Tips for Report Writing…

With some notes on presentations, too

AAB

Version 0.9
Feb, 2022

Project Assessment

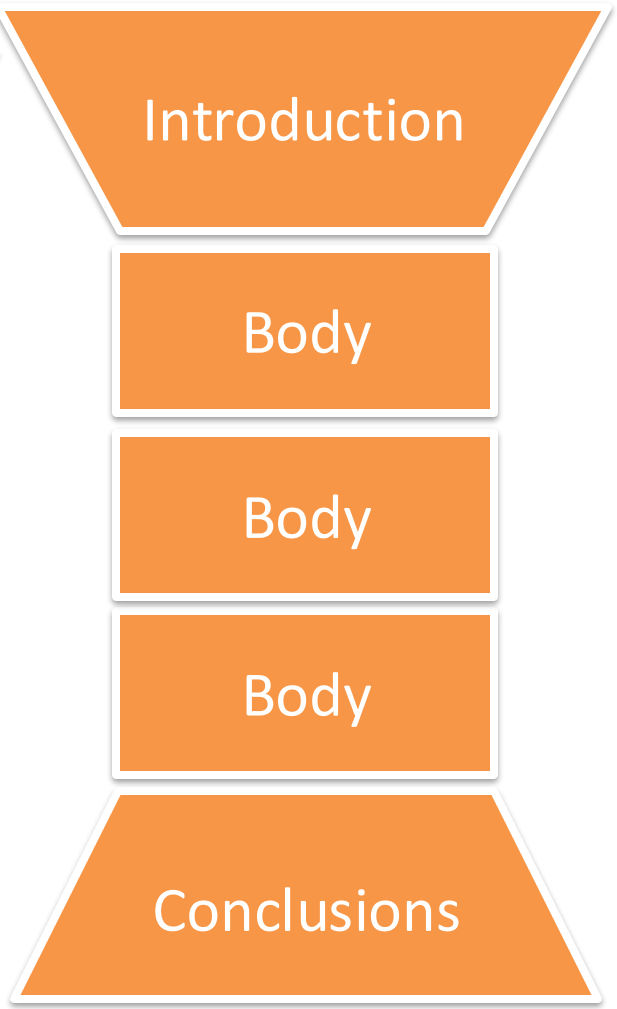
Assessment of Final Year Projects (FYPs) is by more than one member of staff, and generally the second assessor is deliberately from another area of research, or is randomly selected.

Project Assessment

The report must stand on its own, providing a clear progression into details of experiments from a broad introduction, gradually honing into the main contribution of your project (funnel-structure).

In the conclusion and discussion, you can broaden out again to place the work into context (reverse funnel).

"Funnel Structure" to help organise your report writing.



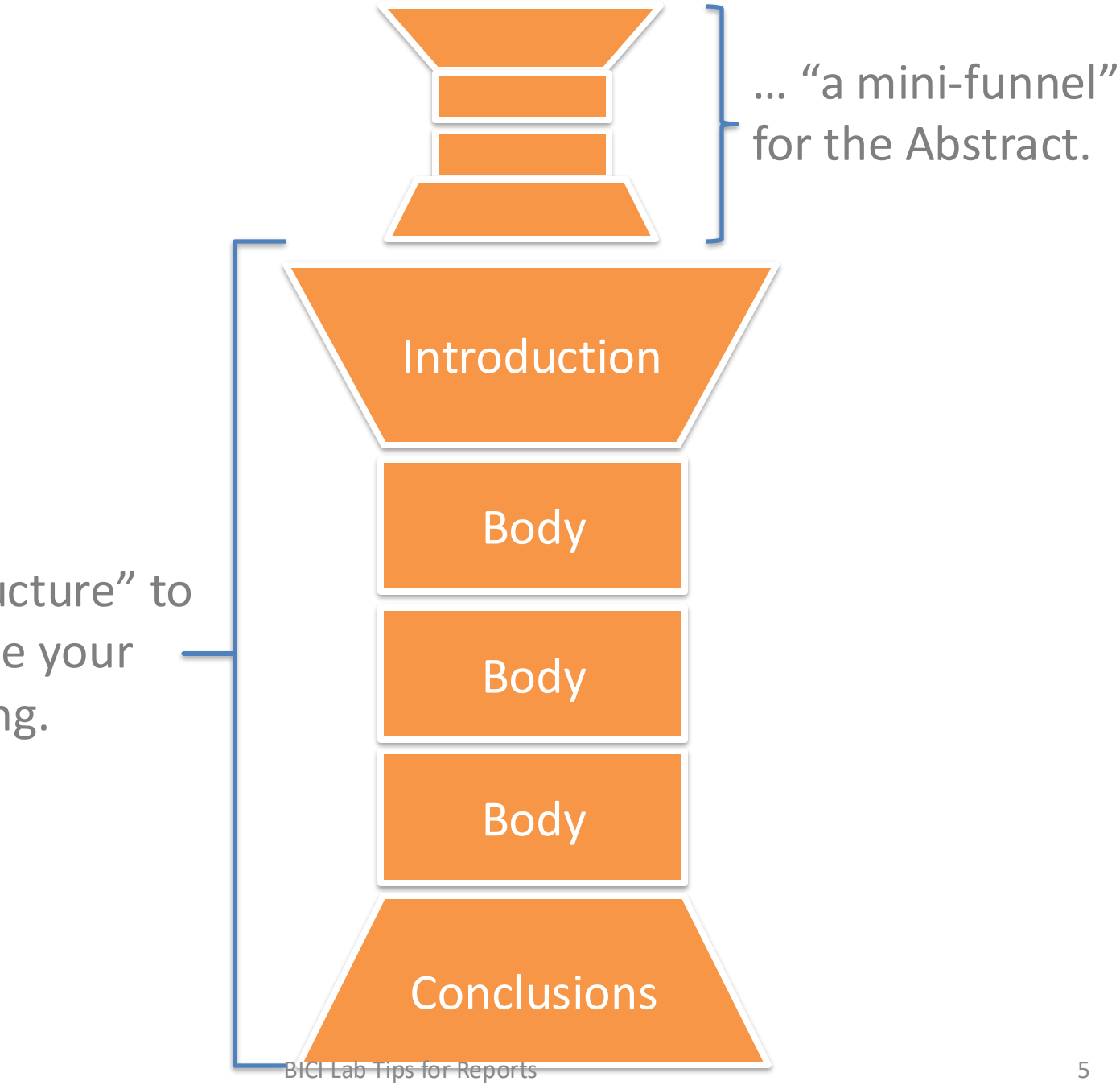
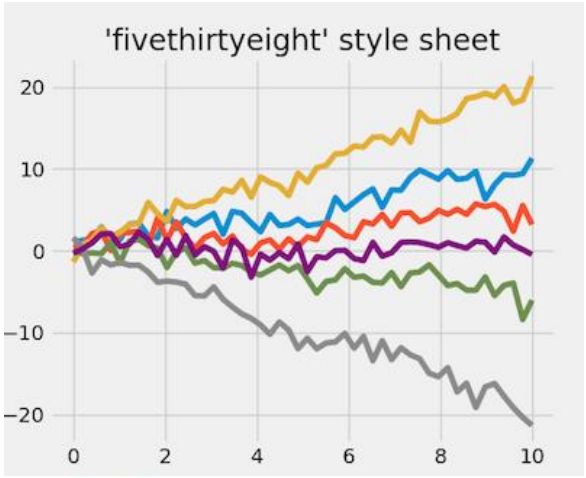
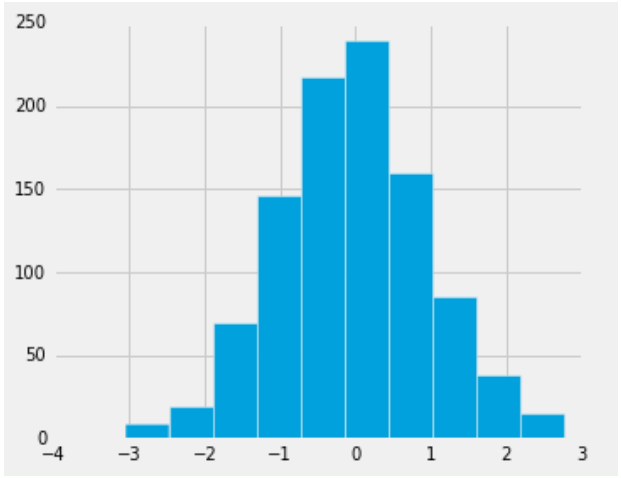

… “a mini-funnel” for the Abstract.
“Funnel Structure” to help organise your report writing.
Introduction
Body
Body
Body
Conclusions

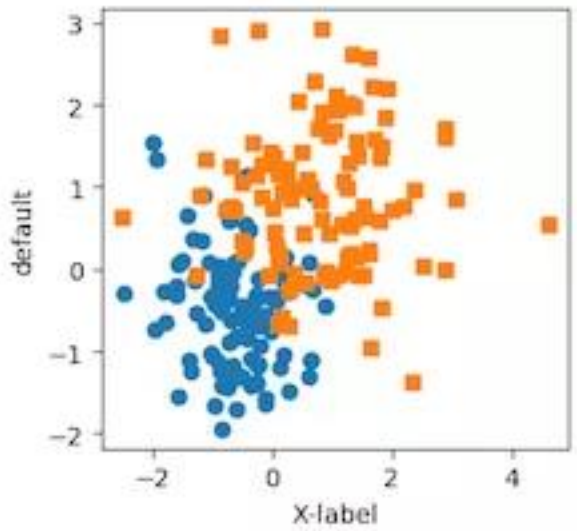
Figure Guidelines

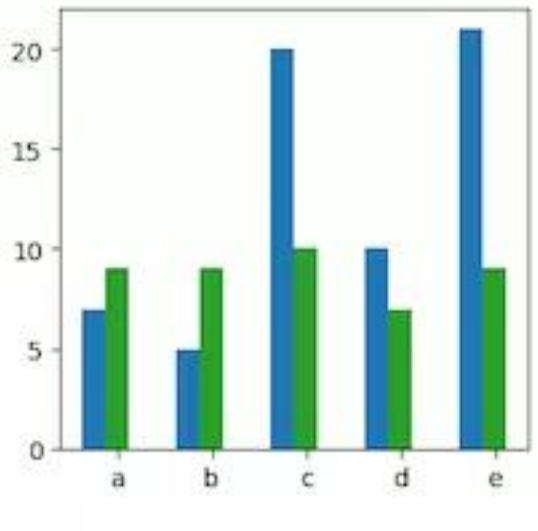
- Ensure that all figures have large, readable axis and value labels (text).
- Use consistent colours and font sizes for all figures.
- Ensure that lines on plots are sufficiently thick.

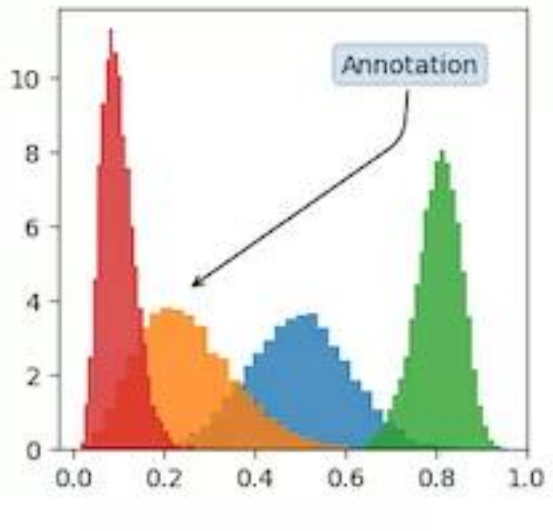
Examples





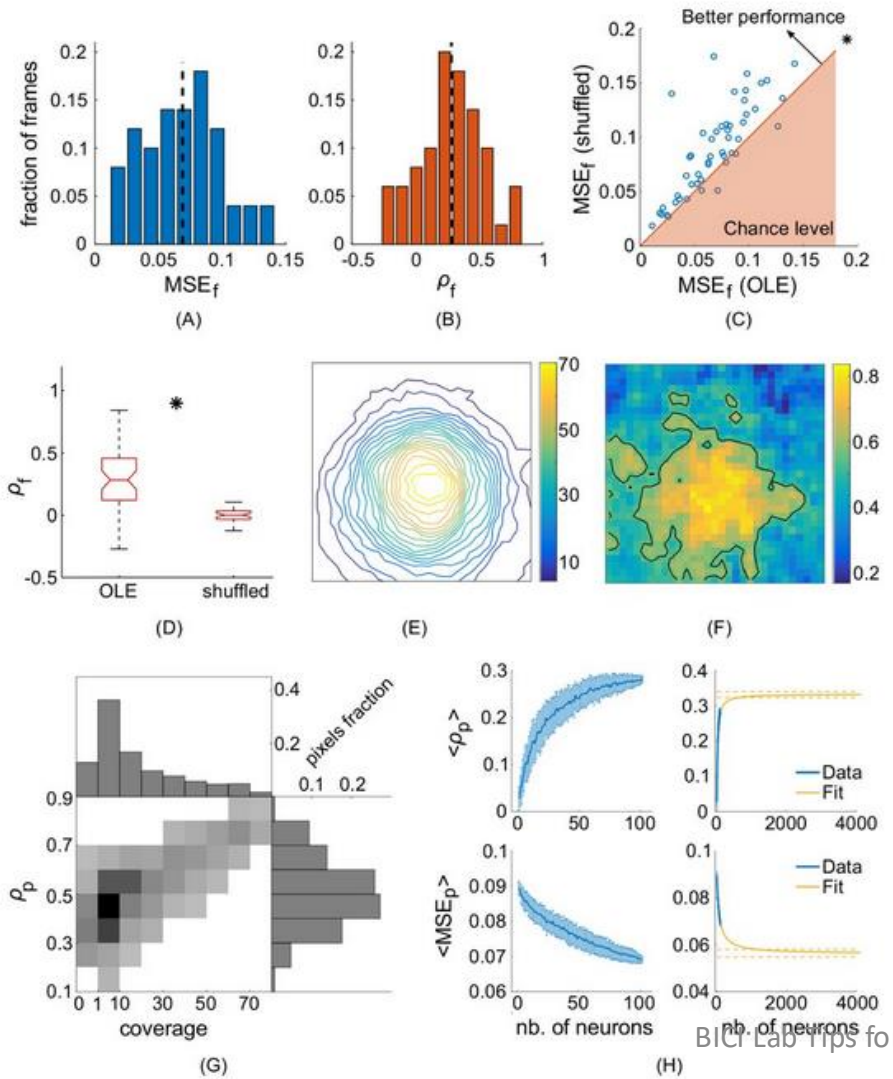






Matplotlib examples; these are not good examples, because axes are not labelled!

Several figures combined….



Note the consistency and sizes of fonts. These are all data generated figures, so can be generated programmatically.

Note use of different types of plot (combined) to provide insight and analysis.

Clear , readable diagrams; sparsely added annotations to enhance Interpretation.

Symbols would be defined in caption.

Garasto *et al*., 2018.

10 Rules for Figures (1/2)

1. Know Your Audience
2. Identify Your Message
3. Adapt the Figure to the Support Medium
4. Captions Are Not Optional
5. Do Not Trust the “Default” plot settings.

10 Rules for Figures (2/2)

6. Use Color Effectively
7. Do Not Mislead the Reader
8. Avoid “Chartjunk”
9. Message >> Beauty
10. Get the Right Tool (Matlab, Matplotlib with Seaborn, Inkscape)

Other links for figure prep….

From: https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1003833

See also: https://www.aje.com/dist/docs/Guide-Creating-Effective-Scientific-Figures-for-Publication.pdf

Figure preparation (flowcharts, etc)

You WILL need to modify figures as you move from draft to final version of report/thesis;

Therefore, save every figure in an editable format. NOT PNG, TIFF, JPG etc.

An example of a v. good diagram

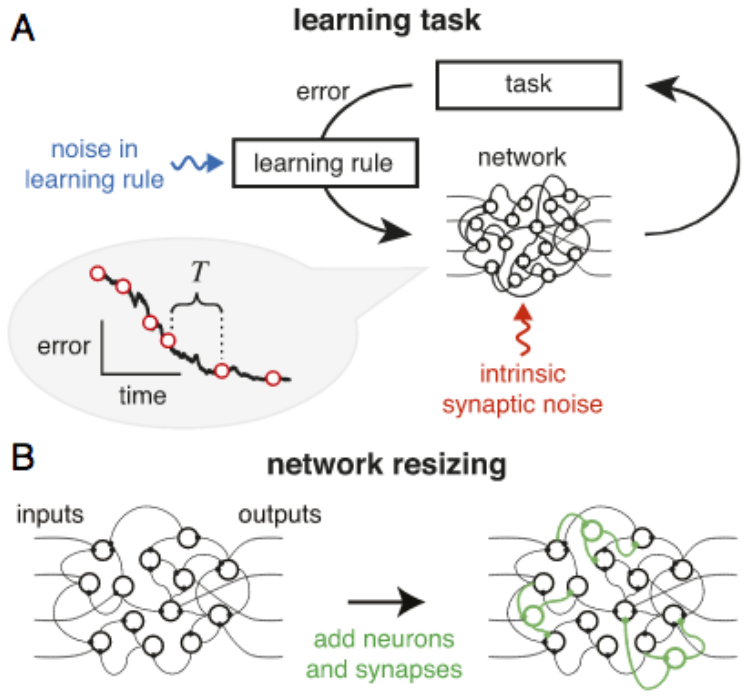


Fig. 1. (*A*) Schematic of learning in a neural network. Information on task error is received by a learning rule which converts this information into synaptic changes that decrease task error. Biologically, the learning rule faces several challenges: It will be subject to noise and perturbations (blue arrow), and the synapses themselves may suffer from intrinsic noise (red arrow). Error information will be acquired only intermittently, as shown in the learning curve on the left, where *T* specifies the intermittency of feedback (main text). (*B*) We analyze the effect of network size on learning performance by adding redundant neurons and synapses (green) to an existing network.

Observe:

Without knowing anything about what the paper is about, the figure and caption conveys a HUGE amount of information.

Key decision to split into (A) and (B).
"A" sets the context of the paper, and
"B" provides a brief insight into the specific contribution of this paper.

From Raman *et al*. https://www.pnas.org/content/116/21/10537

Figure preparation (from experiments)

- You WILL need to modify figures as you move from draft to final version of report/thesis;

- You have two options:

    1. Write separate scripts/programs to generate each figure;

    2. Save every figure in an editable format. NOT PNG, TIFF, JPG etc.

Examples of editable formats

Editable means a VECTOR fomat:

- SVG: editable using Inkscape
- PDF (not recommended); sometimes editable via Inkscape
- Something like TIKZ (not that easy…)
- Power Point (not recommended)
- Word (not recommended)

See also http://cellbio.emory.edu/bnanes/figures/.

Common error….

- Thinking: “I can’t fit the figures in…”
- Yes you can – in LaTeX, you can use the `subcaption` or `subfigure` environments (choice depends on compatibility).
- Worst case – combine outside of document (usually for final version).
- For data generated figures, there are programmatic ways of combining plots:

https://matplotlib.org/3.1.0/tutorials/intermediate/constrainedlayout_guide.html

For the AI/ML Component of Projects
(where applicable)

Don’t just report your “best” result

Include results from different types of network/training algorithms in tabular form, not just your “final” result.

Real-Time Detectors	Train	mAP	FPS
100Hz DPM [30]	2007	16.0	100
30Hz DPM [30]	2007	26.1	30
Fast YOLO	2007+2012	52.7	**155**
YOLO	2007+2012	**63.4**	45
Less Than Real-Time			
Fastest DPM [37]	2007	30.4	15
R-CNN Minus R [20]	2007	53.5	6
Fast R-CNN [14]	2007+2012	70.0	0.5
Faster R-CNN VGG-16[27]	2007+2012	73.2	7
Faster R-CNN ZF [27]	2007+2012	62.1	18

Other examples…

TABLE IV

MODELS TRAINED ON MNIST. FIVE MODELS ARE TRAINED ON THE MNIST DATA SET. *CORRUPTION* INDICATES THE STANDARD DEVIATION OF GAUSSIAN NOISE ADDED DURING THE CORRUPTION PROCESS $c(\tilde{x}|x)$. *PRIOR* INDICATED THE PRIOR DISTRIBUTION IMPOSED ON THE LATENT SPACE. M IS THE NUMBER OF MONTE CARLO INTEGRATION STEPS (SEE ALGORITHM 2 IN THE APPENDIX) USED DURING TRAINING—THIS APPLIES ONLY TO THE iDAAE

ID	Model	Corruption	Prior	M
1	AAE	0.0	10D Gaussian	-
2	DAAE	0.5	10D Gaussian	-
3	DAAE	0.5	10-GMM	-
4	iDAAE	0.5	10D Gaussian	5
5	iDAAE	0.5	10D Gaussian	25

TABLE V

MNIST RECONSTRUCTION. *RECON.* SHOWS THE MEAN SQUARED ERROR FOR RECONSTRUCTIONS OF CORRUPTED TEST DATA SAMPLES ACCOMPANIED BY THE STANDARD ERROR. *CORRUPTION* IS THE STANDARD DEVIATION OF THE ADDITIVE GAUSSIAN NOISE USED DURING TRAINING AND TESTING

Model & Training				Recon.
Model	Corruption	Prior	M	Mean $\pm$ s.e.
AAE	0.0	10D Gaussian	-	0.017±0.001
DAAE	0.5	10D Gaussian	-	0.023±0.001
DAAE	0.5	2D 10-GMM	-	0.043±0.001
iDAAE	0.5	10D Gaussian	5	0.022±0.001
iDAAE	0.5	10D Gaussian	25	0.026±0.001

A bit “shouty” in style (capitals, but this issue comes from the LaTeX template of the publisher)….

Note the extensive captions, explanation of column headings; where appropriate, standard errors are included in the results.

Include clear architecture descriptions

Layer (type)	Output Shape	Param #
input_15 (InputLayer)	(None, 300, 300, 3)	0
conv2d_15 (Conv2D)	(None, 296, 296, 10)	760
max_pooling2d_14 (MaxPooling	(None, 148, 148, 10)	0
flatten_14 (Flatten)	(None, 219040)	0
dense_13 (Dense)	(None, 1)	219041

Total params: 219,801
Trainable params: 219,801
Non-trainable params: 0

Include variants, if compared

Network Architectures					
RFC-Lenet		RFC-12s		RFC-VGG	
input: 28×28		input: 120×180		input: 240×360	
Recurrent Node	Conv: F(5), P(10), D(20)	Recurrent Node	Conv: F(5), S(3), P(10), D(20)	Recurrent Node	Conv: F(11), S(4), P(40), D(64)
	Relu		Relu		Relu
	Pool 2×2		Pool 2×2		Pool 3×3
	Conv: F(5), D(50)		Conv: F(5), D(50)		Conv: F(5), P(2) D(256)
	Relu		Relu		Relu
	Pool(2×2)		Pool(2×2)		Pool(3×3)
	Conv: F(3), D(500)		Conv: F(3), D(500)		Conv: F(3), P(1) D(256)
	Relu		Relu		Relu
	Conv: F(1), D(1)		Conv: F(1), D(1)		Conv: F(3), P(1) D(256)
	-		-		Relu
					Conv: F(3), P(1) D(256)
					Relu
					Conv: F(3), D(512)
					Conv: F(3), D(128)
	DeConv: F(10), S(4)		Flatten		ConvGRU: F(3), D(128)
	Flatten		GRU: W(100×100)		Conv: F(1), D(1)
	GRU: W(784×784)		DeConv: F(10), S(4)		DeConv: F(20), S(8)

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Different performance measures

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Results from other papers...

Different performance measures

Reporting Experiments

- Give all relevant experimental details. DO NOT assume audience knows about CIFAR, Montezuma's revenge etc.

- More to the point, explain the *significance* of using a particular dataset or environment. Particularly true for robotics stream people.

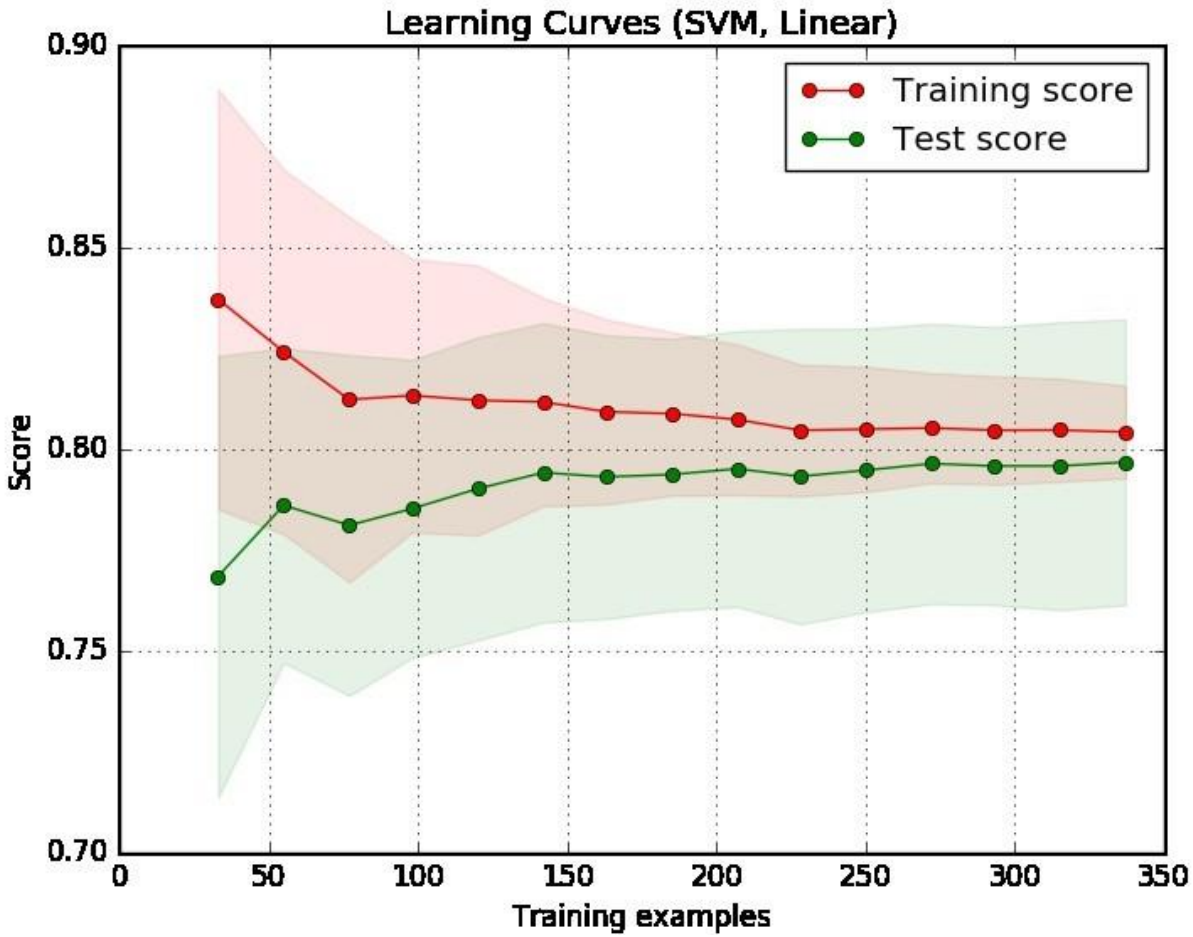
Reporting Experiments

Average performance in a test set/in new environments is only part of the story; it is important to report on the variability of models.

Reporting Experiments

Include error bars/bounds for training curves; for example, compute the standard deviation of performance as a function of training epochs, add upper and lower bounds as (say) +/- 1.96 sigma as data and training partitioning is permuted.

Reporting Experiments



Reporting Experiments

- Standard deviation of performance can be computed in different ways, e.g. permuting training and test data, or starting training with multiple random seeds at initialisation.

- Permuting training and test data gives some indication of how repeatable results might be in other datasets.

Reporting Experiments

- If you can’t permute data, or are working with rather restricted environments, use a collection of several random seeds for weight initialisation.

Reporting Experiments

You can also report results of final trained performance – and its variability – under data permutations or weight seed initialisation using tables. Note the format of mean (s.d.) below, but you can also use +/- notation.

Scale	CBCL		TRF	
	Boys (n = 602)	Girls (n = 611)	Boys (n = 581)	Girls (n = 598)
Withdrawn	1.9 (2.0)	2.0 (2.1)	2.1 (2.8)	2.0 (2.6)
Somatic complaints	0.8 (1.3)	1.0 (1.6)	0.3 (0.7)	0.3 (0.8)
Anxious/Depressed	4.9 (3.5)	5.2 (3.7)	5.0 (4.6)	5.8 (4.8)
Social problems	2.2 (2.0)	2.1 (2.0)	2.3 (3.3)	1.8 (82.7)
Thought problems	0.3 (0.8)	0.3 (0.8)	0.3 (0.9)	0.3 (0.7)
Attention problems	4.2 (3.2)	3.1 (2.8)	7.3 (8.2)	4.4 (6.2)
Delinquent behavior	2.5 (2.1)	1.9 (1.7)	1.4 (1.9)	0.8 (1.3)
Aggressive behavior	9.4 (6.7)	7.6 (5.9)	6.6 (8.9)	3.5 (5.9)
Internalizing	7.5 (5.3)	8.1 (5.9)	7.1 (6.6)	7.8 (6.8)
Externalizing	11.9 (8.2)	9.5 (7.1)	8.0 (10.4)	4.3 (6.8)
Total problems	30.4 (18.1)	27.7 (17.4)	25.2 (23.7)	18.8 (17.7)

Reporting Experiments

For the formatting of tables, see
https://inf.ethz.ch/personal/markusp/teaching/guides/guide-tables.pdf

The LaTeX package “booktabs” has several useful constructs for good table formatting.

Like figures, captions are not optional – they should be descriptive, and highlight key messages about the outcomes we can see from the table.

Big Hint…

A common problem in reporting work is that the **quantity** of work spent on experiments is not appreciated by assessors.

Big Hint…

The solution to this is to “squeeze as much out of your experiments as possible”.

Tip: even experiments that don’t yield good performance can be reported. But don’t report performance where training is not at all happening (e.g. flat training curves).

Tip: many authors will include performance results from other papers/techniques in the same table, citing papers where those results are reported (important!).

Other tips….

- Equations: by all means, **use them**. A balance to equations and text is key to having a readable report.

- If you've done something "hacky" in coding, write an equation to express it (could be a novel contribution).

- You can also express contributions/ideas through **pseudo-code**; treat as equations (label, define inputs/outputs etc) + add captions (like tables).

Other tips….

- Do a spell-check (of course!) AND a check for consistency of spelling/hyphenation.

- Punctuation – lots of people get very upset about bad punctuation. Get feedback from friends.

- Citation style – check for consistency (best sometimes, online citation entries are inconsistent)

Get feedback on your report!!!

- The most common source of “low” marks comes from not getting feedback EARLY ENOUGH on reports.

- Provide early drafts – it does not matter if they are imperfect – you are NOT being assessed in the feedback phase…..

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Presentation Tips

- Plan on 1 minute per slide; 20 m talk, no more than 20 slides.

- Minimal text on slide. Do not read off things from slides: that is annoying.

Speak at the right speed/volume

- Important: if you have a tendency to speak fast, DON'T…You get this right from rehearsing the talk before you give it. Often, several times.

- Speak **relatively loudly** (you need to practice this, with friendly feedback): remember, some people may have hearing problems.

Presentation Tips

- Do use humour where you can, but keep it sparse.

- Do acknowledge collaborations etc; acknowledge sources of funding (PhD/RA students: if you are supported by a scholarship, say so on last slide, for example).

Presentation Tips

- A slide may have several figures (along the lines of Slide 7 and 8 of this presentation).
- You can spend time explaining carefully each graph/image on the slide; allow up to 2 minutes for such slides.
- Do not rush your presentation; instead, have extra slides to bring up if more details are needed

Animations

- Highly useful, particularly if you have time-varying images. Just incorporate as movies.
- Check that movies play on the machine you will give the talk.
- Remember to come up with some spoken explanation of what people should observe in the animations.

Wisdom from Maria Petrou

"You can't just say it: you have to beat them over the head with it!" [The late Maria Petrou – critiquing one of my grant applications]

Translation: Spell it out! Don't assume your audience will understand what you are showing them in a graph or image. Point to what you want them to see and say (generalized example):

"Note how X improves Y according to metric Z".

Presentation Tips

- Do not underestimate how important it is to use the right way of explaining concepts: your audience will always misinterpret **everything!**
- The only guard against misinterpretation of your work/what you say is to **get feedback** on your presentation before you present, so you know how to update slides to disambiguate.
- Remember that technical terminology is often overloaded (in the coding sense!). Define everything.

Avoid, avoid, avoid

- The tendency to “play it cool” and drink water while you speak.

- Speaking too quietly in an attempt to appear relaxed (a common issue with tech presentations). It is deeply irritating to most people that will be involved in assessing you.

Rehearse, Rehearse, Rehearse

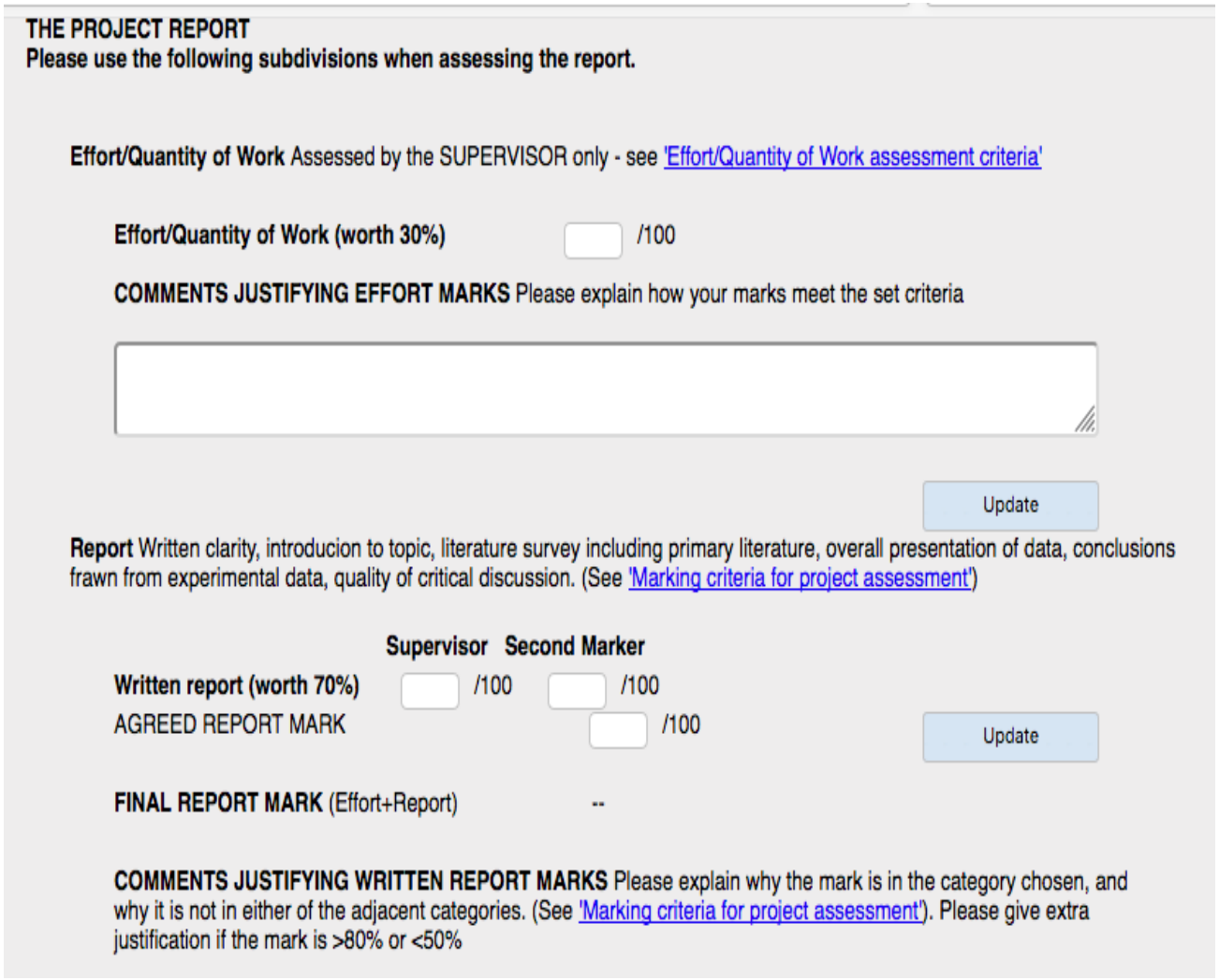
- Sounds simple, but in order to be able to rehearse, you cannot leave the slide prep to the last minute!

- True story: We have rehearsed presentations with students applying for PhD positions. It has made the difference!

Assessment of Reports

The slides following this on assessment are OLD; they were once applicable to reports for MScs and UGs; but they give a hint of what to look out for in report/paper writing!

Assessment “criteria”



THE PROJECT REPORT
Please use the following subdivisions when assessing the report.

Effort/Quantity of Work Assessed by the SUPERVISOR only - see 'Effort/Quantity of Work assessment criteria'

Effort/Quantity of Work (worth 30%) /100

COMMENTS JUSTIFYING EFFORT MARKS Please explain how your marks meet the set criteria

Update

Report Written clarity, introducion to topic, literature survey including primary literature, overall presentation of data, conclusions frawn from experimental data, quality of critical discussion. (See 'Marking criteria for project assessment')

	Supervisor	Second Marker
Written report (worth 70%)	/100	/100
AGREED REPORT MARK		/100

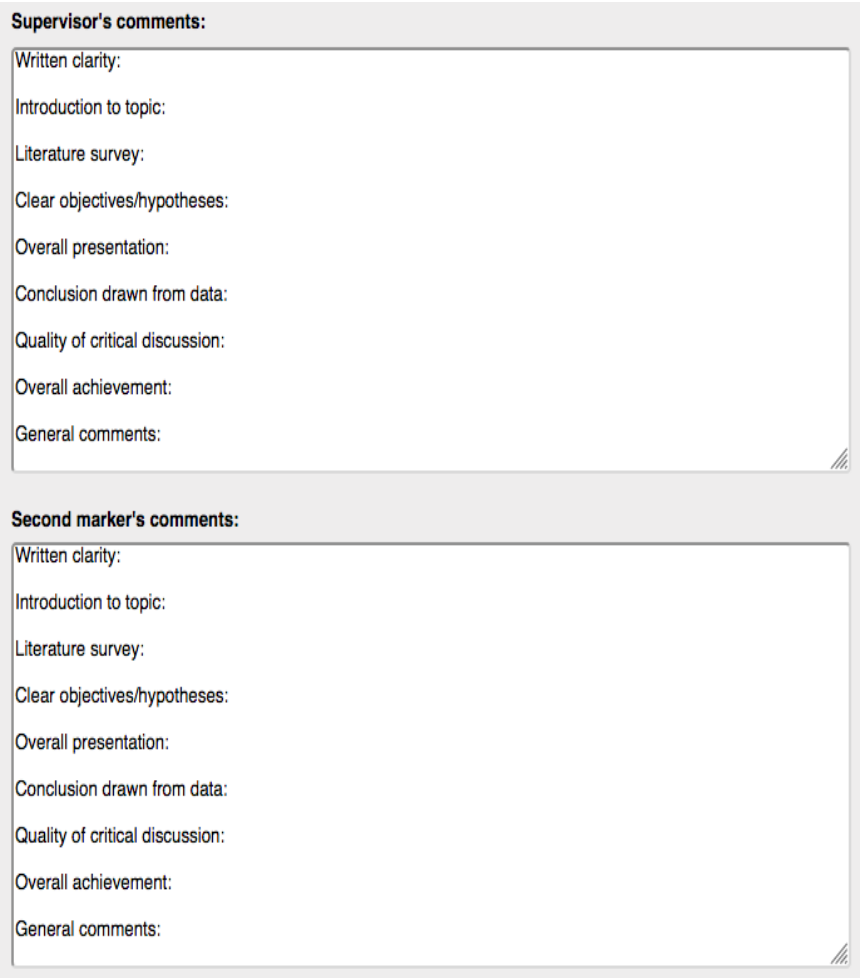
Update

FINAL REPORT MARK (Effort+Report) --

COMMENTS JUSTIFYING WRITTEN REPORT MARKS Please explain why the mark is in the category chosen, and why it is not in either of the adjacent categories. (See 'Marking criteria for project assessment'). Please give extra justification if the mark is >80% or <50%

Note that the **Project Report** carries a significant amount of weight.

Assessment “criteria…”



Supervisor's comments:

Written clarity:

Introduction to topic:

Literature survey:

Clear objectives/hypotheses:

Overall presentation:

Conclusion drawn from data:

Quality of critical discussion:

Overall achievement:

General comments:

Second marker's comments:

Written clarity:

Introduction to topic:

Literature survey:

Clear objectives/hypotheses:

Overall presentation:

Conclusion drawn from data:

Quality of critical discussion:

Overall achievement:

General comments:

Things to note:

1. First AND second marker give extensive justification.
2. Clarity of report is vital (avoid undefined terminology that is specific to the sub-field).
3. Literature survey == appropriate use of citations.
4. Conclusions drawn from data -> in the text AND in table and figure captions.

Questions ?