Contact Information

Thomas Chadefaux
3 College Green, office 5.05
Office Hours: By appointment
thomas.chadefaux@tcd.ie

Description

This module will cover the fundamental techniques and approaches to forecasting. Students will in particular learn the main building blocks of a forecasting model, how to build their own forecasting models, and how to evaluate their performance. Techniques ranging from ARIMA models to neural networks will be applied to both time series and panel data. Students will be able to apply the approaches covered in the module to forecast political, economic, and/or social outcomes in a research report.

Requirements and grading

Each week we will discuss a particular topic using the readings as a basis. *All* written assignments (and presentation slides) must be submitted via Blackboard ('Assignments' rubric). Your grade will be calculated as follows:

Assignments (x2) (20% each)

Take-home assignments will be circulated in weeks 2 and 4 and will be due in weeks 3 and 5 respectively.

Final paper (60%)

A final paper will be due at the end of the module. In it, you will be expected to conduct your own forecasting project and to write a paper of approximately 2,000

words. The paper should demonstrate both your technical skills (as learned in class) and your ability to present and explain the social problem to be addressed and the solution proposed. Details will be discussed in class.

Statistical Package: R

We will use the free statistical program R to practice the techniques that we learn in class. I strongly recommend that you install R on your own laptop so that you can duplicate the step-by-step instructions shown in class.

Turnitin

Please submit *all* your written work through Turnitin via Blackboard (mymodule.tcd.ie).

Plagiarism

Please follow the standard of academic honesty set forth in the College Calendar (http://tcd-ie.libguides.com/plagiarism/calendar) and online: http://tcd-ie.libguides.com/plagiarism. You should also complete the online tutorial on avoiding plagiarism http://tcd-ie.libguides.com/plagiarism/ready-steady-write.

Readings

We will mostly rely on the following textbook (abbreviated below as PTSF):

Shmueli, Galit, and Kenneth C. Lichtendahl Jr. *Practical Time Series Forecasting with R: A Hands-on Guide* (2nd ed.). Axelrod Schnall Publishers, 2018.

The lectures will focus on the content of the chapters; the tutorials will focus on practical exercises, in part derived from the end-of-chapter problems.

Course Outline

Week	Topic	Readings (PTSF)	Assignment
1	Introduction to Social Forecasting	Ch. 1, 2	
2	Performance Evaluation and Validation	Ch. 3–5	
3	Smoothing and Arima	Ch. 5–7	**#1 due**
4	Neural Networks (I)	Ch. 9	
5	Neural Networks (II); communication	Ch. 9, 10	**#2 due**
6			
7			**Final paper due**

Table 1: Module Overview

Details of weekly sessions

Week 1. Introduction to Social Forecasting

What to predict; how it's done; types of forecasting; forecasting vs explanation; how much can we forecast; visualizing time series.

Required Readings

- PTSF, ch. 1–2

Recommended Readings

- Michael D Ward. Can we predict politics? Toward what end? *Journal of Global Security Studies*, 1(1):80-91, 2016
- Thomas Chadefaux. Conflict forecasting and its limits. Data Science, 1(1-2):7-17, 2017
- Kenneth J Arrow, Robert Forsythe, Michael Gorham, Robert Hahn, Robin Hanson, John O Ledyard, Saul Levmore, Robert Litan, Paul Milgrom, Forrest D Nelson, et al. The promise of prediction markets. *Science*, 320(5878):877, 2008

Week 2. Performance Evaluation and Validation

Naïve predictions; Performance evaluation: what is a good prediction? Performance evaluation for binary data; Partitioning data; Overview of methods

Required Readings:

- PTSF 3–4

Week 3. Smoothing and ARIMA

Smoothing, trends, seasonality, autocorrelation

Recommended Readings:

- PTSF 5–7

Week 4. Neural Networks (I)

Required Readings:

- PTSF 9

Recommended Readings:

- Taylor, M. "Make Your Own Neural Network: An In-depth Visual Introduction For Beginners." Ind. Publish. (2017).
- A Simple Introduction to Neural Networks (`https://towardsdatascience.com/simple-introduction-to-neural-networks-ac1d7c3d7a2c`)

Week 5. Neural Networks (II) and Presenting forecasts

Neural nets continued; Intro to LSTM models; Presenting forecasts

Required Readings:

- PTSF 9 (review) and 10