

Updates & Reporting based on ANN

Reporting

Please prepare a few slides to present (which will be uploaded on our confluence page)

1. Developing a customized optimizer : **Sammy**
2. Developing a customized loss-function : **Sammy**
3. Finding algorithmic error :
Impact from initialization of weights
Limitation in experimental, statistical & systematic error: **Aaryan**
(How big can be the error of F be to do a decent extraction)
4. Identifying the optimum # of points of F corresponding to different angles : **Pranav**
5. Identifying kinematic limitations in a decent extraction for a particular formalism and for particular-model (model for CFFs)
6. Cross-validation model comparison: **Cole**
7. Comparison between Tensorflow Vs Pytorch : **Cole**
8. Handling different observables such as FUU, FUL, FUT etc.
9. Validation approach to identify the error : **Surya**

Work organization

GitHub page: <https://github.com/extraction-tools/ANN>

Confluence page: <https://confluence.its.virginia.edu/display/twist/ANN+Fitting+Project>

Weekly Updates

Date	Title	Presenter	Slides	Summary / Notes
18 Jan 2022		Cole	ColeWeis-1-18-22.pdf	
25 Jan 2022	Error on F and Consistency Statistics	Aaryan	01_25_2022.pdf	
04 Feb 2022	limiting the angles of phi	Pranav	Pranav-02_04_2022.pdf	
04 Feb 2022		Pranav	Progress Report 02_04_2022.pdf	
11 Feb 2022		Pranav	Progress Report 02_11_2022.pdf	
04 Mar 2022		Aaryan	03_04_21.pdf	
11 Mar 2022		Pranav	pr03112022.pdf	
18 Mar 2022		Aaryan	Aaryan_03_18_21.pdf	
18 Mar 2022		Cole	Cole_3-18-2022.pdf	
25 Mar 2022	Sensitivity of (F-BH) (in BKM02)	Aaryan	Aaryan-3_25_2022.pdf	
25 Mar 2022	Fits using method2 with reduced phi (in BKM10)	Pranav	Pranav_03-25-2022.pdf	
08 Apr 2022		Pranav	Pranav_04082022.pdf	
15 Apr 2022		Pranav	Pranav_04152022.pdf	
22 Apr 2022		Pranav	Pranav_042222.pdf	
20 May 2022		Aaryan	05_20_2022_Aaryan.pdf	
27 May 2022		Pranav	final_results_pranav_05_27_2022.pdf	
12 Aug 2022		Amanuel	Amanuel-Update-08-12-2022.pdf	
12 Aug 2022		Cole	Cole Weis SpinPhysics ANN 8-12-22.pptx	

Weekly Updates

Before 14 Jan 2022

[Tuesday][A]

Pranav: Generating pseudo data & optimizing local fits (with Liliet)

Aaryan: Exploring & testing the Method 2 with initialization of weights, and exploring how to bootstrapping effectively

[Tuesday][B]

Surya: Optimizing local fits

Cole: Finding bounds for CFFs using a novel approach

[Friday][A]

Nathan: Finding bounds for CFFs using grid-search

Andrew: Finding bounds for CFFs using Nick's approach & exploring loss-function

[Friday][B]

Sammy: Exploring loss function, implementation of stigmergic loss

Arthur: Fast prototyping with GPUs

Date	Title	Presenter	Slides	Notes
15 Oct 2021	Plan	Ishara	ANNGroupProjectsPlan.pdf	There are 9 working groups reporting updates every other week (please see attached slides)

Tuesday group

Date	Title	Presenter	Slides	Summary / Notes
02 Nov 2021	Possible approaches: weight averaging	Aaryan & Pranav	Slides Nov 2, 2021.pdf	
09 Nov 2021	CFF Bounds Local Fit Experimentation	Cole	Cole_11_09_2021.pdf	
16 Nov 2021		Pranav	Slides Nov 16, 2021.pdf	
16 Nov 2021	Different Loss Function Exploration	Aaryan	Research Meeting Update_Aaryan_Nov_16_2021.pdf	Played around with different loss functions including MAE, MSE, and working with the interference values. Also worked with method 2 that does not reinitialize weights after each replica, and saw how predictions for CFFs get better for following replicas.
30 Nov 2021	Optimizing local fits	Aaryan	Aaryan_11_30_21.pdf	Exploring methods with seeing when to reset weights and observing differences in averages when weights are reset for each replica and when they are not.
30 Nov 2021	Optimizing local fits	Pranav	Pranav_Progress Nov 30.pdf	
07 Dec 2021		Cole	Optimizing CFF bounds_Cole_12_07_2021.pdf	
07 Dec 2021		Surya	Surya_12_7_2021.pdf	

21 Dec 2021	Different Methods	Aaryan	Aaryan_12_21_21.pdf	Tried combining Nick's Method and Pure Bootstrapping Method and saw that averages are similar to correct results while distribution of results are still narrow as pure bootstrapping.
21 Dec 2021		Pranav	Pranav_Dec_21_2021.pdf	Worked on implementing a K-means clustering algorithm in order to narrow down networks at intermediate stages using weight averaging. Two methods: using the networks immediately after weight averaging and training for an additional 100 epochs after weight averaging. Overall, using relatively small numbers of replicas and training epochs, the results were extremely poor for both methods tried. The next step is to experiment with different numbers of replicas and cluster centers to see if better results can be obtained.
21 Dec 2021	TensorFlow Graph Execution and tf. function	Cole	ColeWeis_12-21.pdf	
04 Jan 2022	Exploring combined-type Method	Aaryan	Aaryan_01_04_2022.pdf	with/without weight reset and random selection of weights for initial training
04 Jan 2022	PyTorch Vs Tensorflow for BKM02	Cole	ColeWeis_1-4-22.pdf	
11 Jan 2022	Consistency /Reproducibility of Experimental Method	Aaryan	Aaryan_01_11_2022.pdf	
11 Jan 2022	K-means algorithm for intermediate weight averaging	Pranav	Pranav_Progress_Report_Tue_Jan_11.pdf	

Friday group

Date	Title	Presenter	Slides	Summary / Notes
05 Nov 2021	A model to narrow bounds for ReE	Andrew	Andrew_11_5.pdf	Information on tensorflow update is included
03 Dec 2021		Andrew	Andrew_12_5_21.pdf	
03 Dec 2021		Nathan	will be uploaded soon	
17 Dec 2021	Mathematica Implementation	Annabel	Annabel_12_17_2021.pdf	
17 Dec 2021	Custom loss function update	Sammy	Sammys_Custom_Loss_Presentation_12_17_2021.pdf	

Prospective projects

1. Developing a customized optimizer : **Sammy**
2. Developing a customized loss-function : **Sammy**
3. Finding algorithmic error :
Impact from initialization of weights
4. Identifying specific angles (low/high angles critical for good fits)
5. Limitation in experimental, statistical & systematic error: **Aaryan**
(How big can be the error of F be to do a decent extraction)
6. Identifying the optimum # of points of F corresponding to different angles : **Pranav**
7. Identifying kinematic limitations in a decent extraction for a particular formalism and for particular-model (model for CFFs)
8. Cross-validation model comparison: **Cole**
9. Comparison between Tensorflow Vs Pytorch : **Cole**
10. Handling different observables such as FUU, FUL, FUT etc.
11. Validation approach to identify the error : **Surya**

Chapter#	Topic	Assignment
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2	Hyper-parameter optimization for Local Fits	
3	Hyper-parameter optimization for Global Fits	
4	Limitation in experimental, statistical systematic error	Aaryan
5	Identifying the optimum number of points of F corresponding to different angles	Pranav
6	Validation approach to identify the error	Surya
7	Boot-Strapping Value	
8	Cross-validation model comparison	Cole
9	Developing a customized optimizer and loss-function	Sammy
10	Comparison between Tensorflow Vs Pytorch	Summy
11	Finding algorithmic error	
12	Model Ensemble Study	
13	Identifying kinematic limitations in a decent extraction for a particular formalism and for particular-model (model for CFFs)	
14	CFFs extraction through Grid-Search algorithm	Nathan
15	Handling different observables such as FUU, FUL, FUT etc	
16	NN Fit only to interference term	