Deep learning for water quality

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Understanding and predicting the quality of inland waters are challenging, particularly in the context of intensifying climate extremes expected in the future. These challenges arise partly due to complex processes that regulate water quality, and arduous and expensive data collection that exacerbate the issue of data scarcity. Traditional process-based and statistical models often fall short in predicting water quality. Deep learning represents an underutilized yet promising approach that can unravel intricate structures and relationships in high-dimensional data. Deep learning methods can help address data scarcity by filling temporal and spatial gaps and aid in formulating and testing hypotheses via identifying influential drivers of water quality. This Review highlights the strengths and limitations of deep learning methods relative to traditional approaches, and underscores its potential as an emerging and indispensable approach in overcoming challenges and discovering new knowledge in water-quality sciences.

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