UNIVERSITY OF SUSSEX

RESEARCH DEGREE EXAMINATION BOARD

Examiner's Joint Report

Outline of the examination process

1. Research Degrees Examination Board appoints examiners
2. Thesis submitted by student and sent to examiners
3. Independent report submitted by each examiner within 8 weeks of receipt of thesis
4. Independent reports exchanged by Assessment & Examinations PGR team
5. *Viva voce* examination held within 1 month of exchange of reports
6. Joint report completed by examiners immediately following the viva
7. Examiners' recommendation considered by Research Degrees Examination Board
8. Candidate informed of outcome by Assessment & Examinations PGR team

Candidate Name	Myles Bartlett
Degree Programme	PhD
Thesis Title	SEMI-SUPERVISED METHODS FOR DISTRIBUTIONALLY-ROBUST LEARNING

Name of Internal Examiner	Andrew Philippides
Name of External Examiner	Hugo Larochelle
Third Examiner	
Date of *viva voce* Examination	18/7/2023

a) Report on candidate's performance during *viva voce*:

Myles made an excellent and entertaining defence of his thesis. Both examiners pressed him on several points to test his knowledge and probe the work. In particular, the external had multiple concerns over some of the assertions made by Myles within the thesis. All these concerns were roundly allayed. Often, the lack of detail was down to the fact that the work was originally published in highly page-constrained conference papers and indeed, through discussion we potentially highlighted future avenues of work. In summary, all points were covered well with a few minor changes to be made

b) Basis for recommendation:
The thesis is clearly Myles' own work and contains several published components which clearly add to knowledge and we feel the unpublished chapter is also worthy of publication. All concerns were allayed and can be clarified by minor editing of the thesis with no new experiments needed. As such, we have no hesitation in passing subject to minor corrections as the work we recommend would be less than a week

Was the *viva voce* held remotely?

☐ No X Yes

Was an **independent** chair required for the *viva voce* examination?

☐ No – viva held onsite

☐ No – internal Examiner acted as Chair for remote viva

X Yes – Independent Chair was appointed for remote viva

☐ Yes – other reason detailed below

Name of Chair: Hsi-Ming Ho
c) Chair's report – to be completed by the internal examiner where internal examiner acted as Chair for remote viva.
Viva went smoothly. Student was not impaired by remote viva format

Recommendation of Examiners

Please tick the relevant box

*:*Pass Categories (recommendations for the award of PhD)

1) ☐	**Unconditional pass** The thesis is of doctoral quality and may be awarded the degree of Doctor of Philosophy unconditionally. A very small number of minor typographical errors (max. 10), which can be corrected immediately but do not require checking by the examiners, are permitted. ☐ Tick here to confirm that the candidate has been informed that these typographical corrections must be made in the final version of the thesis submitted to the Assessment & Examinations PGR team
2) X	**Pass with minor corrections** The thesis is of doctoral quality and will pass pending the completion of minor corrections. This category allows for a period of up to three months (four months and two weeks if the candidate was registered as part-time) during which the candidate may undertake the following types of minor corrections: spelling/typing errors, textual errors, reordering of material, correction of citations, correction of figures, tables and diagrams, and the addition of a small number of paragraphs for clarification or qualification. The criterion for this outcome category is the nature of the corrections requested. The time allowed to complete the corrections is a maximum, and is not a guide to how much work is required. Any request for corrections that goes beyond the kinds specified here requires the selection of outcome 3. The corrections are to be approved by the internal examiner.
3) ☐	**Pass with corrections** The thesis is of doctoral quality and will pass pending the completion of a number of more substantial corrections. This category allows for a period of up to six months (nine months if the candidate was registered as part-time) during which the candidate may undertake the following types of corrections in addition to those specified in category 2: more substantial addition of paragraphs, including the incorporation of some new material, reordering and restructuring of chapters, or some additional data analyses. The criterion for this outcome category is the nature of the corrections requested. The time allowed to complete the corrections is a maximum, and is not a guide to how much work is required. This category may be chosen when the examiners have identified deficiencies in the thesis that were adequately compensated for by the candidate's performance in the viva voce – in this case, please ensure that you have provided adequate documentation in section a) 'Report on candidate's performance during viva voce' above. The corrections are to be approved by the internal examiner, but may also be sent to the external examiner should that be considered appropriate – **(*tick here if external examiner approval needed* ☐)**.

Non-pass Categories (recommendations where the PhD is not to be awarded at this stage)

4) ☐	**Major revisions and re-submission for the PhD** The thesis is not of doctoral standard but may be resubmitted for examination for the award of Doctor of Philosophy. This category allows for a period of up to 12 months (18 months if the candidate was registered as part-time) during which the candidate is required to thoroughly revise their thesis for resubmission, using the guidance set out in the examiners' joint report. The candidate will be registered on re-submission status for this period. A further *viva voce* examination may be held if required by the examiners. Note that this decision can only be taken once the revised thesis has been submitted and read by the examiners. In making a recommendation for major revisions and resubmission, the examiners should be aware that the candidate will be offered the opportunity of accepting the award of the MPhil instead of resubmitting for the PhD. The MPhil may be offered according to one of the three pass categories above, the corrections to be approved by the examiners: ☐ MPhil unconditionally ☐ MPhil with minor corrections ☐ MPhil with corrections The candidate should be encouraged to discuss the options with their supervisor before deciding whether to resubmit for the PhD or accept the award of MPhil.
5) ☐	**Award of the MPhil** The thesis is not of doctoral standard and may not be resubmitted for the award of PhD, but the MPhil may be awarded according to one of the three pass categories above, the corrections to be approved by the examiners: ☐ MPhil unconditionally ☐ MPhil with minor corrections ☐ MPhil with corrections
6) ☐	**Fail** The candidate be failed and not be permitted to revise and re-submit the thesis for examination.

It is University policy that the joint report of the examiners is released to the supervisor and candidate

If you do not wish this report to be released to either the supervisor, the candidate, or both, please state this below and outline the reasons why:

Corrections

In the case of corrections (options 2, 3, or 5) please give below any detailed requirements for the correction of the thesis. Please provide as full and detailed information as possible in order to assist the candidate in the revision of their thesis. Note: recommended changes e.g. to prepare the work for publication should **not** be given here, but in the subsequent box.

Below is a list of corrections. Apart from the last correction, these are also on the annotated pdf sent to Myles (together with typos of the internal examiner). Note also some of these (eg the first) are for you to consider doing rather than a proscriptive instruction to do it.

Page: 13

Author: 111920 Subject: Highlight Date: 18/07/2023 14:16:45
if there's any work (related to the thesis!) that didn't work ie negative results could include them. Think of Myles 2.0. as discussed in viva

just consider if anything could be included

Page: 30

Author: 111920 Subject: Highlight Date: 18/07/2023 14:17:42

could you add an example here to make it clear what you mean as done in the viva

Page: 61

Author: 111920 Subject: Highlight Date: 19/07/2023 21:55:21
(here and elsewhere) could move figs closer to where referenced in the text and could refer to them more in the text
Author: 111920 Subject: Highlight Date: 19/07/2023 21:55:47
maybe add to figure as discussed in the viva. Could also add to the caption and maybe also in the text where you describe the figure. No page constraints any more!
Author: 111920 Subject: Sticky Note Date: 19/07/2023 21:56:22
same is true elsewhere - myabe have a look through and see what you think

Page: 63

Author: 111920 Subject: Highlight Date: 12/07/2023 15:20:59
refer to fig 3.1b?
Author: 111920 Subject: Highlight Date: 12/07/2023 15:21:55
if you've put the fig in you should explain it
Author: 111920 Subject: Sticky Note Date: 19/07/2023 21:56:56
ie this again is an example where you can add to the paper if you like with a bit more explanation

Page: 64

Author: 111920 Subject: Highlight Date: 18/07/2023 14:41:38
is it really no longer possible for all cases? Maybe soften this...
Author: 111920 Subject: Sticky Note Date: 19/07/2023 21:57:17
see discussion in viva

Author: 111920 Subject: Highlight Date: 18/07/2023 14:52:10
Say where the evidence for this is in the thesis eg fig 3.12.
Author: 111920 Subject: Sticky Note Date: 19/07/2023 21:58:01
And also consider taking this forward as it could be something new so discuss with Novi

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Author: 111920 Subject: Highlight Date: 18/07/2023 14:53:55
need more explanation of the figures here for me. Maybe can expand now you don't have page constraints. In particular comment on why LN2L does so badly
Author: 111920 Subject: Sticky Note Date: 19/07/2023 21:58:27
see discussion in the viva

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Author: 111920 Subject: Highlight Date: 12/07/2023 16:06:03
can you say why this is?

Page: 81

Author: 111920 Subject: Highlight Date: 12/07/2023 16:14:54
could do with some more detail on your contribution

Page: 87

Author: 111920 Subject: Sticky Note Date: 19/07/2023 21:59:08
add footnote on the paper as discussed in viva

Page: 101

Author: 111920 Subject: Sticky Note Date: 19/07/2023 22:00:21
there was a discussion of bags somewhere in this chapter (i got a bit lost!) but as per the discussion in the viva discuss the influence of bags. potentially could be something to say as future work. Also could mention the use of the mean as the query in the attention mechanism could be good. Discuss with novi if this is novel enough to warrant taking further
Author: 111920 Subject: Sticky Note Date: 18/07/2023 15:31:46
This discussion would normally go as part of conclusion/discussion

Page: 102

Author: 111920 Subject: Highlight Date: 12/07/2023 18:47:04
strange to have results after the main conclusions: re order or at least rename the sections

Page: 108

Author: 111920 Subject: Highlight Date: 18/07/2023 15:32:47
could adjust minorly as per the viva
Author: 111920 Subject: Sticky Note Date: 18/07/2023 15:33:27
also consider changing the order if you like and not too much work

Page: 123

Author: 111920 Subject: Sticky Note Date: 18/07/2023 15:42:20
you don't have to add the new data but you could say that 'future work will include ...'. And/or mention this with ref the final correction

Page: 130

Author: 111920 Subject: Highlight Date: 18/07/2023 15:55:04
could add a little more detail on the steps here

To add to the discussion: The datasets tackled in Chapters 3 and 4 are somewhat synthetic in construction, leaving room for more evidence of the value of the proposed solutions. That said, it is not uncommon for research in this area to use similarly contrived benchmarks, hence this point does need to be corrected by the PhD candidate (not least as more realistic datasets have been attempted. However, it would be good to add to the discussion chapter with a brief (a few paragraphs) discussion of this point (equally could go elsewhere if you feel it would fit better) **[this comment not in the pdf]**

Typos/minor errors found by external

Errors to fix:
Part I
- tackle different manifestations of such with appropriately => tackle different manifestations of such problems with appropriately
- for it is the in the context of => ? (Can't parse statement)
- the top level the implied tree => the top level of the implied tree
- when used in conjunction regularisation => when used in conjunction with regularisation
- are only required model correlations => re only required to model correlations
- some variable that is that is the causal parent => some variable that is the causal parent
- instead of having latent variable that => instead of having a latent variable that
- we instead of have some spurious variable => we instead have some spurious variable
- I will broach more deeply SCL is and how the => I will broach more deeply what SCL is and the
- simply by the denominator should P^te(Y) not be => I can't parse this statement…
- to note that that a predictive => to note that a predictive
- I'm not sure I understand question 2.5. P(Yˆ =1|S=s)P(S=s) = P(Yˆ =1, S=s) and this probability definitely can't be larger than 1 and it's not clear why it should even be close to 1. Is there a typo in this equation?
- can the random variables said to be => can't parse that statement
- Should 2.6 be using Y or \hat{Y}? (Generally in section 2.5, it seems there are a few places where it should be \hat{Y} instead of Y)
- In invariant-representation learning (encompassing fair-representation … => I wasn't able to understand this very long sentence
- has long been recognised Kaplow and Shavell, 1999 => has long been recognised (Kaplow and Shavell, 1999)
- I will revisit the several times more => I will revisit that several times more
- share an underlying structure and how and which variables => share an underlying structure of how and which variables
- We view then view variables => We then view variables
- I illustrate in Fig. 2.1 illustrate => Fig. 2.1 illustrates
- in the sense that former has => in the sense that the former has
- not to say that there one can't observe => not to say that one can't observe
- such that we have instead have => such that we instead have
- "ICM principle states that modules in a joint distribution's causal decomposition do not inform or influence one another, i.e. I(X, Y) = 0" => I don't think that's correct… if I(X,Y) = 0, then Y Is independent of X and P(Y|X) = P(Y). This is much different from saying that P(Y|X) and P(X) don't share anything in their structure
- this implies that in the when X is => this implies that when X is

- to say that that the task => to say that the task
- in the minimising/minimising direction => in the minimising/maximising direction
- associated with given a input x => associated with a given input x
- to the strength adversary used to drive it => can't parse
- usual forward mapping, f (·), and its inverse f (·) => you are using the same symbol for the forward and inversa mapping…
- have been applied applied to AF => have been applied to AF
- computation to define define an optimal => computation to define an optimal
- bijectivity does not come at a cost => bijectivity does come at a cost
- Conventional architectures do not suffer this problem => Convolutional (??) architectures do not suffer this problem
- the layers making up an INN are necessarily less expressive than their invertible counterparts => do you mean their non-invertible counterparts?
- thus more them are needed => thus more of them are needed
Part II
- variables with spurious correlations correlations do not => variables with spurious

correlations do not
- can then crystallised as => can then be crystallised as
- principal of which being complete that of information-preservation => can't parse this statement
- figure use [17] as a reference for Ln2L, however the references are not numbered
- the much of the text => much of the text
- becomes obvious when decompose a classifier => becomes obvious when we decompose a classifier
- the causally-relevant component of X) => remove the) parenthesis
- on page 83, function h has domain Z (which suggests it takes a single z as input), yet it is supposed to take a set of z's as input
- the known sources the mean => the known sources to the mean
- for effectively leverage => for effectively leveraging
- For this dataset, we instead report Robust TPR => What is "this dataset" in this sentence?
- For figure 4.3, I wasn't able to figure out it is the accuracy of *what* that is measured. Is it the accuracy of a linear prob trained on the learned representation?
- marginal distributions (P (Y |X) and P (S|X) instead => missing a closing parenthesis ")"

Recommended changes for publication

If you have comments to assist the candidate in preparing their work for publication, please note these here. These must be **suggestions only**; any changes required for the successful completion of the degree should be recorded in the box above.

Revise and re-submit

In the case of a revise and re-submit recommendation (option 4) please give below any detailed requirements for the revision of the thesis in order for the candidate to receive a PhD or MPhil, respectively.

PhD revisions

MPhil revisions

If corrections or revisions are marked in copies of the thesis, please confirm in the appropriate section above that you have returned those copies to the candidate.

Please ensure that any corrections are also listed in the appropriate section above.

Please provide any general comments you may have on the examination process, or how it might be improved, below:

Internal Examiner Signature	Andrew Philippides	Date	19/7/2023
External Examiner Signature		Date	
Third Examiner Signature		Date	

Once completed, please return to the Assessment & Examinations PGR team