

عنوان مقاله:

Transparent Machine Learning Algorithm Offers Useful Prediction Method for Natural Gas Density

محل انتشار:

مجله پردازش گاز, دوره 6, شماره 2 (سال: 1397)

تعداد صفحات اصل مقاله: 14

نویسندگان:

David Wood - Professor DWA Energy Limited Lincoln, United Kingdom

Abouzar Choubineh - MSc Petroleum University of Technology, Ahwaz, Iran

خلاصه مقاله:

Machine-learning algorithms aid predictions for complex systems with multiple influencing variables. However, many neural-network related algorithms behave as black boxes in terms of revealing how the prediction of each data record is performed. This drawback limits their ability to provide detailed insights concerning the workings of the underlying system, or to relate predictions to specific characteristics of the underlying variables. The recently proposed transparent open box (TOB) learning network algorithm successfully addresses these issues by revealing the exact calculation involved in the prediction of each data record. That algorithm, described in summary, can be applied in a spreadsheet or fully-coded configurations and offers significant benefits to analysis and prediction of many natural gas systems. The algorithm is applied to the prediction of natural gas density using a published dataset of ۶۹۳ data records involving ۱۴ variables (temperature and pressure plus the molecular fractions of the twelve components: methane, ethane, propane, ۲-methylpropane, butane, ۲-methylbutane, pentane, octane, toluene, methylcyclopentane, nitrogen and carbon dioxide). The TOB network demonstrates very high prediction accuracy (up to $R^2 = 0.997$), achieving comparable accuracy to the predictions reported ($R^2 = 0.995$) for an artificial neuralnetwork (ANN) algorithm applied to the same data set. With its high levels of transparency, the TOB learning network offers a new approach to machine learning as applied to many natural gas systems.

کلمات کلیدی:

Predicting gas density, Learning networks, Multi-component natural gas, Auditable machine learning, Transparent predictions

لینک ثابت مقاله در پایگاه سیویلیکا:

<https://civilica.com/doc/1254548>

