**Research Project 2**

Oral presentation – 10%  
Reproducible research report – 10%  
Cross-validation critique - 5%  
Team process reflection – 2%

**General information about Research Project 2**

**Aim**

This project is designed to offer you an opportunity to demonstrate your learning by reproducing a high-impact manuscripts findings. For this project, you will work in teams of 3-5 students. You will also gain experience at working in groups and evaluating research results by assessing their validity qualitatively and quantitatively.

**Teams**

Students will form teams in Week 9. When required we will allocate students in such a way as to foster diversity. Successful and sustainable collaboration is dependent on self and peer awareness of your strengths and weaknesses, a concerted effort in developing relationships, a shared vision and well-organised strategy and action. It is highly recommended that you try to adapt the design thinking process taught in Week 3 to create your group work strategy.

**Assessment**

Team product will be assessed by both a *team oral presentation* (10% team mark), a *team reproducible report* (10% team mark) with *individual cross-validation critique* (5% individual mark), *individual team process reflection* (2.5% individual mark) contributing to an individual mark. Information for each of these assessments follows.

The team process reflection will be assessed from your reflection of yourself and peers performance in the team. Your course coordinator will use peer evaluations, group summaries, meeting attendance and minutes to provide individual marks on how well you contributed to the team. More information on these assessments follow.

**Reproducing a “high quality” manuscript from the literature.**

Find a high impact manuscript that uses ‘omics data to construct some form of predictive biomarker for disease response or outcome. Reproduce their findings and comment on those that cannot be reproduced. On completion of this task you will have communicated whether you believe the science behind this paper and whether the methods are appropriate, robust and reproducible.

This task is split into four components.

**(10% group mark) Reproducible report** to focus on the following 4 aspects:

1. Provide a clear summary of the aim, methods and results of the paper.
2. Describe the experimental design and workflow.
3. Comment on the appropriateness of the methods and analysis used in the paper.
4. Explain the success or difficulties you had reproducing their results.

**(10% group mark) Presentation** to focus on the same 4 goals in addition to questions.

**(5% individual mark) Cross-validation critique**:

Critique the cross-validation approaches that were used in the original study. If there was no cross-validation used in the original manuscript, apply various cross-validation strategies where appropriate and comment. Assess the robustness of their findings via cross-validation and other methods of evaluation.

**(2.5% individual mark) Team process reflection:**  
  
The team process will be assessed from your reflection of yourself and peers performance in the team.

**Paper selection criteria should include:**

1. A high quality paper that made a reasonable impact in the biomedical sciences published in the last 12 years. *Have a look at the number of citations as well as the departments and institutions of authors.*
2. Uses high-throughput biological assays such as high-throughput sequencing, mass spectrometry or microarray. *Are there informative supplementary material and data online?*
3. Conclusions and results that are based on statistical and/or bioinformatics approaches.
4. **The outcome or endpoint can be converted into a binary variable (very important!!!)**. This will be important for the cross-validation component of the project.
5. It would help if there were **at least 10 samples in each outcome category**.
6. It is preferable that you choose a manuscript which **hasn’t** had code made available. If it has, you will have to perform an alternate analysis to provide a comparison and critique of the reported results.

Keep in mind that the project is based on reproducing the selected manuscript.

**Research Project 2 – Reproducible report: 10%**

This assessment is to be completed in teams as part of your project. It is worth 10% of your final mark in AMED3002 and each student in the team will receive the same mark. Evaluating and assessing the validity of research results is never trivial with many scientists placing trust in the peer review system to filter out poor quality research findings. With requirements of most journals that ‘omics data be made publicly available; in principle it should now be possible to reproduce a manuscript’s results. The ability to reproduce results is ground-breaking as it increases transparency in scientific research and facilitates the ability to assess the robustness of the original findings.

**Assessment**

As described previously, this project should reproduce, evaluate and assess the analysis results from a high impact paper that claims to have identified or constructed some biomarker of disease state. The report should be thorough, succinct and clear and written in language that would be appropriate for both your classmates and the authors of the original manuscript.

*Length*: 3 – 10 pages including appendix and references.

*File type*: html with “hide-able” code chunks.

*Due date*: 11:59pm Monday 6th of June

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| **Criteria** | **Does not meet expectations** | **Meets expectations** | **More than meets expectations** | | |
|  | **F (0 – 4.5)** | **P (5 – 6)** | **C (6.5 – 7)** | **D (7.5 – 8)** | **HD (8.5 – 10)** |
| **1. Technical Skills**  Purpose stated; information accurate, clear and concise.  Organisation clear, logical and flowing.  Graphics visually consistent and labelled.  Provides correct citing of all sources and direct quotes.  Spelling and grammar checked.  Keeps to word limit. | Purpose not stated and or information not accurate/concise and/or organised in a clear manner. Graphics are poorly labelled and/or spelling and grammar incorrect and/or does not keep to word limit. | Purpose stated, information accurate and organised in a clear manner. Graphics are labelled. Correct spelling and grammar and keeps to word limit. | Purpose and information accurate, **concise** and organised in a clear, logical and flowing manner. Graphic **visually consistent** with the rest of report and labelled. Citation, spelling and grammar correct and keeps to word limit. | Purpose and information accurate, **comprehensive** and concise, organised in a clear, logical and flowing manner. Graphics **eye catching**, complement rest of report spelling and grammar correct and keeps to word limit. | Purpose and information accurate, concise and **discerning** and organised in a clear, logical and flowing manner. Graphics eye catching and **elucidate** the rest of the reportand are visually thought provoking.Citation, spelling and grammar correct and keeps to word limit. |
| **2. Communication skills**  Promotes the dissemination of information and findings.  Attracts and engages audience to discuss/think.  Graphics are clear and digestible.  Analytical methods reported appropriately for target readership. | Does not promote the  dissemination of information  or findings. Does not attract or engage reader to think/discuss and/or analytical methods reported inappropriately for target readership. | Promotes the  dissemination of  information and findings.  Attracts and engages  reader. Graphics are clear and digestible.  Analytical methods reported appropriately for target readership. | **Comprehensively** promotes  the dissemination of  information and findings.  Attracts and **consistently**  engages reader to  think/discuss.  Graphics are clear and digestible. Analytical methods reported appropriately for target readership. | **Thought provoking** in  dissemination of information  and findings. Attracts and  **continually** promotes  engagement of reader to  think/discuss. Graphics are clear and **representative of originals**. Analytical methods reported **intuitively** for target readership. | **Inspires** dissemination of information and findings.  Attracts and continually promotes  **emotional and intellectual** engagement.  Graphics are clear and **reasonable replicas or improvements** of the originals. **Insightful** and intuitive report of analytical methods for target readership. |
| **3. Analytics**  Provides a summary of the aim, methods and results of the paper.  Describe the experimental design and workflow.  Comment on the appropriateness of the methods and analysis used in the paper.  Outline the success or difficulties you had reproducing their results. | Does not provide a summary of the aim, methods and results of the paper and/or  describe the experimental design and workflow and/or  comment on the appropriateness of the methods and analysis used in the paper and/or outline the success or difficulties you had reproducing their results. | Provides a summary of the aim, methods and results of the paper.  Describe the experimental design and workflow.  Comment on the appropriateness of the methods and analysis used in the paper.  Outline the success or difficulties you had reproducing their results. | Provides a **cohesive** summary of the aim, methods and results of the paper. Describe the experimental design and workflow. **Debates** the appropriateness of the methods and analysis used in the paper.  **Explains** the success or difficulties you had reproducing their results. | Provides an **insightful** and cohesivesummary of the aim, methods and results of the paper. Debates and **demonstrates** the appropriateness of the methods and analysis used in the paper **in the context of the overall** experimental design and workflow.  Explains the success or difficulties you had reproducing their results. | Provides a summary of the aim, methods and results of the paper that **elucidates its findings and purpose**. Is **decisive** on the appropriateness of the methods and analysis used in the paper and providing insight into plausible improvements of the experimental design and workflow.  The success or difficulties in reproducing their results are **used to critique** the findings and conclusions of the manuscript. |

**Research Project 2 - Oral Presentation: 10%**

This assessment is to be completed as a team as part of your project. It is worth 10% of your final mark in AMED3002. You will be assessed on your presentation skills, measured by criteria covering: slides, flow of information, engagement with the audience and clarity of message. The purpose of this presentation is to provide the background and analytical process of your reproducibility study while also helping establish the flow of your written report and providing an opportunity to get feedback. The presentation should be targeted to a scientific audience.

*Time*: 7 minute presentation + 3 minutes question time

*File type*: powerpoint, RMarkdown, keynote etc

*Due date*: Week 13, May 23rd 11:59pm

The presentation will be given in PechaKucha style with your team presenting 20 slides. Each slide will be presented for precisely 20 seconds with each member of the team presenting 5 slides (if in a four member team). Questions will follow the presentation. Presentations will run during the 3pm-5pm week 13 workshop.

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|  | **F (0 – 4.5)** | **P (5 – 6)** | **C (6.5 – 7)** | **D (7.5 – 8)** | **HD (8.5 – 10)** |
| **1. Technical Skills**  Purpose stated; information accurate, clear and concise.  Organisation clear, logical and flowing.  Graphics visually consistent and labelled.  Provides correct citing of all sources and direct quotes.  Spelling and grammar checked.  Keeps to time limit.  Enables equitable contributions from team members. | Purpose not stated and or information not accurate/concise and/or organised in a clear manner. Graphics are poorly labelled and/or spelling and grammar incorrect and/or does not keep to time limit. | Purpose stated, information accurate and organised in a clear manner. Graphics are labelled. Correct spelling and grammar and keeps to time limit. | Purpose and information accurate, **concise** and organised in a clear, logical and flowing manner. Graphic **visually consistent** with the rest of presentation and labelled. Citation, spelling and grammar correct and keeps to time limit. | Purpose and information accurate, **comprehensive** and concise, organised in a clear, logical and flowing manner. Graphics **eye catching**, complement rest of presentation and labelled. Citation, spelling and grammar correct and keeps to time limit. Enables equitable contributions from team members. | Purpose and information accurate, concise and **discerning** and organised in a clear, logical and flowing manner. Graphics eye catching and **elucidate** the rest of the presentationand are visually thought provoking.Citation, spelling and grammar correct and keeps to time limit. Provides all team members an opportunity to demonstrate technical contributions to project. |
| **2. Communication skills**  Promotes the dissemination of information and findings.  Attracts and engages audience to discuss/think.  Graphics are clear and digestible.  Analytical methods reported appropriately for audience. | Does not promote the  dissemination of information  or findings. Does not attract or engage audience to think/discuss and/or analytical methods reported inappropriately for audience. | Promotes the  dissemination of  information and findings.  Attracts and engages  audience. Graphics are clear and digestible.  Analytical methods reported appropriately for audience. | **Comprehensively** promotes  the dissemination of  information and findings.  Attracts and **consistently**  engages audience to  think/discuss.  Graphics are clear and digestible. Analytical methods reported appropriately for audience. | **Thought provoking** in  dissemination of information  and findings. Attracts and  **continually** promotes  engagement of audience to  think/discuss. Graphics are, clear and digestible. Analytical methods reported **intuitively** for audience. | **Inspires** dissemination of information and findings.  Attracts and continually promotes **emotional and intellectual** engagement.  **Creative** graphics are clear and digestible.  Content pitched in a **creative** and appropriate way. **Insightful** and intuitive report of analytical methods for audience. |
| **3. Analytics**  Provides a summary of the aim, methods and results of the paper.  Describe the experimental design and workflow.  Comment on the appropriateness of the methods and analysis used in the paper.  Outline the success or difficulties you had reproducing their results. | Does not provide a summary of the aim, methods and results of the paper and/or  describe the experimental design and workflow and/or  comment on the appropriateness of the methods and analysis used in the paper and/or outline the success or difficulties you had reproducing their results. | Provides a summary of the aim, methods and results of the paper.  Describe the experimental design and workflow.  Comment on the appropriateness of the methods and analysis used in the paper.  Outline the success or difficulties you had reproducing their results. | Provides a **cohesive** summary of the aim, methods and results of the paper. Describe the experimental design and workflow. **Debates** the appropriateness of the methods and analysis used in the paper.  **Explains** the success or difficulties you had reproducing their results. | Provides an **insightful** and cohesivesummary of the aim, methods and results of the paper. Debates and **demonstrates** the appropriateness of the methods and analysis used in the paper **in the context of the overall** experimental design and workflow.  Explains the success or difficulties you had reproducing their results. | Provides a summary of the aim, methods and results of the paper that **elucidates its findings and purpose**. Is **decisive** on the appropriateness of the methods and analysis used in the paper and providing insight into plausible improvements of the experimental design and workflow.  The success or difficulties in reproducing their results are **used to critique** the findings and conclusions of the manuscript. |

**Research Project 2 – Cross-validation critique: 5%**

This assessment is to be completed as an individual in addition to your team’s reproducible research project. It will be appended to your copy of the groups reproducible report and submitted to Canvas. It is worth 5% of your final mark in AMED3002.

The purpose of this task is to critique the cross-validation approaches that were used in the original study. If there was no cross-validation used in the original manuscript, apply various cross-validation strategies where appropriate and comment. Assess the robustness of their findings via cross-validation and other methods of evaluation.

You will be assessed on your application of cross-validation and potentially alternate evaluation techniques. You will also be assessed on your insight into the behaviours, pros and cons of the approaches and how they relate to your chosen dataset.

*Length*: 2-4 pages appended to your groups report.

*File type*: html with “hide-able” code chunks.

*Due date*: 11:59pm Monday 6th of June.

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| **1. Technical Skills**  Purpose stated; information accurate, clear and concise.  Organisation clear, logical and flowing.  Graphics visually consistent and labelled.  Provides correct citing of all sources and direct quotes.  Spelling and grammar checked.  Keeps to word limit. | Purpose not stated and or information not accurate/concise and/or organised in a clear manner. Graphics are poorly labelled and/or spelling and grammar incorrect and/or does not keep to word limit. | Purpose stated, information accurate and organised in a clear manner. Graphics are labelled. Correct spelling and grammar and keeps to word limit. | Purpose and information accurate, **concise** and organised in a clear, logical and flowing manner. Graphic **visually consistent** with the rest of report and labelled. Citation, spelling and grammar correct and keeps to word limit. | Purpose and information accurate, **comprehensive** and concise, organised in a clear, logical and flowing manner. Graphics **eye catching**, complement rest of report spelling and grammar correct and keeps to word limit. | Purpose and information accurate, concise and **discerning** and organised in a clear, logical and flowing manner. Graphics eye catching and **elucidate** the rest of the reportand are visually thought provoking.Citation, spelling and grammar correct and keeps to word limit. |
| **2. Communication skills**  Promotes the dissemination of information and findings.  Attracts and engages audience to discuss/think.  Graphics are clear and digestible.  Analytical methods reported appropriately for target readership. | Does not promote the  dissemination of information  or findings. Does not attract or engage reader to think/discuss and/or analytical methods reported inappropriately for target readership. | Promotes the  dissemination of  information and findings.  Attracts and engages  reader. Graphics are clear and digestible.  Analytical methods reported appropriately for target readership. | **Comprehensively** promotes  the dissemination of  information and findings.  Attracts and **consistently**  engages reader to  think/discuss.  Graphics are clear and digestible. Analytical methods reported appropriately for target readership. | **Thought provoking** in  dissemination of information  and findings. Attracts and  **continually** promotes  engagement of reader to  think/discuss. Graphics are **creative**, clear and digestible. Analytical methods reported **intuitively** for target readership. | **Inspires** dissemination of information and findings.  Attracts and continually promotes **emotional and intellectual** engagement.  Graphics are creative, clear and digestible.  **Insightful** and intuitive report of analytical methods for target readership. |
| **3. Analytics**  Use of cross-validation in manuscript critiqued.  Cross-validation is used to assess robustness of findings.  Comments on broader application of various cross-validation strategies to the findings in the report. | Use of cross-validation in manuscript not critiqued and/or cross-validation is not used to assess robustness of findings and/or comments on broader application of various cross-validation strategies to the findings in the report. | Use of cross-validation in manuscript identified.  Cross-validation is applied to analysis from report.  Comments on application of cross-validation strategies to the findings in the report. | Use of cross-validation in manuscript **critiqued**.  Cross-validation is used to **assess robustness** of findings.  Comments on broader application of **various** cross-validation strategies to the findings in the report. | **Insight** is provided by the critique of the cross-validation used in the manuscript.  Multiple cross-validation strategies are used to assess robustness of findings and **contextualize the behaviour** of the strategies | Critique of the cross-validation used in the manuscript is used to **establish validity** of results.  Multiple cross-validation strategies **and other techniques** are used to assess robustness of findings and **illustrate** the behaviour of the strategies in context. |

**Research Project – Team process: 2%**

You are required to submit a report providing information on your team work and reflections as detailed below. This is worth 2.5% of your final mark in AMED3002 and each team member will receive an individual mark. On submission of the information below, you agree that your reflections are a genuine and independent account. You have tried to be as objective as possible. You have stood back and tried your best to view the experience objectively.

*Length*: about 2 pages

*File type*: pdf, word doc, html

*Due date*: 11:59pm Friday 27th May.

*Your Reflection document should contain the following information.*

Team Name:

Your Name /Student Number:

Other Group Members*: [Name/Student Number, etc]*

1. **Meetings you attended:** dates/time attended + location

*[e.g. Meeting 1- ‘*Getting started*’ Fisher Library, 25.09.17, 2-4pm;*

*Meeting 2 – ‘*Movingforward*’ online via Collaborations, Canvas, 4.10.17, 9-11am]*

1. **List and outline the tasks you completed:**
2. **Individual reflection** [One page in total]

a. What did you learn from being part of this specific group for this task? [maximum half a page]

*[Your reflections could include commentary on yours and the group’s teamwork skills, organisational and time management skills, and collaborative skills]*

b. What did you learn from completing the task? [at least half a page]

*[Your reflections should include commentary on yours and the group’s analytic & thinking skills]*

***4. Complete the team survey for each member of your team.***

Provide a number ranging from 0 (no input) to 5 (maximal input /led this component) to evaluate each group member (including yourself) for the following tasks.

* Organising the team or ensuring thing get done.
* Drafted or constructed the figures and graphics.
* Performed statistical tests.
* Conception of project and identification of data.
* Construction and formatting of media and presentation.
* Interpretation and communication of findings.