



Surveys



Report Portals



My Panel



Resources



Help



[main folder](#) [raisedal](#) [mehilshah](#) [Group - 1E](#) [Questions](#)

Questions

[Group - 1E](#)

Section 1

[Edit](#)

Introduction

[New text](#)

Hello there!

Welcome to this survey! We are a group of researchers from Dalhousie University, Canada. Recently, we conducted an empirical study involving 85 reproducible bugs from Stack Overflow posts. Our aim was to understand two main aspects: (1) the edit actions that can be employed to complete code snippets for bug reproduction and (2) the information that enhances the reproducibility of bug reports. Our investigation has yielded several interesting findings, and we are seeking your feedback on them.

We reproduced 85 bugs and discovered they could be reproduced using 10 edit actions. To enhance their reproducibility, 5 main information categories need to be present. The edit actions and information categories are described below.

Edit Actions

Input Data Generation: Generating input data which simulates the data used for training the model.
 Neural Network Construction: Reconstructing or modifying the neural network based on the information provided
 Hyperparameter Initialization: Initializing the hyperparameters for training, such as batch size and number of epochs
 Import Addition and Dependency Resolution: Determining the dependencies in the code snippet and adding the missing imports.
 Logging: Adding appropriate logging statements to capture relevant information during reproduction
 Obsolete Parameter Removal: Removing outdated parameters or functions to match the parameters of the latest library versions
 Compiler Error Resolution: Debugging and resolving compiler errors that arise due to the errors in the provided code snippet.
 Dataset Procurement: Acquiring the datasets and using them to train the model
 Downloading Models & Tokenizers: Fetching pre-trained models and tokenizers from external sources.
 Version Migration: Updating the code to adapt the changes introduced in newer library or framework versions.

Information Categories

Data: Shape of the input data, type of data, data distribution.
 Model: Neural network architecture, number of layers, neurons, activation function for layers.
 Hyperparameters: Batch size, epochs, optimizers, loss function.
 Code Snippet: Training code snippet, evaluation script, data preprocessing, and transformation operations.
 Logs: Compiler error logs, training error logs

[\[Edit | Delete \]](#)

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Section 2

[Edit](#) | [Delete](#)

[New text](#)

Demographics

[New text](#) | [New question](#) | [New question from library / other surveys](#)

Question 1

[Edit](#) | [Add to library](#) | [Delete](#)

1. What is your relevant work experience with deep learning?

- ☐ <1 Year
- ☐ 1-5 Years
- ☐ 5-10 Years
- ☐ >10 Years

[Split section](#) | [New text](#) | [New question](#) | [New question from library / other surveys](#)

Question 2

[Edit](#) | [Add to library](#) | [Delete](#)

2. What is your relevant experience with deep learning bug fixing?

- ☐ <1 Year
- ☐ 1-5 Years
- ☐ 5-10 Years
- ☐ >10 Years

[Split section](#) | [New text](#) | [New question](#) | [New question from library / other surveys](#)

Question 3

[Edit](#) | [Add to library](#) | [Delete](#)

3. What is your current occupation?

- ☐ Software Practitioner (Software Engineer, Deep Learning Engineer, Machine Learning Engineer etc.)
- ☐ Researcher (Masters/Doctoral Student, PostDoc, Faculty)

Menu

Questions

[Branching](#)

[Custom question numbers](#)

[Set page breaks](#)

[Remove page breaks](#)

[Preview survey](#)

[Reports and data](#)

[Survey home](#)

Recent items

[mehilshah](#)

[Group - 1C](#)

[Group - 4E](#)

[Group - 3E](#)

[Group - 2E](#)

[raisedal](#)

[main folder](#)

[Answering Follow-up Quest](#)

[usmimukherjee](#)

Guide

The following steps are recommended for your survey:

[Create questions](#)

[Add conditional branching](#)

[Customize look and feel](#)

[Set privacy and behavior](#)

[Translate survey](#)

[Publish survey](#)

[Analyze collected data](#)



Question 4

Edit | Add to library | Delete

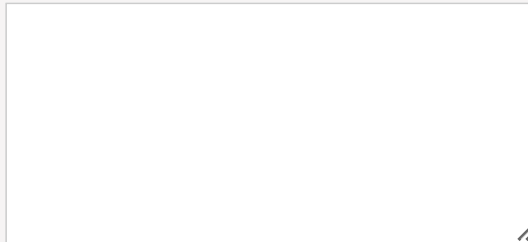
4. What are the deep learning frameworks you have worked with?

- ☐ Tensorflow
☐ PyTorch
☐ Keras
☐ Other

Question 5

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5. What challenges are associated with reproducing deep learning bugs in your day-to-day activities?



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Section 3

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Bug #1

Given the issue description, and the code snippet. Please reproduce the bug, and select the most appropriate edit operations and critical information needed to reproduce this bug.

To help the reproduction process, we have provided the sample edit operations [here](#).

Original Issue Report: <https://stackoverflow.com/questions/59278771/super-low-accuracy-for-neural-network-model>

Description:

I followed a tutorial on neural network model evaluation using cross-validation with code (given below). The accuracy was supposed to be around 95.33% (4.27%) but I got ~Accuracy: 34.00% (13.15%) on a few attempts. The model code seems exactly the same. I downloaded the data from [here](#) as instructed. What could go wrong? Thanks

Code Snippet: You can use this Colab notebook as the base notebook to start the reproduction process: <https://colab.research.google.com/drive/1CH0EKq3Wc2ctcw1kWvAzxe3O7i-FA05f?usp=sharing>

Hints:

1. Code Snippet, Logs and Data can be useful information for reproducing the bug.
2. Input Data Generation, Import Addition, Version Migration, Hyperparameter Initialization and Compiler Error Resolution can be useful edit actions for reproducing the bug.
3. Focus on the statement: "I followed a tutorial on neural network model evaluation using cross-validation with code (given below)".

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Question 6

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6. What are the edit operations that could be used to reproduce this bug?

- | | |
|--|--|
| <input type="checkbox"/> Input Data Generation | <input type="checkbox"/> Neural Network Construction |
| <input type="checkbox"/> Hyperparameter Initialization | <input type="checkbox"/> Import Addition and Dependency Resolution |
| <input type="checkbox"/> Logging | <input type="checkbox"/> Obsolete Parameter Removal |
| <input type="checkbox"/> Compiler Error Resolution | <input type="checkbox"/> Dataset Procurement |
| <input type="checkbox"/> Downloading Models and Tokenizers | <input type="checkbox"/> Version Migration |

Question 7

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7. Why do you think these edit operations could prove useful in reproducing the bug?

[Split section](#) | [New text](#) | [New question](#) | [New question from library / other surveys](#)

Question 8

[Edit](#) | [Add to library](#) | [Delete](#)

8. What are the critical information components that could help the reproducibility of this bug?

- ☐ Data
- ☐ Hyperparameters
- ☐ Model
- ☐ Code Snippet
- ☐ Logs

[Split section](#) | [New text](#) | [New question](#) | [New question from library / other surveys](#)

Question 9

[Edit](#) | [Add to library](#) | [Delete](#)

9. How do you think the selected critical information could be useful in reproducing the bug?

[Split section](#) | [New text](#) | [New question](#) | [New question from library / other surveys](#)

Question 10

[Edit](#) | [Add to library](#) | [Delete](#)

10. Did you implement any additional operations or actions beyond those suggested by us? Please let us know your thoughts.

[New text](#)

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Section 4

[Edit](#) | [Delete](#)

Bug #2

Given the issue description, and the code snippet. Please reproduce the bug, select the most appropriate edit operations and critical information needed to reproduce this bug.

To help the reproduction process, we have provided the sample edit operations [here](#).

Original Issue Report: <https://stackoverflow.com/questions/39525358/neural-network-accuracy-optimization>

Description:

I have constructed an ANN in keras which has 1 input layer(3 inputs), one output layer (1 output) and two hidden layers with with 12 and 3 nodes respectively, as shown below in the code.

The dataset has 4 columns: 3 columns with values in the range [60, 70] and the target variable is binary (0/1 output)

so after 150 epochs i get: **loss: 0.6932 - acc: 0.5000 - val_loss: 0.6970 - val_acc: 0.1429**

My question is: how could i modify my NN in order to achieve higher accuracy?

Code Snippet: You can use this Colab notebook as the base notebook to start the reproduction process: <https://colab.research.google.com/drive/1O8y5vYDP7ODPcvi1cGNraMOP8iXxLLhM?usp=sharing>

Hints:

1. Logs, Model and Code Snippet can be useful information for reproducing the bug.
2. Neural Network Construction, Import Addition, Hyperparameter Initialization, Logging, and Dataset Procurement can be useful edit actions for reproducing the bug.
3. Focus on the statement: "so after 150 epochs i get: loss: 0.6932 - acc: 0.5000 - val_loss: 0.6970 - val_acc: 0.1429"

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[New question](#) | [New question from library / other surveys](#)

Question 11

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11. What are the edit operations that could be used to reproduce this bug?

- | | |
|--|--|
| <input type="checkbox"/> Input Data Generation | <input type="checkbox"/> Neural Network Construction |
| <input type="checkbox"/> Hyperparameter Initialization | <input type="checkbox"/> Import Addition and Dependency Resolution |
| <input type="checkbox"/> Logging | <input type="checkbox"/> Obsolete Parameter Removal |
| <input type="checkbox"/> Compiler Error Resolution | <input type="checkbox"/> Dataset Procurement |
| <input type="checkbox"/> Downloading Models and Tokenizers | <input type="checkbox"/> Version Migration |

[Split section](#) | [New text](#) | [New question](#) | [New question from library](#) / other surveys

Question 12

[Edit](#) | [Add to library](#) | [Delete](#)

12. What are the critical information components that could help the reproducibility of this bug?

- ☐ Data
- ☐ Hyperparameters
- ☐ Model
- ☐ Code Snippet
- ☐ Logs

[Split section](#) | [New text](#) | [New question](#) | [New question from library](#) / other surveys

Question 13

[Edit](#) | [Add to library](#) | [Delete](#)

13. How do you think the selected critical information could be useful in reproducing the bug?

[Split section](#) | [New text](#) | [New question](#) | [New question from library](#) / other surveys

Question 14

[Edit](#) | [Add to library](#) | [Delete](#)

14. How do you think the selected critical information could be useful in reproducing the bug?

[Split section](#) | [New text](#) | [New question](#) | [New question from library](#) / other surveys

Question 15

[Edit](#) | [Add to library](#) | [Delete](#)

15. Did you implement any additional operations or actions beyond those suggested by us? Please let us know your thoughts.

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Section 5

[Edit](#) | [Delete](#)[New text](#)

Unique ID Generation

[New text](#) | [New question](#) | [New question from library](#) / other surveys

Question 16

[Edit](#) | [Add to library](#) | [Delete](#)16. Please use this secure [link](#), and enter the Unique ID generated in the following textbox.If you want to withdraw from the survey, email us with this Unique ID at shahmehil@dal.ca, and we will delete your response.

Unique ID

[New text](#) | [New question](#) | [New question from library](#) / other surveys

