

Experiment Mgr Example with Custom Training Loop and UI based on the 3D Brain Segmentation Example

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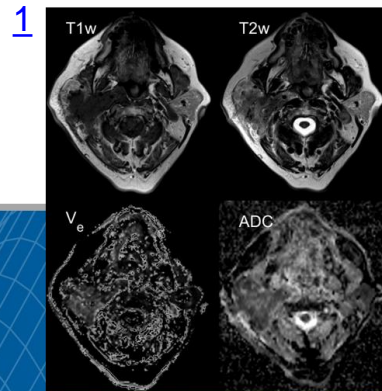
Motivation from Univ of Freiburg Med Res Ctr Project using Multiple MRI Channels

Original solution driven by special needs of customer



Resolving trainNetwork() Limitations
Custom Training, Custom UI and
Virtual MiniBatch (for UofFreiburg Throat Cance

By Arnie Berlin
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Custom UI from Custom Training Loop (Multiple GPU)

Variety of
Stop
Mechanisms

Also implemented
back-door
mechanism

Custom
Charts

Virtual MiniBatch Size =
4*single pass
MiniBatch size
(using sub iterations)

Multiple Status
Messages

Accuracy for
Each Class

Real-time
Validation
Montage

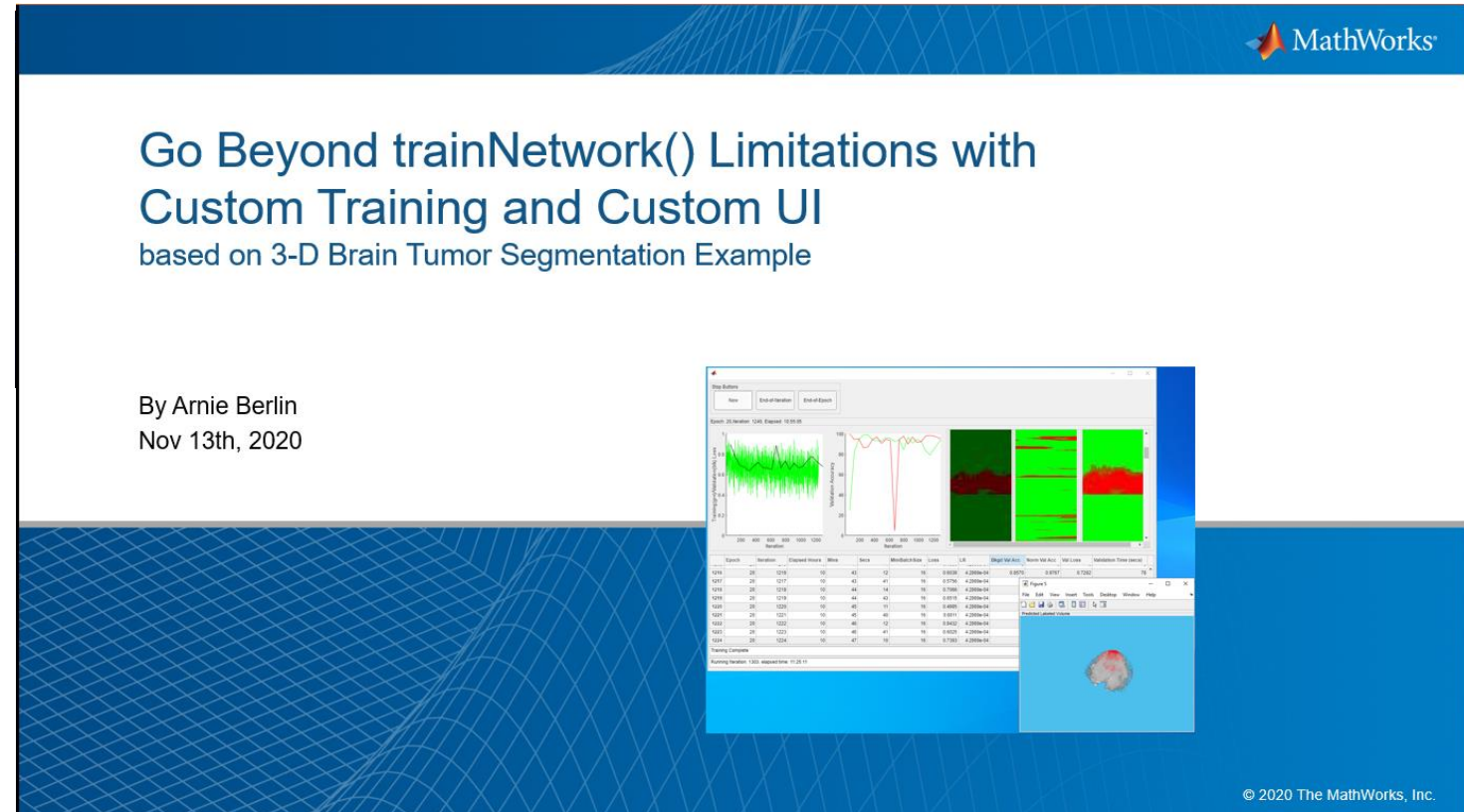
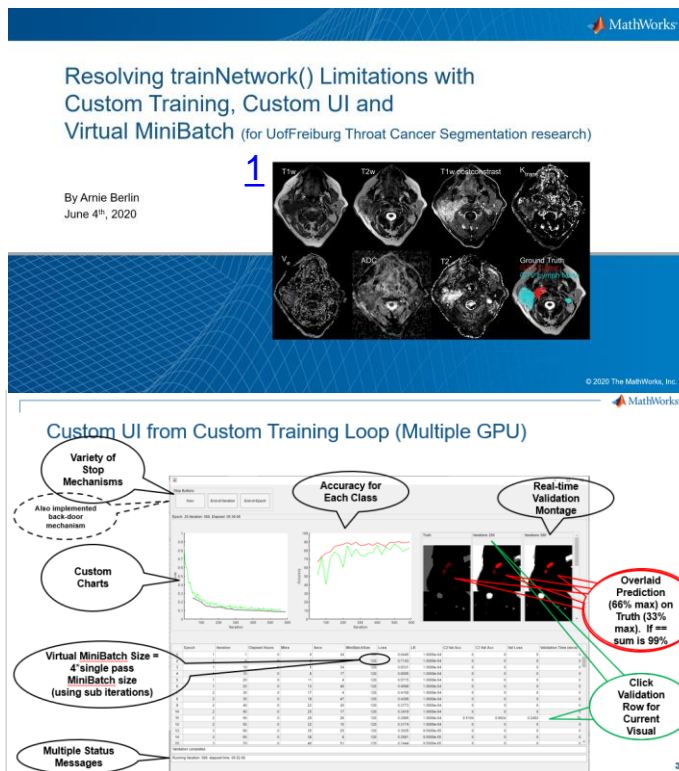
Overlaid
Prediction
(66% max)
on
Truth (33%
max). If ==
sum is 99%

Click
Validation
Row for
Current
Visual

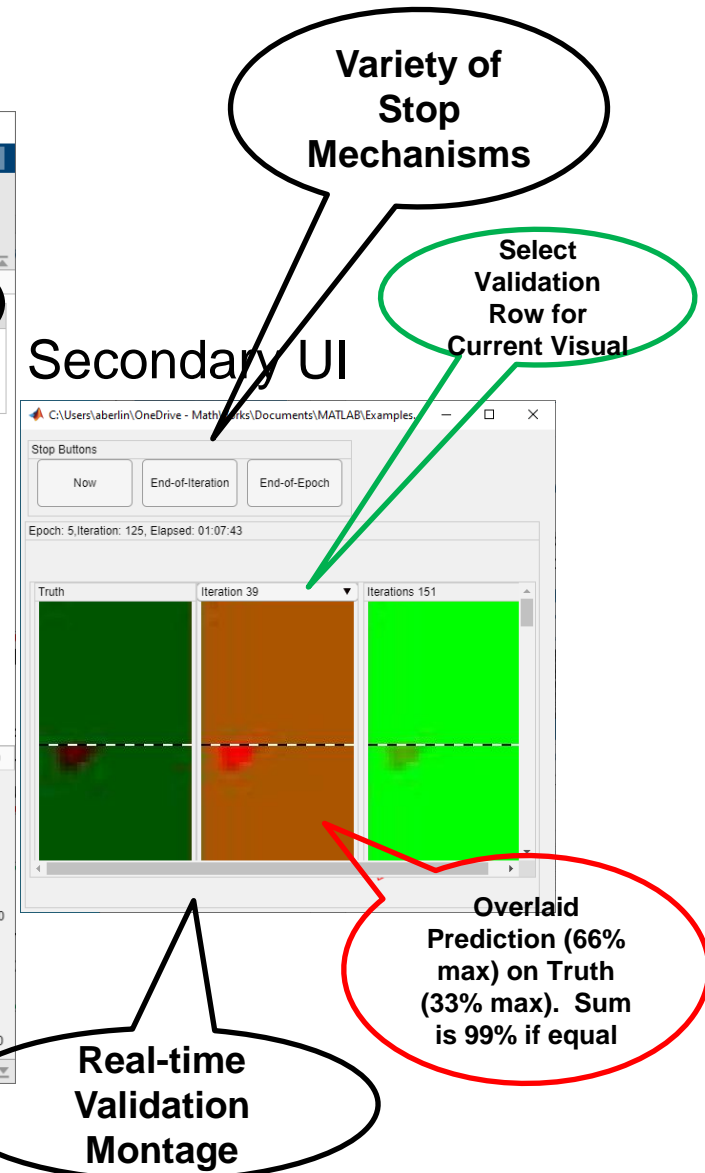
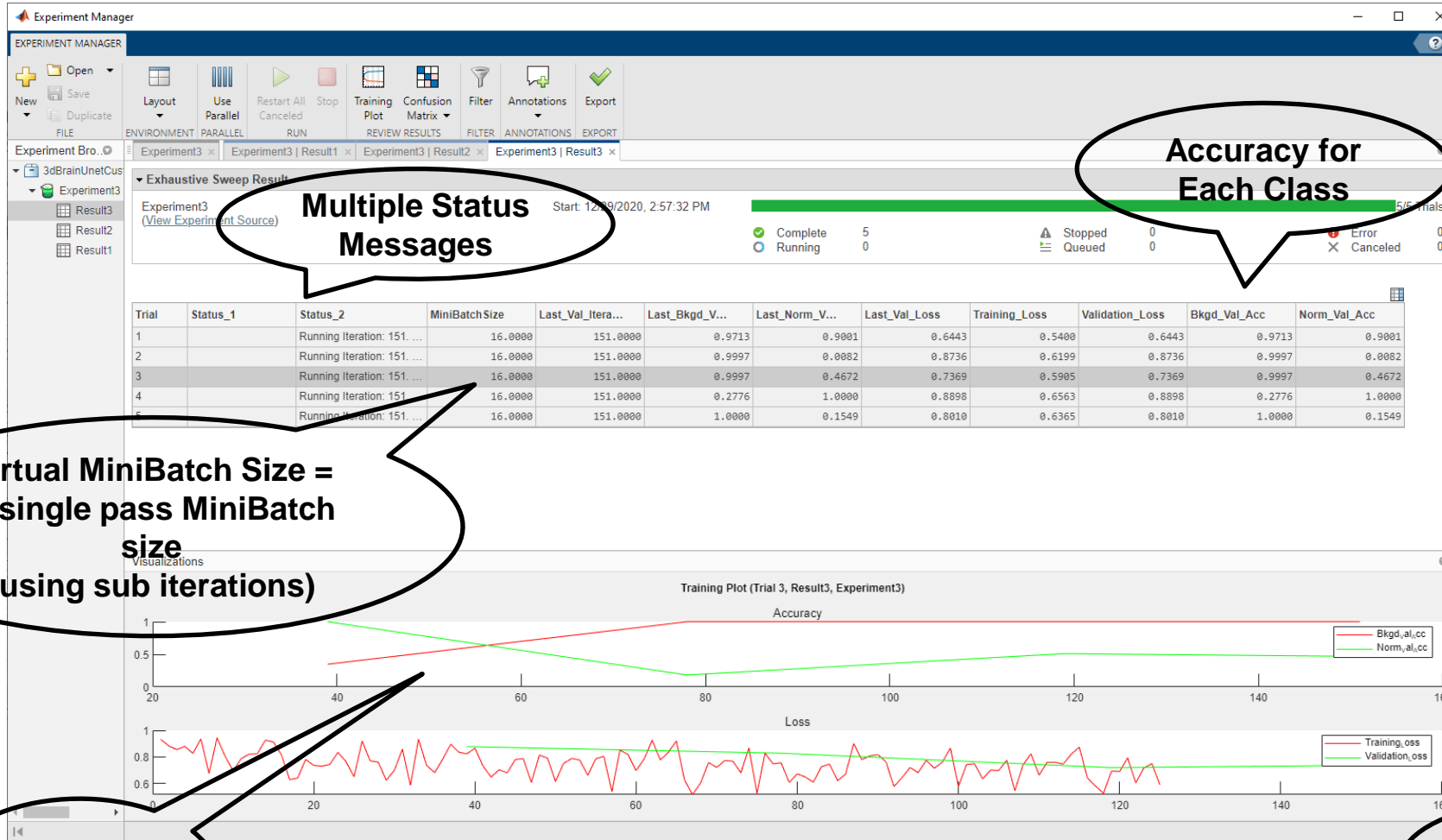


Motivation from Univ of Freiburg Med Res Ctr Project using Multiple MRI Channels

Original solution driven by special needs of customer → Ported to 3D Brain example



Custom Features Implemented using Experiment Manager



Experiment Setup Panel

The screenshot shows the Experiment Manager interface. The left sidebar contains the Experiment Browser with a tree view showing '3dBrainUnetCustomExpMgrExample' and 'Experiment3'. The main panel has tabs for 'Experiment3*' and 'Experiment3 | Results'. The 'Experiment3*' tab is active, showing the 'Description' section with the text '3D Brain Example Leave-One-Out Experiment'. The 'Hyperparameters' section contains a table with the following data:

Name	Values
trialParams	["0 1" "1 2" "2 3" "3 4" "4 5"]
maxEpochs	5
miniBatchSize	4
executionEnvironment	"multi-gpu"

Below the table are 'Add' and 'Delete' buttons. The 'Training Function' section shows the text 'segment3DBrainTumorUsingExpMgr' with 'New' and 'Edit' buttons below it. Three callout bubbles provide additional information:

- A bubble pointing to the 'trialParams' row in the Hyperparameters table contains the text: **String Array to Group Dynamic Parameters per trial**.
- A bubble pointing to the values in the 'trialParams' row contains the text: **"<channel> <trial num>" (0=none)**.
- A bubble pointing to the 'maxEpochs', 'miniBatchSize', and 'executionEnvironment' rows contains the text: **Static parameters for all trials**.

Basic Constructs

```

111
112 %have to wait until g_expMonitor is assigned in trainDLNetwork()
113 - if ~isempty(g_expMonitor)
114 -     if isempty(g_expMonitor.Info)
115 -         g_expMonitor.Info = ["Status_1", "Status_2", "Iteration", "Epoch", "MiniBatchSize", "LearnRate", "Last_Val_Iterat
116 -         g_expMonitor.Metrics = ["Training_Loss", "Validation_Loss", "Bkgd_Val_Acc", "Norm_Val_Acc"];
117 -         groupSubPlot(g_expMonitor, "Loss", ["Training_Loss", "Validation_Loss"]);
118 -         groupSubPlot(g_expMonitor, "Accuracy", ["Bkgd_Val_Acc", "Norm_Val_Acc"]);
119 -     end
120 -     if g_expMonitor.Stop
121 -         send(g_clientStopTrainingSignal, [{true} {false} {false}]);
122 -     end
123 - end

```

```

300 addpoints(lineValBkgdAccurCell{1}, iteration, double(100*valA
301 - addpoints(lineValNormAccurCell{1}, iteration, double(100*valA
302 - drawnow;
303 - updateInfo(g_expMonitor, "Last_Val_Iteration", iteration, ...
304 -     "Last_Bkgd_Val_Acc", valAccur(1), ...
305 -     "Last_Norm_Val_Acc", valAccur(2), ...
306 -     "Last_Val_Loss", valLoss);
307 - recordMetrics(g_expMonitor, iteration, ...
308 -     "Bkgd_Val_Acc", valAccur(1), ...
309 -     "Norm_Val_Acc", valAccur(2), ...
310 -     "Validation_Loss", valLoss);
311 - lastValAccur = valAccur;
312 - lastValLoss = valLoss;
313 - end

```

Footnotes

- 1) Bielak, L., Wiedenmann, N., Berlin, A. et al. Convolutional neural networks for head and neck tumor segmentation on 7-channel multiparametric MRI: a leave-one-out analysis. Radiat Oncol 15, 181 (2020). <https://doi.org/10.1186/s13014-020-01618-z>