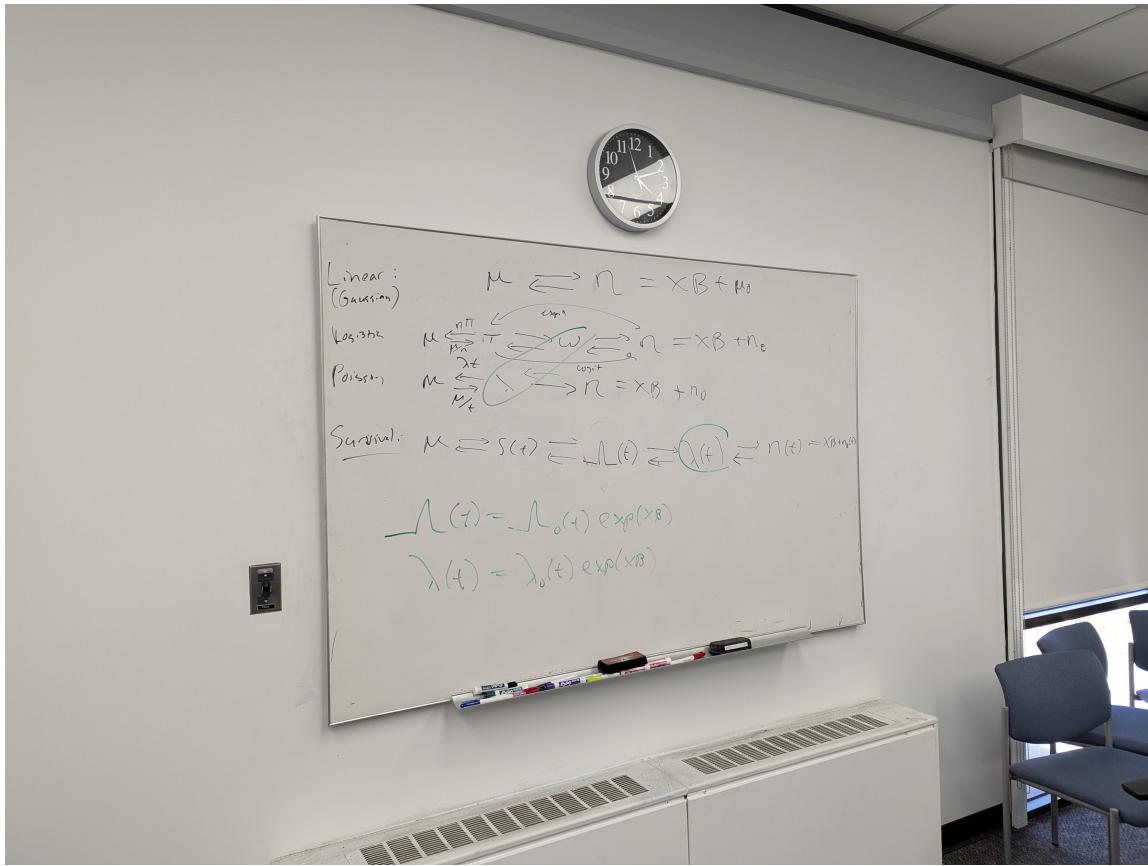


Figure 1: Parallel Model Structures

### 1.3 We use maximum likelihood estimation to fit models to data

- likelihood
- log-likelihood
- score function
- hessian

### 1.4 We use asymptotic normality of MLEs to quantify uncertainty about models

- observed information matrix
- expected information matrix
- standard error
- confidence intervals
- p-values

### 1.5 We use (log) likelihood ratios to compare models

Sometimes we adjust these comparisons for model size (AIC, BIC)