Advances in Programming Languages
Written Coursework Assignment

Course Lecturer: Ian Stark

Session 2018/19, Semester 1

This document describes the written coursework assignment for *Advances in Programming Languages* (APL). This is a substantial piece of assessed work, and is additional to the homework reading and other exercises issued during individual lectures. Please read the whole of this document.

Any significant changes to coursework arrangements will be posted to the course mailing list apl-students@inf.ed.ac.uk. For general updates and other information, I recommend you check the course information on *Learn* or the website https://wp.inf.ed.ac.uk/apl18. If you have further questions then please send me email.

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Contents

1 Timetable

The assignment is in two stages: an outline draft, for which you receive formative feedback that does not contribute to the final grade; and a final report, for which you receive written feedback and a mark that contributes 20% to your final grade for the course. The following table sets out important dates for this coursework.

Start	Semester 1 Week 2	Thursday 27 September	Assignment published
Submit 1	Semester 1 Week 4	Friday 12 October	Submit outline draft **4pm**
Return 1	Semester 1 Week 5	Friday 19 October	Written feedback by email
Submit 2	Semester 1 Week 8	Friday 9 November	Submit final report by **4pm**
Return 2	Semester 1 Week 10	Friday 23 November	Written feedback by email

You have 6 weeks to complete the coursework assignment. This is not because it is likely to take that long: the period is to allow you to arrange and plan work across all your courses. If you have a course with a similar deadline which you feel may cause difficulties, then you might aim to complete the APL report early. If you submit very early, and later improve your report, then you can resubmit. Each submission overwrites the previous one, and you can do this as many times as you like.

2 Topics

The assignment is to write a report on any one of the following five topics.

- Parallel performance portability with *Lift*

- Dynamic information flow policies in *Jeeves*

- Programming quantum computation with *Quipper*

- Query expressions for language-integrated database access in *F#*

- Probabilistic programming for statistical inference in *Stan*

Preparing the report will involve reading research papers, technical manuals, and some code development on the system in question. See the sample outline in Section 7 below for information on the expected content of your report.

It is also possible to propose your own topic. If you would like to do this then please Ian.Stark@ ed.ac.uk. Suggest a title and write a brief paragraph explaining the topic and what you think is interesting about it.

3 Assessment

Your final report will be marked and graded by the course lecturer following the University's standard marking scheme and the College guidelines on assessing essays. Copies of these are included at the end of this document.

4 Outline Draft

Your preliminary submission must be a file draft.pdf containing an outline draft of your report as a PDF document. This should follow the format described in Section 7 but with the following simplifications.

- It can be much shorter, with some sections just a few lines.

- Leave the Abstract and Introduction blank: write these when you have made progress on the final report.

- The Context and Solution sections can be simple notes on what you plan to write there.

- The Example section just needs a screenshot of your chosen language platform in action. In the final report this has to be an example you have written; for the draft, it's enough to demonstrate you have been able to install and set up the system, so "Hello, World!" is fine.

- The Resources section needs to list three relevant resources you have identified, with a short paragraph for each summarizing what it says.

- Related Work and Conclusion can be left blank for now.

- The Bibliography must include full references for the items cited in the Resources section.

You can, if you wish, fill out sections more substantially or list more resources. Your draft must not exceed the page limit for the final report; I expect most outline drafts to be much shorter.

One of the three resources must be a published paper or book; the other two may be published articles, but could also be white papers, web tutorials, manuals, or similar. In all cases you must provide suitable information that would enable someone else to obtain the document. See the "Bibliography" entry in Section 7 below for further information on writing references.

To create the screenshot you will need to have your chosen system downloaded, installed, and running on a suitable machine. If you have difficulties with this then ask for help in lectures, on the course mailing list, or by email to the lecturer.

Submit your file draft.pdf using the following command on a DICE desktop machine.

    submit apl outline draft.pdf

You must do this by 4pm on Friday 12 October 2018.

For more information about the submit command, connecting remotely to a DICE server machine, or other computing issues, please visit the relevant School help pages http://computing.help.inf.ed.ac.uk.

The outline draft is not graded for credit, but will be assessed with written feedback sent to your student email account.

5   Final Report

Your final report must be a file report.pdf containing your report as PDF document. No other format will be accepted. See below for guidelines on preparation and content of the report.

Submit your file report.pdf using the following command on a DICE desktop machine.

    submit apl final report.pdf

You must do this by 3pm on Friday 9 November 2018.

The final report will be assessed by the course lecturer and is weighted 20% in your grade for this course. You will receive a grade, a percentage mark, and written feedback on your report by Friday 23 November. This will be sent by email to your University student mail account.

6   Report Preparation

The recommended tool for creating the report is LaTeX using pdflatex with the article class, and bibtex with the plain style. You may find the listings and graphicx packages useful.

In addition, *LibreOffice* is freely available for Windows, Linux and Mac, installed on Informatics machines, and can write PDF. Mac OS X natively creates PDF. Microsoft Office 2007 and later can export to PDF.

7   Report Content

The final report must be 8–10 pages long and self-contained. To allow for listings and diagrams, no word count is imposed, but pages must be A4 size, numbered from 1, and use 11 or 12 point serif body text. Margins can be at most 2.5cm. You must use a spelling checker before submission. No cover sheet is required: the title and abstract should appear on the first page with the body text.

The following is an example report outline. You need not follow this to the letter: it is intended only as a guide. In particular, notice that it does not include a full literature survey, as would be normal for a more substantive piece of research.

Certain elements, however, are required: see Section 8 below for details.

Title / Date / Matriculation number Please do not include your name, as some feel that to do so may compromise assessment. The University's stated aim is wholly anonymous assessment (University of Edinburgh Taught Assessment Regulation 32), but our current electronic submission system does not support that: it works by matriculation number rather than examination number.

Abstract An appropriate abstract for a report like this might read:

> X is a problem/challenge/issue, Y is a proposed solution/approach/technique. This report describes how this has been used in project/language Z, showing how it works, detailing some of the advantages and limitations, and with an example of Y as applied to W.

Introduction A summary of your report, written in such a way that it could be read separately — having done so, the reader should have a clear idea of what it is that the report says. Finish with an overview of the report structure.

Context The problem domain, why it is a challenge, some illustration of the difficulties it presents.

⟨*name-of-proposed-solution*⟩ What is the proposed solution. How the language or project at hand applies this solution. Sprinkle with small examples to illustrate how this works. State some advantages and explain what is gained. Identify its limitations, why it might be tricky to use, things that are still not solved

Example Briefly describe an example. Give code, with annotations and a more detailed description. Include a sample screenshot of this in action: code+compilation+execution. (Use the LATEX graphicx package to include images.)

Resources List some notable resources that you have consulted, such as: technical paper, conference paper, journal article, web tutorial, manual, demonstration video. For each such resource, write a paragraph or two summarizing what it contains, in your own words.

Related work Other projects or languages applying the same technique. Other approaches to the same problem. For each of these, say what it does and how it compares.

Conclusion What the approach described does; summarise its advantages and limitations.

Bibliography For every item of source material used, give a full bibliographic reference. This must be sufficient for a reader to obtain and consult the original document. In particular, a URL on its own is not enough: if the resource is itself a web site, then its URL must be accompanied by a descriptive title, an author if known, and the date on which you fetched it. Read the caution on academic use of Wikipedia at https://en.wikipedia.org/wiki/Wikipedia:Academic_use.

If you wish, you may include an appendix containing the full text of the source code for your example applications. This does not count towards the page limit.

8 Required Elements

The following specific elements of the report are essential:

- The example. By way of salt, for 2018/19 this must in some way concern social media. This does not mean it needs to be a full-blown application: simply that if there is a list to be sorted then make it a list of, for example, chat messages ordered by date and time.

- The screenshot. Your example code must be tested and run on the system studied, with a screenshot of this included in the report.

- Bibliography and citations. You must include proper citations throughout the report.

Other elements listed in the section above are more flexible, within reason, where you feel this better supports the specific topic of your investigation.

9 Academic Integrity

The text of your report must be your own unaided work, written in your own words. See the following:

- Regulations 29 and 30 of the University of Edinburgh Taught Assessment Regulations;
  https://www.ed.ac.uk/files/atoms/files/taughtassessmentregulations.pdf#page=25

- Informatics statement on academic misconduct;
  http://web.inf.ed.ac.uk/infweb/admin/policies/academic-misconduct

- University guidance on academic misconduct.
  https://www.ed.ac.uk/academic-services/students/conduct/academic-misconduct

I strongly recommend the following working practices.

- Start with a blank document; all the words must be yours.

- Do not cut and paste from other documents; except for direct quotations, which must be highlighted and have their source declared.

- Do not let other students on this course read your text; nor read theirs. This does not by any means bar discussion with other students; simply that the text of the report itself must be your own work, not written in collaboration with anyone else.

I hope to have a peer feedback session for you preliminary reports. At this you will be reading anonymized submission of other students: this is acceptable provided you do so only as explicitly directed.

10 Publishing Your Work

You may wish to make your assignment public, both the final report and the code you have written. This is permitted for APL; however, you must not do this while the assignment is running, or for two weeks after submission. After that you are welcome to publish your work; please tell me if you plan to do so.

If you plan to use an online code repository for your work, make sure that you keep this private until the course is complete. Both *GitHub* and *BitBucket* provide suitable private repositories: you may need to sign up for a student account, which you can do with your University of Edinburgh email address.

11   Example Reports

As further guidance on what is expected, the course web pages host two reports from previous students on the course.

- *Regular Expression Types and Patterns in CDuce*
  https://blog.inf.ed.ac.uk/apl14/files/2014/09/cduce.pdf

- *Futures and Promises in Alice ML*
  https://blog.inf.ed.ac.uk/apl14/files/2014/09/aliceml.pdf

Both pieces of work scored above 70 and were in the top half of the coursework mark distribution. I am grateful to the authors for giving permission to share their reports with future classes.

12   Feedback Forms

On the following two pages you can see copies of feedback forms for both the preliminary and final reports. Once the lecturer has assessed your coursework submission you will receive a completed form like this with feedback on your work. This is sent to your University student mail account.

13   Marking Scheme

University of Edinburgh

Extended Common Marking Scheme

Honours Class	Mark (%)	Grade	Summary Description
I	90-100	A1	Excellent (Outstanding)
I	80-89	A2	Excellent (High)
I	70-79	A3	Excellent
II.1	60-69	B	Very Good
II.2	50-59	C	Good
III	40-49	D	Undergraduate pass, may not be sufficient for MSc
Fail	30-39	E	Marginal Fail
Fail	20-29	F	Clear Fail
Fail	10-19	G	Bad Fail
Fail	0-9	H	Very Bad Fail

For undergraduate students, a mark of 40 or over is required to pass the course. For postgraduate students, a mark of 40 or over is sufficient for the diploma or certificate, 50 or over is required for a masters degree, and 70 or over is awarded distinction.

https://www.ed.ac.uk/student-administration/exams/regulations/common-marking-scheme

At the end of this document, following the sample feedback forms, you will find the College of Science and Engineering essay grade descriptors. These summarise the standard expected in scientific writing submitted for assessment at the University. Note that the higher grades, with marks 80 and above, require not only an excellent piece of work, comprehensive in research and professionally presented, but also additional elements of personal insight, creativity, or other exceptional performance.

Feedback on Outline Draft

This sheet provides individual feedback on the draft report you submitted as part of your APL coursework. This first stage does not contributed to the overall course mark. However, it forms an important part of your investigation, and you should read any comments carefully. If you would like to ask questions about either your outline draft or this feedback, please email the course lecturer to arrange a meeting.

https://wp.inf.ed.ac.uk/apl18/coursework

Area	Feedback
Topic	(chosen topic)
Background Notes: The Context and Solution sections need some simple notes on what you plan to write there.	(feedback on background notes: are there additional ideas or directions you should include?)
Screenshot of the system in action	✓(screenshot is present)
Literature references	✓(all references present)
Choice: One of the three references must be to a published paper; the other two may be published articles, but could also be white papers, web tutorials, manuals, or similar.	(feedback on suitability and relevance of the chosen references)
Description: For every reference, write a short paragraph summarizing its content. You don't need to include every detail, but someone reading your paragraph should be able to get a good idea of what the reference is about and what it says on that topic.	(feedback on the summary paragraph: whether it is clear, comprehensible, and informative)
Bibliography: For every item of source material used, give a full bibliographic reference. This must be sufficient for a reader to obtain and consult the original document. In particular, a URL on its own is not enough: if the resource is itself a web site, then its URL should be accompanied by a descriptive title, an author if known, and the date on which you fetched it.	(feedback on the presentation of references: whether they are specific, comprehensive, and useful to the reader; if not, then some suggestions on how to improve them)

(possible additional feedback on the content of the submission)

Feedback on Final Report

This sheet provides individual feedback on the report you submitted as your APL coursework. Your report has been marked and graded following the University's standard marking scheme and the College guidelines on assessing essays. Please contact the course lecturer by email if you would like a short one-to-one feedback meeting.

https://wp.inf.ed.ac.uk/apl18/coursework

Area	Feedback
Knowledge	(feedback on the range of material covered and its relevance; also the correct presentation of facts)
Understanding and handling of key concepts	(feedback on the command of the subject and depth of understanding demonstrated)
Focus and exploration of the subject	(feedback on how well the report keeps to the subject identified and whether it introduces irrelevant material)
Critical analysis and discussion	(feedback on how the problems and solutions presented are analysed and evaluated)
Literature synthesised, analysed and referenced	(feedback on the use of the references given, how they are brought together and applied to support the presentation made in the report)
Structure	(feedback on the organisation and coherence of the report)
Presentation	(feedback on the quality of presentation, referencing, use of figures and tables where appropriate)
Overall	(feedback on the report in general, some comments and advice for future work)

Grade: ?   (??/100)

Extended Common Marking Scheme: General Descriptors for Honours Years

These general descriptors are for use by Schools as the basis for their Specific Descriptors. The descriptors are indicative of the level of performance expected from the students. They are not, however, a check list of qualities that each student must demonstrate. The way the performance is demonstrated will vary from subject to subject, and from one mode of assessment to another. These descriptors are written primarily as an aid to the assessment of judgmentally assessed work, such as essays, fieldwork, lab or project reports and certain types of examination.

Grade Mark   Honours descriptors [degree class]

A1   90-100   Excellent (Outstanding) [First]

Often faultless. The work is well beyond that expected at the appropriate level of study.

A2   80-89   Excellent (High) [First]

A truly professional piece of scholarship, often with an absence of errors. As 'A3' but shows (depending upon the item of assessment):

significant personal insight / creativity / originality

and / or

extra depth and academic maturity in the elements of assessment.

A3   70-79   Excellent [First]

Knowledge: Comprehensive range of up-to-date material handled in a professional way.

Understanding and handling of key concepts: Shows a command of the subject and current theory.

Focus on the subject: Clear and analytical; fully explores the subject.

Critical analysis and discussion: Shows evidence of deep thinking and/or an appropriately logical and rigorous approach in critically evaluating and integrating the evidence and ideas. Deals confidently with the complexities and subtleties of issues Shows elements of personal insight / creativity / originality.

Literature synthesised, analysed and referenced: Comprehensive grasp of the up-to-date literature which is used in a professional way.

Structure: Clear and coherent showing logical, ordered thought.

Presentation: Clear and professional with few, relatively minor flaws. Accurate referencing; using the correct referencing system. Figures and tables well constructed and accurate. Good standard of spelling and grammar.

B   60-69   Very Good [2(i)]

Knowledge: Very good range of up-to-date material, perhaps with some gaps, handled in a professional way.

Understanding and handling of key concepts: Shows a firm grasp of the subject and current theory but there may be gaps.

Focus on the subject: Clear focus on the subject with no or only trivial deviation.

Critical analysis and discussion: Shows initiative, the ability to think clearly, critically evaluate ideas, to bring different ideas together, and to draw sound conclusions.

Literature synthesised, analysed and referenced: Evidence of further reading. Shows a firm grasp of the literature, using good, up-to-date references to support the arguments.

Structure: Clear and coherent showing logical, ordered thought.

Presentation: Clear and professional with few, relatively minor flaws. Accurate referencing; using the correct referencing system. Figures and tables well constructed and accurate. Good standard of spelling and grammar.

C 50-59 Good [2(ii)]

Knowledge: Sound but limited. Inaccuracies, if any, are minor.

Understanding and handling of key concepts: Understands the subject but does not have a firm grasp and depth of understanding of all the key concepts.

Focus on the subject: Addresses the subject with relatively little irrelevant material.

Critical analysis and discussion: Limited critical analysis and evaluation of sources of evidence.

Literature synthesised, analysed and referenced: References are used appropriately to support the argument but they may be limited in number or reflect restricted independent reading.

Structure: Reasonably clear and coherent, generally presenting ideas and information in a logical way.

Presentation: Generally well presented but there may be minor flaws for example in figures, tables, referencing technique and standard of English.

D 40-49 Pass [3rd]

Knowledge: Basic; may have factual inaccuracies and omissions.

Understanding and handling of key concepts: Superficial; there may be some gaps in understanding. Lacks detail, elaboration or explanation of the key concepts and ideas; some may have been omitted.

Focus on the subject: Addresses the subject but may deviate from the core issues.

Critical analysis and discussion: Limited or lacking. The arguments and conclusions may be weak or lack clarity with unsubstantiated statements. The emphasis is likely to be more on description than analysis.

Literature synthesised, analysed and referenced: Basic and limited. May lack appropriate citations and evidence of independent reading.

Structure: Lacks clarity of structure. Shows poor logical development of arguments.

Presentation: Inadequate; may show flaws in the overall standard of presentation or in specific areas such as figures, referencing technique and standard of English (e.g. repeated minor spelling, punctuation or grammatical errors).

E   30-39   Marginal Fail

Knowledge: Poor and inadequate. Content too limited, there may be inaccuracies.

Understanding and handling of key concepts: Poor and inadequate; does not show sufficient understanding. Concepts omitted or poorly expressed.

Focus on the subject: Does not adequately address the subject.

Critical analysis and discussion: Poor and inadequate. May be no real attempt to critically evaluate the work.

Literature synthesised, analysed and referenced: Poor and inadequate; appropriate literature citations lacking or trivial.

Structure: A lack of coherence or poor structure.

Presentation: Overall standard of presentation may be poor. May be problems in specific areas such as writing style and expression (making it hard to follow the content), errors in referencing technique, and poor standard of English (spelling, punctuation and grammar).

F   20-29   Clear Fail

Knowledge: Very poor. Irrelevant or erroneous material may be included. May be very limited in scope consisting, for example, of just a few good lines.

Understanding and handling of key concepts: Very poor, may be confused.

Focus on the subject: Does not address the subject.

Critical analysis and discussion: Extremely limited or omitted. May be confused.

Literature synthesised, analysed and referenced: Extremely limited or omitted.

Structure: Confusing or no attempt to order the material in a systematic way.

Presentation: Writing style and presentation may be unacceptable.

G   10-19   Bad Fail

Knowledge: Serious lack of knowledge. Irrelevant or erroneous material may be included.

Understanding and handling of key concepts: None or trivial evidence of understanding.

Focus on the subject: Does not address the subject.

Critical analysis and discussion: May be no coherent discussion.

Literature synthesised, analysed and referenced: May be omitted.

Structure: Confusing or no attempt to order the material in a systematic way.

Presentation: Writing style and presentation may be unacceptable.

H   0-9   Very Bad Fail

The presented work is of very little relevance, if any, to the subject in question. It is incomplete or inadequate in every respect. A blank answer must be awarded zero.