**How to forecast local oil prices: A machine learning approach to aid state agencies.**

1. **Introduction:**

Forecasting oil prices is a critical task for state agencies, as it directly impacts budget planning, revenue projections, and economic policies. However, there are several reasons state agencies may not fully utilize advanced econometric modeling and machine learning models for oil price forecasting, such as tradition and inertia, data limitations, complexity and interpretability, resource constraints, risk aversion, integration challenges, lack of awareness, etc. While growing interest is in incorporating machine learning into oil price forecasting, state agencies face various barriers. Overcoming these challenges requires combining technical expertise, data availability, and a willingness to embrace innovative approaches. The objective of this study is to provide a tool for state agencies to implement state-of-the-art forecasting techniques to improve the accuracy of their forecasts of oil prices, specifically local oil prices.

The oil and gas industry substantially impacts the US economy, supporting jobs, generating tax revenue, and providing consumer cost savings. In 2020, the top five oil-producing states in the US were Texas (1.78 billion barrels), New Mexico (574 million barrels), North Dakota (431.2 million barrels), Colorado (386 million barrels), and Alaska (159 million barrels)1–4. Oil production plays a pivotal role in shaping revenue forecasts for these states. Their fiscal health is intricately tied to the oil industry's fortunes, making it essential to manage both short-term spending and long-term savings. Texas, being the largest oil-producing state, also benefits significantly from oil revenue. The state's budget and economic health are closely linked to the performance of the oil and gas industry. Fluctuations in oil prices and production directly impact Texas' revenue forecasts. New Mexico, as the No. 2 oil-producing state in the US, heavily relies on oil revenue. The state is currently experiencing a windfall in government income from petroleum production. However, this windfall is slowing down due to various factors, including market dynamics and global oil demand. New Mexico faces the challenge of determining how much it can effectively spend while setting aside billions of dollars for the future in case the world's thirst for oil falters5. Lower oil prices and production outlooks can reduce revenue available for general state spending and capital projects6,7.

Forecasting oil prices is a complex task that involves various factors and methodologies. States, industry experts, and organizations use different approaches to predict oil prices. States often collaborate with economists and research institutions to develop economic models. These models consider supply and demand, geopolitical events, macroeconomic indicators, and global economic trends. Some states employ economists to perform this forecasting. The US Energy Information Administration (EIA) forecasts various energy commodities, including oil. EIA's Short-Term Energy Outlook (STEO) includes projections for crude oil prices based on supply, demand, and other relevant factors8. Some states directly adopt EIA's forecasts. Some states adhere to industry experts' opinions.