Jack Stanley

Relevant Coursework

McGill University

AUDIT | **IFT6135:** *Representation Learning* \\ Aaron Courville (Université de Montréal)

- A course on representation learning in general and deep learning in particular. Topics include neural network training and optimization, convolutional neural networks, recurrent neural networks, transformers, variational autoencoders, generative adversarial networks, autoregressive generative models, diffusion models, and self-supervised learning.

A | **IFT6269:** *Probabilistic Graphical Models* \\ Simon Lacoste-Julien (Université de Montréal)

- A unifying introduction to statistical modeling of multidimensional data through the framework of probabilistic graphical models, together with their associated learning and inference algorithms. Based on Michael I. Jordan's course at Berkeley.

A | **COMP565:** *Machine Learning in Genomics and Healthcare* \\ Yue Li

- Linear models in statistical genetics, causal inference, single-cell genomics, multi-omic learning, electronic health record mining. Applications of machine learning techniques: linear regression, latent factor models, variational Bayesian inference, neural networks, model interpretation.

A | **MATH682:** *Statistical Inference* \\ James McVittie

- Advanced review of statistical theory and concepts. Likelihood inference and Bayesian estimation and inference.

University of Toronto

A+ | **STA414:** *Statistical Machine Learning II* \\ David Duvenaud

- Probabilistic foundations of supervised and unsupervised learning methods such as naive Bayes, mixture models, and logistic regression. Gradient-based fitting of composite models including neural nets. Exact inference, stochastic variational inference, and Markov Chain Monte Carlo. Variational autoencoders and generative adversarial networks.

A+ | **BCB420:** *Systems Biology* \\ Ruth Isserlin

- Current computational approaches for analyzing and modeling biology as integrated molecular systems. Lectures plus hands-on practical exercises.

A | **BCH426:** *Signalling Pathways* \\ Liliana Attisano, Igor Stagljar, Amira Klip, Daniela Rotin

- Focused on the molecular aspects of signal transduction, covering how cells receive and then transmit signals via intracellular proteins such as kinases and phosphatases and how this ultimately regulates cell function. Specific topics covered include calcium regulation and signalling by extracellular ligands including morphogens, growth factors and/or insulin.

A | **STA365:** *Applied Bayesian Statistics* \\ Daniel Simpson

- Modern theory and approaches for Bayesian inference. Computational techniques for tractable inference and MCMC sampling. Bayesian multi-parameter and multi-level models. Introduction to Stan probabilistic programming.

A | **BCH425:** *Structural Biology* \\ Simon Sharpe, Jean-Philippe Julien, John Rubinstein, Christopher Yip

- Theory of modern biophysical techniques as applied to the study of the structure and function of macromolecules; emphasis on X-ray crystallography, electron cryomicroscopy, NMR spectroscopy, and other spectroscopic methods.

A+ | **BCH441:** *Bioinformatics* \\ Boris Steipe

- An overview of the sources of biomolecular data, annotation and integration, and the most important strategies for computational inference and the interpretation of results.

A | **MGY428:** *Functional Genomics* \\ Timothy Hughes, Andrew Fraser, Ben Blencowe

- Functional genomics describes the discipline of defining and attributing function to all of the heritable material of an organism on a genome-wide scale. Topics include sequencing, annotation, forward and reverse genetics, mapping regulatory sites and mechanisms, and proteomics.

A- | **BCH478:** *Advanced Biochemistry Laboratory* \\ Grant Brown

- Wet-lab. Used CRISPR/Cas to construct a heterologous metabolic pathway in budding yeast. Defined genes important for pathway assembly. Investigated anti-CRISPR protein structure and function. Used state-of-the-art interaction methodologies (SPR, BLI, MST) to analyze anti-CRISPR binding affinities. Investigated protein crystallization, crystallization optimization, structure solving, model building, and refinement.

A | **BCH450:** *Antibiotics* \\ Justin Nodwell

- Studied the action of the biochemical targets of the existing antibiotics (nucleotide, RNA, DNA, protein and cell wall synthesis), the manner in which these pathways are inhibited in antimicrobial therapy and the biochemical basis of antibiotic resistance. Also looked at the biochemistry and origin of naturally occurring and synthetic antibiotics.

A+ | **STA457:** *Time Series Analysis* \\ Tharshanna Nadarajah

- An overview of methods and problems in the analysis of time series data. Topics included descriptive methods, filtering and smoothing time series, theory of stationary processes, identification and estimation of time series models, forecasting, seasonal adjustment, spectral estimation, bivariate time series models.

B+ | **STA314:** *Statistical Machine Learning I* \\ Dushanthi Pinnaduwage

- Statistical methods for supervised and unsupervised learning from data: training error, test error and cross-validation; classification, regression, and logistic regression; principal components analysis; stochastic gradient descent; decision trees and random forests; k-means clustering and nearest neighbour methods.

A | **MGY470:** *Human Molecular Genetics* \\ Michael Wilson, James Dowling, Christopher Pearson, Philip Awadalla, Neal Sondheimer, James Stavropoulos

- Survey course on current aspects of human and molecular genetics including: chromosome structure and function, inheritance of mutations and disease, the human genome and disease gene mapping, cancer genetics, mouse disease models and gene based diagnostics and therapies.

A- | **STA302:** *Methods of Data Analysis* \\ Shivon Sue-Chee

- Topics covered include: initial examination of data, correlation, simple and multiple regression models using least squares, geometry of least squares, inference for regression parameters for normally distributed errors, confidence and prediction intervals, model diagnostics and remedial measures when the model assumptions are violated, interactions and dummy variables, ANOVA, model selection, and penalized regression.

A | **BCH340:** *Proteins* \\ Haley Wyatt, Hue Sun Chan, Walid Houry

- A detailed overview of protein structure and function. Introduction to folded and intrinsically disordered proteins. Biophysical methods to study protein stability and folding were discussed, as well as experimental approaches to determine protein structure and function. Introduction to catalysis, kinetics, and the mechanisms that regulate enzyme activity, as well as proteomic methods to study protein networks in cells.

A | **STA255:** *Statistical Theory* \\ Fode Tounkara

- Mathematical aspects of some of the topics of basic probability. Topics include discrete and continuous probability distributions, conditional probability, expectation, sampling distributions, estimation and testing, the linear model.

A | **MAT235:** *Calculus II* \\ Nara Jung

- Parametric equations and polar coordinates. Vectors, vector functions and space curves. Differential and integral calculus of functions of several variables. Line integrals and surface integrals and classic vector calculus theorems.

A | **STA220:** *Practice of Statistics I* \\ Shivon Sue-Chee

- An introductory course in statistical concepts and methods, emphasizing exploratory data analysis for univariate and bivariate data, sampling and experimental designs, basic probability models, estimation and tests of hypothesis in one-sample and comparative two-sample studies.

A+ | **MAT223:** *Linear Algebra I* \\ Nicholas Hoell

- A course on linear algebra in $\mathbb{R}^n$ emphasizing the interplay between algebraic and geometric perspectives. Topics include systems of equations, Gaussian elimination, representations of lines and planes, dot products, subspaces and translated subspaces, bases and change of basis, projections, the rank and nullity of a linear transformation, the rank/nullity/row space/column space of a matrix, matrix inverses, determinants, eigenvectors and eigenvalues, and matrix diagonalization. Introduction to simple proofs.

University of Victoria

A+ | **MATH101:** *Calculus I B* \\ Chris Eagle

- Volumes; arc length and surface area; techniques of integration with applications; polar coordinates and area; Taylor's formula; improper integrals; series and tests for convergence; power series and Taylor series; complex numbers.

A+ | **MATH100:** *Calculus I A* \\ Chris Eagle

- Review of analytic geometry; functions and graphs; limits; derivatives; techniques and applications of differentiation; antiderivatives; the definite integral and area; logarithmic and exponential functions; trigonometric functions; Newton's, Simpson's and trapezoidal methods; l'Hopital's rule.