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Large-scale Groundwater Simulation using Artificial Neural Networks in the Danube River Basin

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Artificial Neural Networks (ANNs)



Simulate changes in groundwater levels



Inputs

parameters of water budget
precipitation,
temperature, etc..



Output

hydraulic head throughout
Danube River Basin

ANN architectures



Training algorithms

Levenberg-Marquardt
Bayesian
Regularization



Activation functions of the neurons

tangent sigmoid
logarithmic sigmoid
linear

Applications



Data

from 128 wells

1 January 2000 - 31
October 2014



1st Application: Best
Performance

Bayesian Regularization



2nd Application: single well simulation

Pros and Cons

All wells

- Great for trends
- Less accurate for single well
- Possibility to extrapolate spatially

Single well

- Better for single well error
- Prone to Overfitting
- No possibility to extrapolate spatially