

# Gaussian process forecasting of mood in bipolar disorder

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## Abstract

Bipolar disorder is characterised by recurrent episodes of mania and depression and affects about 1% of the population. Mood forecasting can facilitate the recognition of relapse and can provide objective information about the patient's clinical status. In this paper we forecast mood ratings in patients with bipolar disorder using exponential smoothing and Gaussian process models. Self-rated mood data is used, comprising weekly scores for depression on a standard scale. To evaluate the forecasting methods, a fixed-length window is moved through each time series and used to forecast the next week's mood rating. A baseline method is applied by using the last value in the training window as the forecast. Forecasting performance for an individual patient is summarised by the root mean square error over the next step forecasts for their time series, and the distribution of these errors over the group of patients is examined. We find that Gaussian process forecasting is slightly more accurate than simple exponential smoothing in this application. Further work is proposed on variable selection, including the incorporation of environmental predictors, and on mood event forecasting. We conclude that the recent availability of data and the paucity of published models both make for potentially important advances in the field.

*Keywords:* Health forecasting, Time series, Multivariate time series, Regression

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