



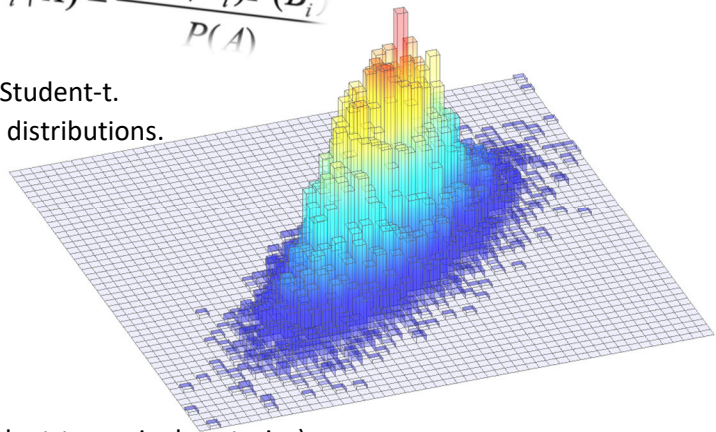
TOPICS IN MATHEMATICS OR STATISTICS (Bayesian Statistical Learning)



Tentative topics:

- Conditional probability and Bayes' rule.
- Discrete and continuous distributions of data;
 - binomial, beta, gamma, inverse gamma, normal and Student-t.
 - The bivariate normal and the normal-inverse gamma distributions.
- Maximum likelihood estimation.
- Conditional and marginal distributions.
- Conjugate and non-conjugate prior distributions.
- Maximum a-posteriori and marginal mean estimation.
- Bayesian binomial probability
 - (binomial likelihood, beta prior, beta posterior).
- Bayesian normal mean estimation
 - (normal likelihood, normal-inverse gamma prior, Student-t marginal posterior).
- Bayesian multiple regression
 - (normal likelihood, bivariate normal-inverse gamma prior, bivariate Student-t marginal posterior).
- LASSO (normal likelihood, Laplace-inverse gamma priors).
- Naïve Bayesian Classification
 - (normal class likelihoods, normal-inverse gamma class priors with discrete uniform prior class probabilities).
- Markov chain Monte Carlo numerical integration including
 - importance sampling, Gibbs sampling, and the Hastings algorithm.
- Sequential updating of previous Bayesian models.
- A computational flavor throughout.

$$P(B_i | A) = \frac{P(A | B_i)P(B_i)}{P(A)}$$



$$f(\mu, \sigma^2 | y_1, \dots, y_n) = \frac{f(y_1, \dots, y_n | \mu, \sigma^2) f(\mu, \sigma^2)}{f(y_1, \dots, y_n)}$$

Prerequisites/Notes:

- COSC 1010, MATH 1451, and MATH 4720 or the equivalents
- Students enrolled in MSSC 5931 will have additional assignments

For more information, email the instructor:

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