

About Us

**Jemin.ai make digital twins** that model and understand the real world in fine detail, because we realize that everything and everyone is unique. Since 1988, our AI experts have been building digital twins of the real world using neural network Artificial Intelligence. This example is about work we did twinning a chemical process for a petrochemical company.

Business Analysis

**Machinery and industrial processes** behave in predictable ways, unless something unexpected goes wrong. By building a digital twin of the machine or process, it is possible to identify when it is operating outside its expected envelope, and to experiment offline with different control parameters to optimize performance.

Data Design

**As with all digital twinning**, the first task is to frame the question in a way that artificial intelligence can answer. This usually comes down to identifying how data can be broken down into comparable units and understanding what drives the differences between them. In machine and process twinning, if each machine or process is unique then the comparable units are snapshots of system performance over time. The performance measure chosen in this case was yield of the chemical being produced, and the driving factors were flow rates, reactor temperatures and energy consumed. A data table is then designed with each row being a minute of run time and the columns being chemical yield and the driving factors.

Data Sourcing

**Data may need to be combined from various sources.** Most will be available in-house, derived from sensors. External sources may be needed for other factors such as air temperature and humidity.

Cleaning & Filling

**Data is rarely clean on arrival.** Some will be missing, but can be interpolated or even estimated as a digital twinning process in its own right. Data will also be subject to errors, noise and known exceptional circumstances. While artificial intelligence techniques can identify many exceptions, charting the data and eyeballing it is often the easiest solution.

Data Mapping

**The last data pre-processing stage is mapping.** Text data must be converted to categories. Highly skewed data must be squashed so it is more evenly distributed. Other data must be normalized to ensure the rows are directly comparable, for example kg of product per kg of reactant.

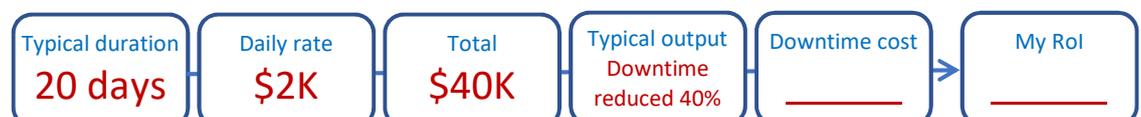
Build Twin

**Finally**, the AI is ready to do its work. Our neural network algorithms, which we have perfected over three decades, excel at extracting insights from real-world data, no matter how ugly and ill-conditioned. Crucially for machine and process analysis, not just a digital twin of return is created, but also a triplet, the digital twin of error, which defines the envelope outside which behaviour is not normal and needs attention.

Delivering Results

**Once the digital twin is built**, it can be interrogated: What drives the performance? How can I detect when it is not behaving as expected? How can I improve performance at minimum cost? The twin and triplet can be exported as a C++ or Excel function convenient analysis of new contracts.

Return on Investment



Contact

**jemin.ai** 320 City Road, London EC1V 2NZ, UK  
Sales: *Richard Hoptruff* email [rgh@jemin.ai](mailto:rgh@jemin.ai) phone +44 20 7127 0605