PRESENTERS:
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ABSTRACT

Deep learning methods provide new opportunities for ecology and conservation science. We demonstrate the utility of convolutional neural network models to classify native brook trout at the individual and population levels (~ 90% and 98% classification accuracy, respectively) from images collected from wild populations in Maryland USA. Our results suggest the utility of imagery and deep learning for crowdsourcing and citizen science in fish ecology and conservation.

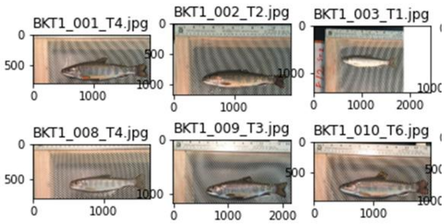
U.S. Department of the Interior
U.S. Geological Survey

Deep learning identifies **individual variation** and **population structure** in native brook trout.

For more information

DATA COLLECTION

- Wild brook trout collected from 3 sites in Maryland USA: Crabtree Creek (2 sites) and Walker Run
- Photos collected over 5 months in an experimental stream laboratory
- Images annotated via Visual Geometry Group application at Oxford University

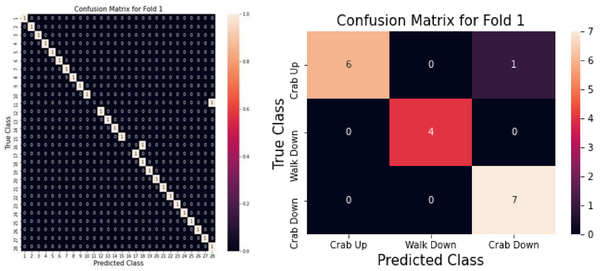


Example of images used in analysis

SUPERVISED TRANSFER LEARNING

- Data augmentation (vertical, horizonal flips, rotations)
- Pretrained ResNet50V2 architecture with ImageNet weights
- Train on USGS Tallgrass supercomputer (using V100 GPU)
- CRAY AI hyperparameter optimization using genetic algorithm: learning rates = 0.0001-0.001; drop-out rates: 0.27-0.30
- Convolutional neural networks to estimate classification accuracy from 5 cross-validation folds

RESULTS



Example confusion matrices for individual classification (left) and source population classification (right). Mean classification accuracy for individuals was 90% and for populations was 98%.

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