

Study Guide for Stat 545 Exam

November 7, 2018

Remember, the exam is closed book, but you are allowed one 8.5 by 11 inch page of notes with writing on one side only. You will have about 50 minutes to take the exam.

Below is a list of topics from each chapter which may be on the exam. Where “Proof” or “Derivation” is stated, be prepared to supply one.

Chapter 1.

1. Different types of variables: nominal, ordinal, qualitative, quantitative, predictor, explanatory, response, continuous, discrete, count.
2. Standard distributions for qualitative and count data: binomial, multinomial, Poisson. Their corresponding likelihoods.
3. Independent Poisson variables conditioned on the total gives multinomial (Proof).
4. Wald, Likelihood Ratio, and score tests. Asymptotic chi-squared null distribution and degrees of freedom. Corresponding confidence intervals.
5. Tests and confidence intervals for binomial and unrestricted multinomial parameters.

Chapter 2.

1. Multinomial vs. Poisson sampling models.
2. marginal and conditional probabilities in contingency table, and their estimates.

3. Case-control studies, observational vs. experimental data, prospective vs. retrospective studies.
4. Comparing two proportions: difference vs. relative risk vs. odds ratio. Advantages of odds ratio for case-control studies.

Chapter 3.

1. Standard error estimate for odds ratio (Proof).
2. Standard error estimates for differences and ratios of proportions.
3. Pearson and Likelihood Ratio Tests (Derivation of LRT) for independence in two way tables.
4. Pearson and standardized residuals for 2-way tables, including interpretations of these.
5. Tests for monotone trends in contingency tables with ordinal variables using correlations based on monotone scores.
6. Exact tests for 2-way tables based on permutation methods.
7. Bonferroni's method for multiple comparisons.

Chapter 4.

1. Exponential family form for GLMs.
2. Canonical links for Binomial, Poisson, and Multinomial families.
3. Other links for Binomial family.
4. Latent variable interpretation of quantile links for binomial responses.
5. Definition of deviance, degrees of freedom.
6. Issues with deviance for grouped and ungrouped binomial data.
7. Relation between deviance and LRT tests for nested models.
8. Deviance residuals vs. Pearson and standardized residuals.

Chapter 5.

1. Simple facts about logistic regression models useful for interpretation (Derivations).

2. Nominal (factor) predictors in logistic regression - representation with indicators and baseline factor level.

Chapter 6.

1. ROC curves for binary classification with application to logistic regression.
2. Infinite estimates in logistic regression: causes (separation), symptoms in computer output, detection using SVM.

Chapter 7.

1. Probit models vs. logit models.
2. Comparison of coefficients in probit and logit models.
3. Other quantile link models.

Chapter 8.

1. Baseline category or multinomial logit models.
2. Cumulative logit models for ordinal response variables including latent variable interpretation. Parallel hyperplanes properties in the space of logits.

Chapter 9.

1. Log-linear models for count data with categorical predictor variables.
2. Log-linear models for count data including continuous predictor variables.
3. Interpretations of terms in low order (main effects and 2-way interactions) in log-linear models in terms of equiprobability, independence, and conditional independence.
4. Relating log-linear model parameters to parameters and estimands (functions of parameters) in multinomial models.

Chapter 10.

1. Standardized residuals for log-linear models and relation to Pearson residuals.