## QUEEN'S UNIVERSITY

Professor James MacKinnon

Department of Economics Winter, 2020

## Economics 950

This course will deal with various aspects of machine (statistical) learning.

The precise set of subjects and the order in which they will be covered has not yet been determined. A preliminary list of topics is

- 1. Various methods for supervised learning
- 2. Model selection and cross-validation
- 3. Methods based on linear regression, including ridge regression and the lasso
- 4. Methods for classification
- 5. Kernel density estimation and kernel regression
- 6. Classification and regression trees, and random forests
- 7. Bias, variance, and model complexity
- 8. Nonlinear models
- 9. Boosting
- 10. Numerical issues
- 11. Lasso for inference
- 12. Neural networks
- 13. Support vector machines

## **Course Requirements**

As usual in 900-level courses, the main requirement is an essay, preferably one that involves some original research. The essay should involve some of the methods that are discussed in the course, whatever those may turn out to be. It is due at the end of July.

Students will be expected to make one or two presentations in class.

## Some useful books:

- Trevor Hastie, Robert Tibshirani, and Jerome Friedman, *Elements of Statistical Learning*, Second Edition, Springer, 2009.
- Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, An Introduction to Statistical Learning, Springer, 2014.
- Trevor Hastie, Robert Tibshirani, and Martin Wainwright, *Statistical Learning with Sparsity*, CRC Press, 2015.
- Bradley Efron and Trevor Hastie, Computer Age Statistical Inference, Cambridge University Press, 2016.
- Ian Goodfellow, Yoshua Bengio, and Aaron Courville, *Deep Learning*, MIT Press, 2016.