

NVIDIA Deep Neural Networks for Game Hints

Problem Statement

Gamers often get stuck on difficult games levels and may become so frustrated that they stop playing entirely. The current solution is tedious Google searching that may lead to unwanted spoilers.



Solution

The goal of the application is to provide a walkthrough video for game hints using only a rendered reference frame in a game. We could provide a service through NVIDIA GeForce Experience™ or GeForce NOW™ that locates the game frame where the player is stuck and links the player to an appropriate walkthrough.

To summarize, train a deep neural network to take the following input and generate the specified output:

Input: video game frame, video game name

Output: Web link to appropriate video walkthrough



Game Selections

		
Perspective	3rd Person	First Person
Challenges	Visually Dark (Limited pixel info)	Test Chambers have similar appearance Greater variation in camera angle

Implementation

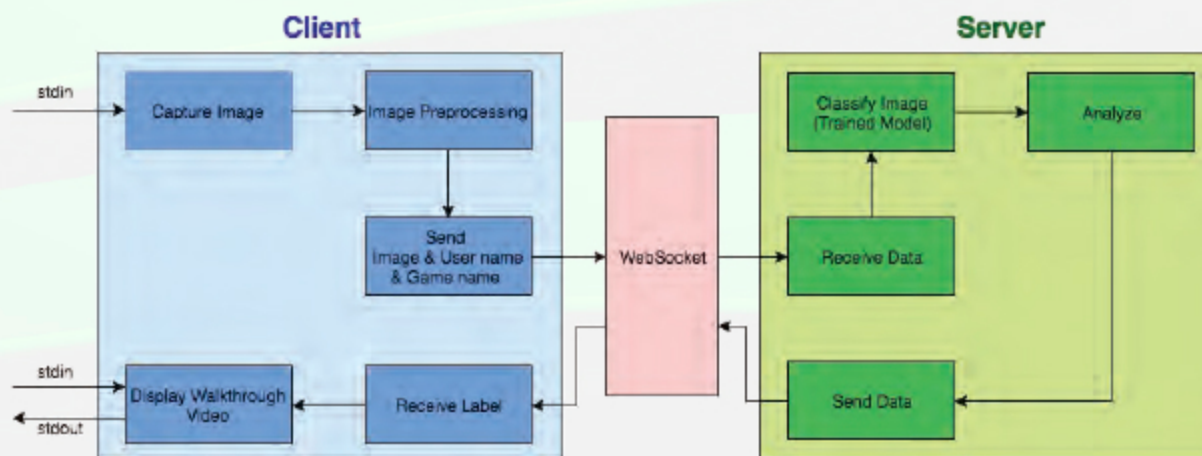
Software:

NVIDIA DIGITS™
Caffe
GoogLeNet & AlexNet

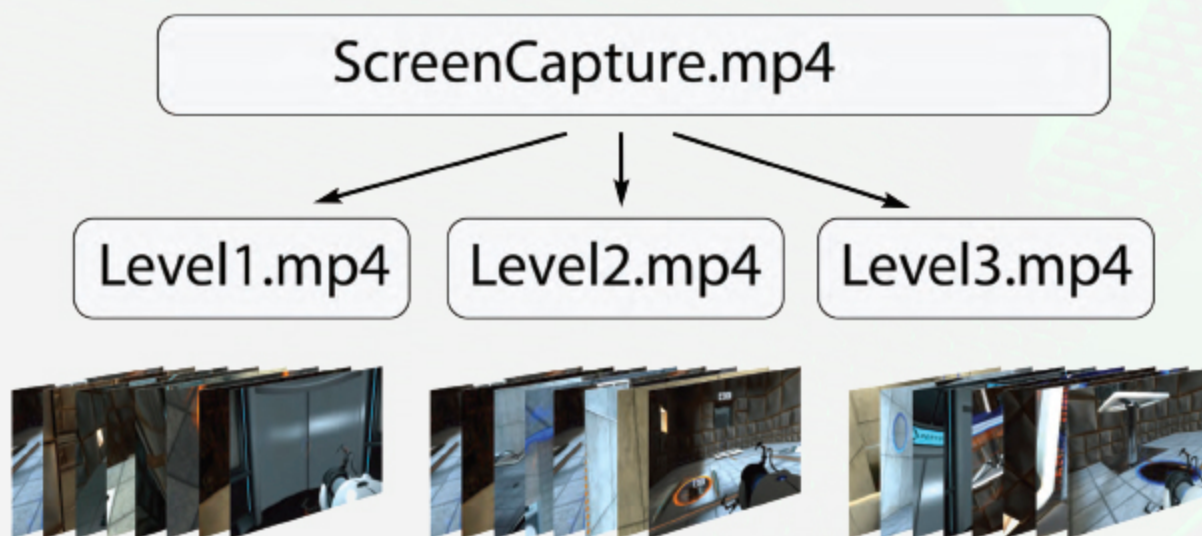
Hardware:

Dual-GPU Linux Machine (model training & server)
Single-GPU Linux Machine (model training & server)
Single-GPU Windows Machine (client & dataset generation)

System Overview:

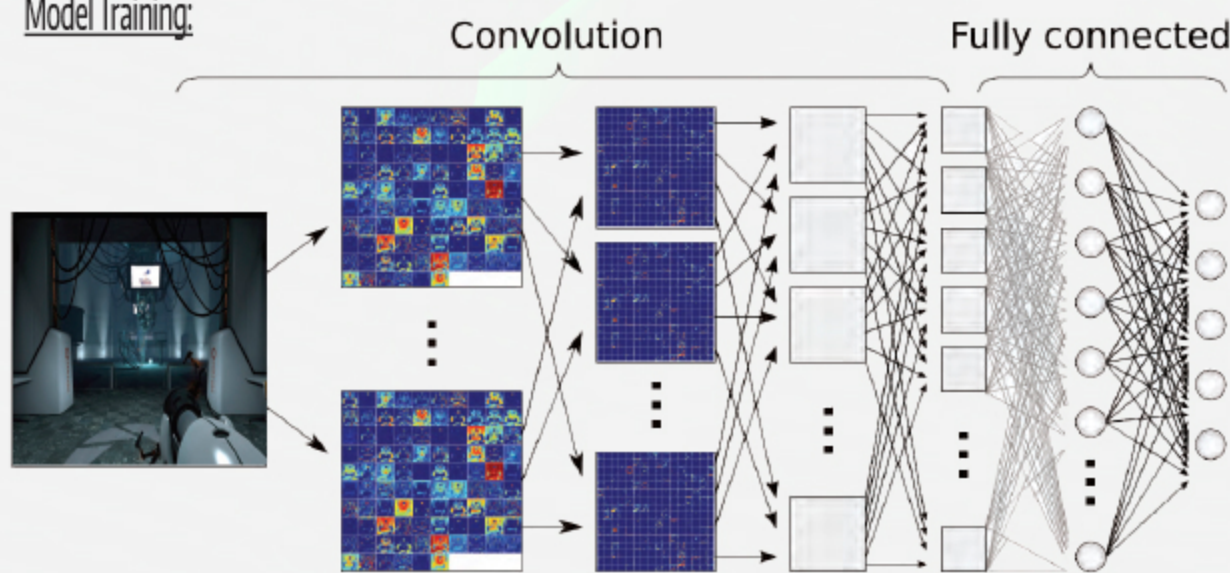


Dataset Generation:



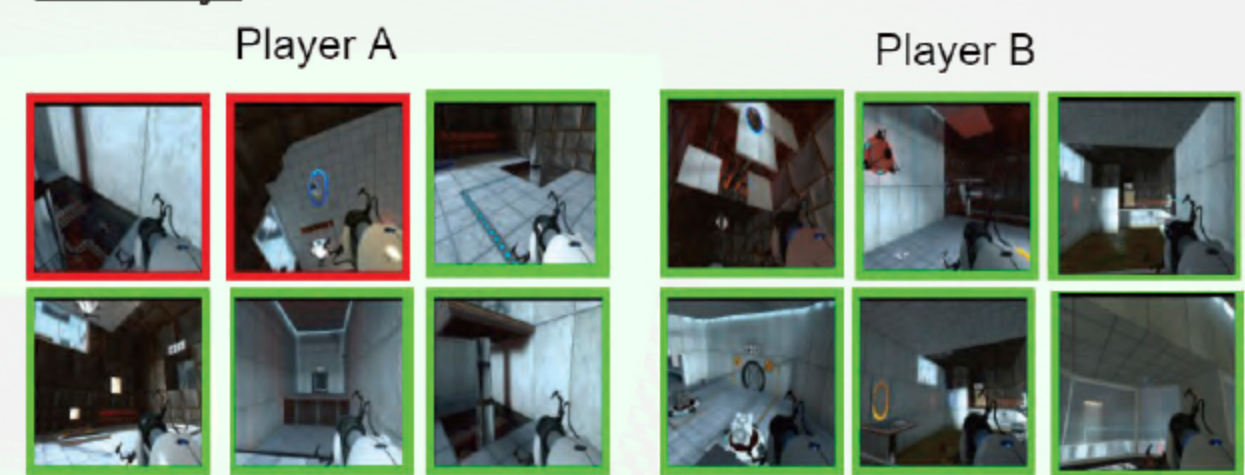
Game:	Images:	Classifications:	Dataset Breakdown
Portal	500,000+	55	75% training, 20% validation, 5% testing
INSIDE	300,000+	126	75% training, 20% validation, 5% testing

Model Training:

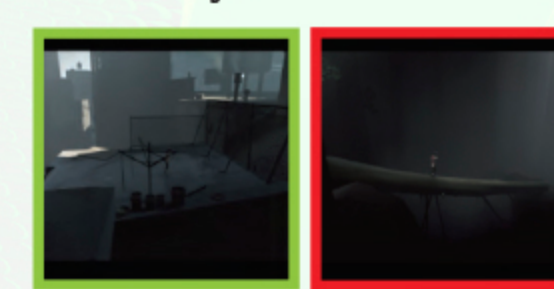


Results

Portal Test Images:



INSIDE Test Images:



Takeaways:

- We suspect the classification error of the neural network is due to model overfitting. Training datasets and parameters can be adjusted to minimize overfitting of the deep neural network.
- The accuracy of the neural network depends on the gamer's level navigation and point-of-view. Gamers can play the game very differently.

What's Next?

- Generate a training dataset with images from multiple screen capture in hopes of preventing overfitting
- Fine-tune DNN Parameters:
Number of epochs, number of hidden layers, learning rate, dropout fractions, batch size, etc.
- Explore different types of game (Open world/Non-linear).
- Evaluate scalability for the NVIDIA marketing team. How can we generate datasets efficiently
- Improve overall user testing accuracy.

Team

Presenters:

Ben Robaidek, Senior, Electrical Engineering, Mathematics
Devin Stoen, Senior, Electrical Engineering
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Mentors:

Roger Allen, NVIDIA
Brian Nelson, Electrical Engineering
Catherine Feng, Electrical Engineering