

# STA422/2162 - Theory of Statistical Inference (2026)

## Announcements

## Instructor

Professor Michael Evans

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## Time and Place

Three hours of lectures per week every Thursday.

First class is Thursday, January 8, 5-8pm in WB119.

## Website

<http://www.utstat.utoronto.ca/mikevans/sta422/sta4222026.html>

## Office Hours

The in-person office hours will be on Thursdays 2-4pm.

## Course Description

Statistical inference is concerned with using the evidence, available from observed data, to draw inferences about aspects of an unknown probability measure. A variety of theoretical approaches have been developed to address this problem and these can lead to quite different inferences. A natural question is then concerned with how one determines and validates appropriate statistical methodology in a given problem. The course considers this larger statistical question. This involves a discussion of topics such as model specification and checking, the likelihood function and likelihood inferences, repeated sampling criteria, loss (utility) functions and optimality, prior specification and checking, Bayesian inferences, principles and axioms, etc. The overall goal of the course is to leave students with an understanding of the different approaches to the theory of statistical inference while developing a critical point-of-view.

The following topics will be covered.

- the meaning of probability
- the evidential versus behavioristic approaches to statistical theory
- pure and frequentist likelihood theory
- decision theory - frequentist and Bayesian
- Birnbaum's theorem
- fiducial theory and close associates such as structural inference
- relative belief and the definition of statistical evidence

## Textbook

There is no textbook but several references will be helpful at different points in the course. Some material will also be drawn from particular papers whose references will be provided.

- Berger, J. (2006) Statistical Decision Theory and Bayesian Analysis. Springer.
- Casella, G. and Berger, R. (1990) Statistical Inference. Duxbury.
- Cox, D.R.(2006) Principles of Statistical Inference. Cambridge.
- Evans, M. (2015) Measuring Statistical Evidence Using Relative Belief. Chapman & Hall.
- Fraser, D.A.S. (1979) Inference and Linear Models. McGraw-Hill.
- Robert, C. (2001) The Bayesian Choice. Springer.
- Royall, R. (1997) Statistical Evidence: A likelihood paradigm. Chapman & Hall.

## Evaluation

There will be 2 midterms held during class, each worth 25%, and a final project worth 50%.

## Class Notes

I will post my class notes here before each class. There will be some Exercises associated with the notes that help to prepare for the midterms.