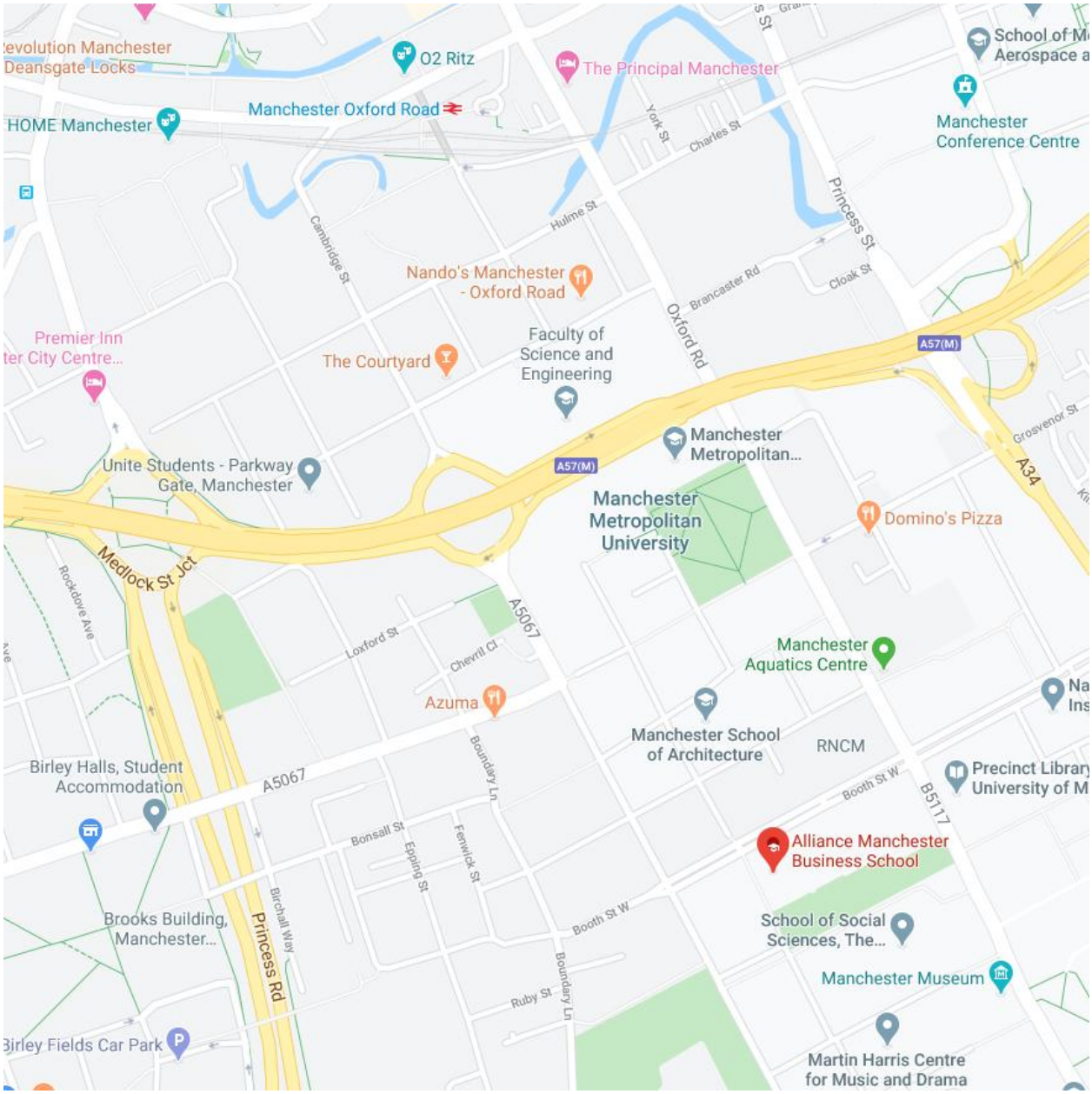
Quarterly Forecasting Forum, 6th March 2020

Location

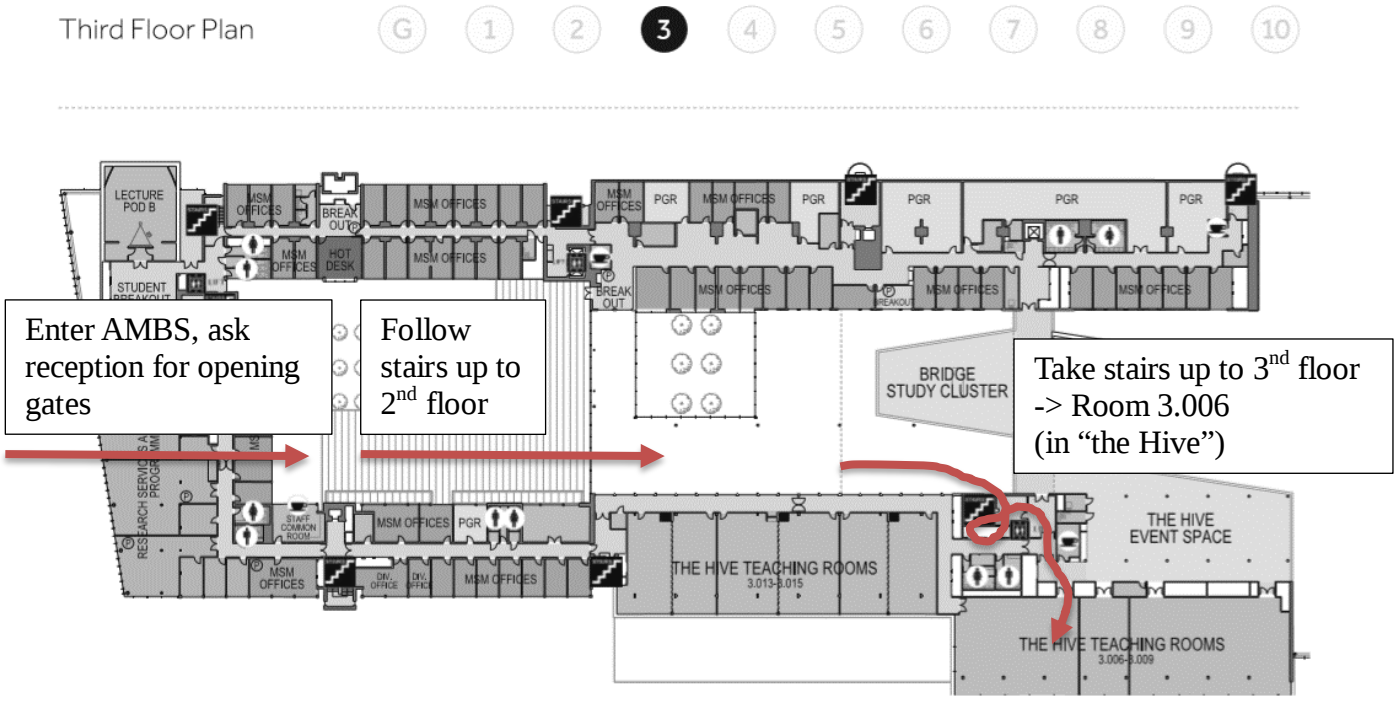
The forum will take place in Room 3.006B, Alliance Manchester Business School University of Manchester, Booth Street West, M15 6PB Manchester



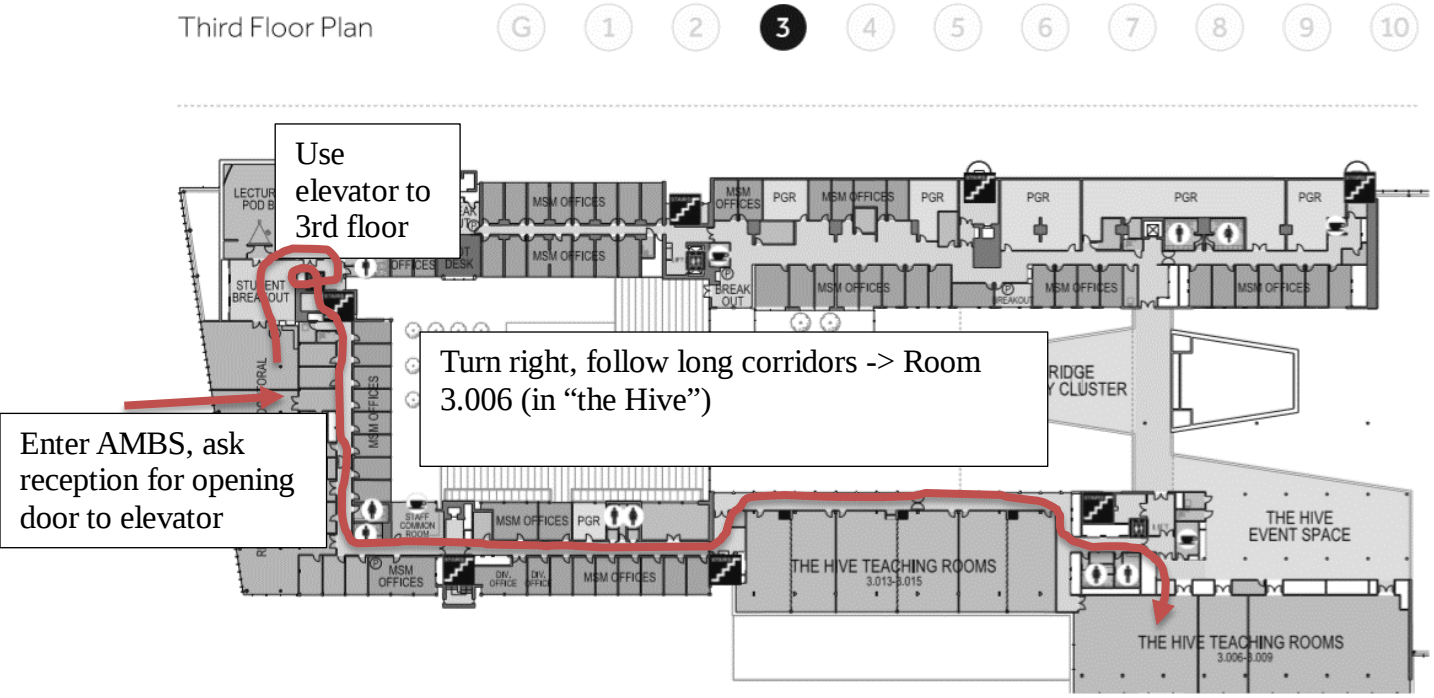
The Google map is here: https://goo.gl/maps/GMnnsmtNjTe5cKLC7

AMBS, 3.006b

The room 3.006b is located in the "Hive event space" in the 3rd floor at the back of the AMBS building. There are (at least) two ways to get there, one with stairs, one using an elevator (see plans below). You may need to ask the reception desk to open gates or doors for you, they will be briefed and can, of course, provide further assistance.



Alternative Way



Agenda of the event

13:00 - 14:00 Arrival and registration
14:00 - 14:45 Presentation 1. Jethro Browell, Leveraging Turbine-level Data for Improved Wind Power Forecasting
14:50 - 15:35 Presentation 2. Florian Dost, Predicting Dynamics in Interrelated Retail Channel Time Series Aggregated from Unobserved Consumer Behaviour
15:40 - 16:00 Coffee break
16:00 - 16:45 Presentation 3. Kandrika Pritularga, Stochastic Coherency in Forecasting Reconciliation
16:50 - 18:00 IIF UK Chapter business
18:00 - Informal Dinner at Brewdog, (https://www.brewdog.com/uk/bars/uk/manchester-outpost)

Abstracts

Leveraging Turbine-level Data for Improved Wind Power Forecasting

Presenter: Jethro Browell, University of Strathclyde

Abstract: Energy forecasting is a key capability that helps keep the lights on, and an exciting multi-disciplinary research area that brings together engineers, meteorologists, statisticians and others. Innovation in wind power forecasting is being driven by advances in data science with forecasters able to access more data with predictive power than ever before. This is also giving rise to new business models for forecast vendors and consumers in what has become a crowded market place. This talk will show how data from individual wind turbines can be used to improve wind power forecasts and discuss challenges to realising these potential benefits in practice.

Predicting Dynamics in Interrelated Retail Channel Time Series Aggregated from Unobserved Consumer Behaviour

Presenter: Florian Dost, University of Manchester

Abstract: Today's retail environment is characterized by a complex and interrelated set of channels across which consumers move freely. These movements include visits to one channel and sales in another, referred to as research shopping, as well as post purchase revisit effects that create feedback within the omnichannel system. When the system includes a prominent offline channel, often only aggregate time series data (e.g., the number of visitors per day), are available to assess these channel interrelations. A model of the aggregate level variables shows then many features of a complex system, such as nonlinearity, state dependence and, potentially, sensitive dependence to initial conditions.

We apply empirical dynamic models, a nonlinear methodology based on attractor learning, to capture the dynamics of the whole channel system, to uncover the existing dependencies between variables, and to explore system state-dependent interrelations between variables (e.g., whether marginal effects between variables differ across days of the week, or the level of visits in one channel, etc.).

We demonstrate the performance of the approach against a vector autoregressive benchmark. First, data is aggregated from simulated complex consumer behaviour to consider a wide range of possible interrelation networks and nonlinear parameter spaces. Second, we illustrate the approach on time series data from an actual omnichannel fashion retailer.

Stochastic Coherency in Forecasting Reconciliation

Presenter: Kandrika Pritularga, Lancaster University

Abstract: Forecasts are essential for supporting decisions in any organisation, which often have to deal with product groups and other hierarchies, for example, geographical groups and market segments. Forecasts on different levels of such hierarchies need to be in agreement, in order to align decision making at different planning horizons and functions. We call such forecasts coherent, i.e. the sum of the lower-level forecasts adds up to the forecasts on the higher level.

Typically forecasts are incoherent when generated, as they are produced for each node of the hierarchy independently, for example, per product/store. Hierarchical forecasting attempts to post-process forecasts to achieve the desired coherency. The state of the art approach, called MinT, is to use a forecast reconciliation scheme that attempts to find the optimal combination weights of the

independent forecasts, into coherent final forecasts. The intuition behind this approach is that the linear combination allows information to pass between forecasts, which ultimately is based on the approximation of the covariance matrix of the forecast errors of the initial independent forecasts.

The literature has largely overlooked that the approximated covariance is treated as known, and therefore that the forecast reconciliation scheme is implicitly deterministic. This is unrealistic, and partially leaves empirical observations regarding the performance of hierarchical forecasting unexplained. We propose a re-definition of coherency, the "stochastic coherency", acknowledging the reconciliation itself is subject to uncertainty. We define coherency in expectations, and not on numerical values of observations, that include innovation terms (randomness). This allows us to better understand the resulting forecast uncertainties, decompose them, and identify better hierarchical reconciliation strategies.

We discuss two sources of uncertainties in forecast reconciliation: one originating from the forecasting models and the other from the reconciliation itself. Although the second source is accounted in the literature, we show that the omitted first increases the variance of reconciled forecasts. We conduct a simulation experiment and find that our re-definition of coherency allows to demonstrate that the more misspecified the forecasting models are and the more complex the information used in the reconciliation is, the more accurate the reconciled forecasts become. However, this comes at a cost of increased uncertainty in reconciled forecasts. This had remained unexplained using the conventional coherency definition. Finally, we provide a guideline for managing the accuracy and the uncertainty in forecast reconciliation and demonstrate the effect on examples of real time series.