



## Data Science Studio Success Story

### Staffing Optimization

A hospital depends on its staff: not enough people will negatively affect patient experience and quality of care, too many will hinder its financial stability. As staffing accounts for more than 50% of an average hospital's costs, it is crucial to manage staffing wisely. But how to efficiently manage these costs while schedules are for the most part still done by hand, based on the number of available beds?

## Patient Forecasting to Optimize Staffing

### About Our Customer

Our customer is a major healthcare provider in the UK which employs approximately 1700 people

### Industry

Healthcare

### Market

Europe

### Use Case

Staffing Optimization

*“Staffing Optimization is the most important lever we have to control our costs. With DSS, we managed to enter a new dimension in terms of patient forecasting which enabled us to have a much more accurate view of who was needed when and where. Plus, our team is really enjoying using the tool – we’re looking forward to building more applications in DSS.”*

### Challenge

#### Staffing Inefficiency: Frustration and High Costs

Physician overwork and patient dissatisfaction are typically the result of a lack of data-driven decision making during the staffing process. Inefficient allocation of staffing hours impeded our customer’s ability to deliver optimal care and retain the best doctors. Our customer needed to better anticipate patient volumes so that staffing decisions could be made in a more transparent fashion that would not undermine providers. Our customer wanted to develop a more accurate prediction of staffing needs.

For this, the hospital wanted to find a technical solution that would enable it to:

- model patient inflows on a small scale;
- recommend staffing schedules based on patient demand forecasting.

### Solution

#### An Automated Predictive Application to Forecast Patient Demand

Demand forecasting is typically performed by looking back at historical patient demand data and projecting trend lines with a seasonal adjustment. In order to adapt its staffing needs on a daily basis, our customer worked with DSS to better anticipate patient demand by building and implementing a patient forecasting system application in DSS. First, the application automatically compiles and processes internal and historical data as well as external datasets such as weather, national epidemics, holidays, and traffic. Then, a machine-learning algorithm builds a statistical model that forecasts patient demand; this prediction is continually improved as new data is incorporated into the model. Finally, an API links the predictive model to the staffing schedule system. Staffing managers therefore have updated staffing suggestions in their scheduling tool based on time, date, and department.

### Results

#### Significant Decrease in Staffing Cost and Turnover

Thanks to optimized schedules, our customer can deliver better care to its patients and has significantly improved productivity:

- the DSS run predictive analytics models are 47% more accurate than historical average predictions;
- 11% decrease in staffing costs, saving around \$730k per year;
- an estimated 9% decrease in staffing turnover in year 1 since application deployment.

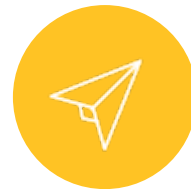
# \_data science studio



External & internal data  
(weather, holidays, past  
volume averages...)



Machine-learning algorithm  
to build a statistical  
forecasting model

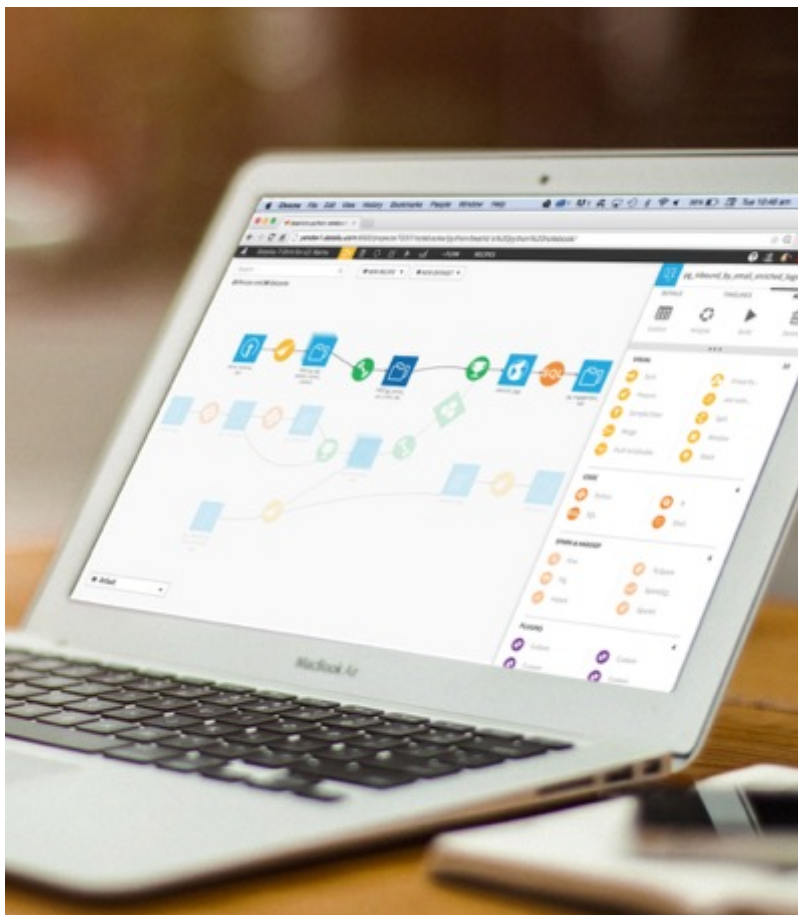


Staffing schedule system  
powered by data-driven  
patient demand forecasting

Delivery of  
an in-house staffing  
optimization data product in  
under 3 months

A user friendly UI  
which resulted in increased  
productivity of both data  
scientists and clinic managers

Easy deployment of predicted  
results in healthcare providers'  
existing staffing tools



## Technology Used



## Time

3 months

## Team

1 data scientists  
2 business analysts  
1 data engineer

## Models

ARIMA combined with Decision Trees