CHILDNet: Curiosity-driven Human-In-the-Loop Deep Network

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INTRODUCTION
Humans can learn actively and incrementally

Active Learning
• Human annotation is expensive
• Choose examples to request labels for incremental learning
• New visual concepts emerge in the real world
• Learn new concepts while preserving existing knowledge

Active + Incremental Learning System

PROBLEM STATEMENT
Goa
• Class-incremental online active learning from continuous unlabeled image stream

Task Definition
• Stream of unlabeled image data
• Labels are only available upon request
• Number of classes can increase over time
• Learn to recognize new classes online using as few examples as possible

Evaluation
• Label request rate
• Prediction Accuracy

DATASET
Omniglot
• 1,623 classes of characters
• 20 hand drawn examples per class
• Total 32,460 examples
• 800 classes for training, 400 classes for validation, 423 classes for testing

METHODS
Siamese Net for One-shot Classification
• Trained for same/different pair verification tasks
• Maintains running mean of features for each class
• Given input image x, predict class c such that
  \[ C = \arg\min_c p(x|c) \]
  where \( p(x|c) \) is similarity score between x and mean of class c

Incremental Learning

Active Learning

Humans can learn actively and incrementally

Incremental Learning

Humans can learn actively and incrementally

EXPERIMENTS
Train
• Sample 10 classes per episode
• 30 images from the 10 classes per episode
• 20,000 episodes for training

Test
• N classes per episode
• All images from N classes per episode

RESULTS
Label Requests

Prediction Accuracy

Varying number of classes

CONCLUSION
• The model is trained with 10 classes per episode
• The model is applicable to variable number of classes

FUTURE WORK
• Develop automatic data annotator with humans in the loop

BIBLIOGRAPHY

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