

The University of Auckland 2013 Genomics and Bioinformatics Survey

Conducted in August 2013 by the Bioinformatics Institute, University of Auckland.

1. Executive summary

- In August 2013 University of Auckland staff were invited to complete an online survey about genomics and bioinformatics.
- 73 University of Auckland research groups responded the survey.
- The aim of this survey was to determine how genomics and bioinformatics research had been conducted in this University over the previous 3 years, how much genomics and bioinformatics is likely to occur here in the next 3 years, and how this kind of work could be made easier for University of Auckland researchers.
- The survey was relatively brief and was intended to broadly predict the minimum expected volume of genomics and bioinformatics activity; it cannot provide more detail than this.
- In the previous 3 years 24 Auckland research groups had conducted microarray analysis, 32 groups had undertaken next generation sequencing, and 22 groups had conducted proteomics/metabolomics studies.
- A few research groups use genomics and bioinformatics heavily and in multiple forms, for example 15 research groups had used both microarray analysis and next generation sequencing in the previous 3 years.
- 66% of research groups had conducted at least some aspects of their data analysis within their own teams in the last 3 years.
- Over the next 3 years 26, 6 and 12 Auckland research groups have confirmed funding for next generation sequencing, microarray analysis and proteomics/metabolomics work, respectively.
- Over the next 3 years 45, 18 and 25 Auckland research groups plan to conduct (but do not yet have confirmed funding) next generation sequencing, microarray analysis and proteomics/metabolomics, respectively.
- Approximately 50% of research groups would like to do their own experimental design and bioinformatic analysis within their research groups, but under oversight from experienced bioinformaticians.
- Approximately 50% of research groups would like to learn bioinformatics analysis by having experienced bioinformaticians teach them as they perform the work together with them.
- 92% of respondents either agreed or strongly agreed with the statement that “undergraduate education about the theory and the practice of genomics and bioinformatics is important”.
- 90% of respondents either agreed or strongly agreed with the statement that " 'How to' seminars and symposia about specific types of bioinformatics and genomics projects was important”.

- 100% of the respondents either agreed or strongly agreed with the statement that "'On the job' bioinformatics and genomics training by skilled bioinformaticians able to assist researchers analyse their own data was important.

2. Background

In August 2013 University of Auckland staff in the Faculties of Science and Medical and Health Sciences were contacted by email and asked to complete an anonymous online survey about past and future genomic and bioinformatics research in the University. The survey is appended to the end of this report. We hoped that this survey would assist with the Bioinformatics Institute's strategic planning.

Researchers were asked whether their groups undertook work in the following categories:

- Computerised planning of cloning procedures, sequence alignment, PCR primer design, or protein motif prediction and visualization
- Microarray analysis
- Any form of Sanger (previous generation) DNA sequence analysis
- Any form of bioinformatic analysis of sequence data
- Proteomic or metabolomic analysis
- Phylogenetics
- Database searching for information about sequences, genes, gene sets, pathways, drugs or biomarkers
- Computerised analysis of any other biological information

The primary aims of this survey were to determine:

- The way in which genomics and bioinformatics research has been conducted in this University over the previous three years
- How much genomics and bioinformatics research is likely to occur in Auckland over the next three years
- How University of Auckland researchers would prefer to conduct this kind of work in the future, and how genomics and bioinformatics research could be made easier for University of Auckland researchers

A similar survey was conducted in May 2010 to inform strategic planning for the Bioinformatics Institute for the period mid 2010-mid 2013 (79 research groups responded to this 2010 survey, and a white paper reporting its results can be found at http://www.bioinformatics.auckland.ac.nz/doc/Bioinf_Inst_White_paper.pdf).

3. Limitations

The 2013 genomics and bioinformatics survey is intended to broadly inform us about the minimum expected volume, and relative proportions of different research types, for genomic and bioinformatics activity in Auckland. The survey was brief and

used relatively non-technical definitions, therefore it does not have sufficient depth to inform us about fine detail of genomics and bioinformatics work in Auckland. For example, a question about the analysis of genomic data performed by research groups in the last 3 years identified the number of individual research groups that had undertaken at least some aspects of the analysis of genomic data, but this question did not indicate the depth of the analysis that each group had undertaken.

73 University of Auckland research groups responded the survey. Apart from this survey, we have no information about the total number of research groups undertaking genomic and bioinformatic activity in the University. Therefore we cannot comment on the proportion of Auckland researchers that use genomics and bioinformatics who responded, or whether there were biases in the types of researchers who responded.

4. Activity over the previous 3 years 2010-2013

The number of research groups conducting various types of genomic and bioinformatic activity during the period 2010-2013 is shown in Figure 1.

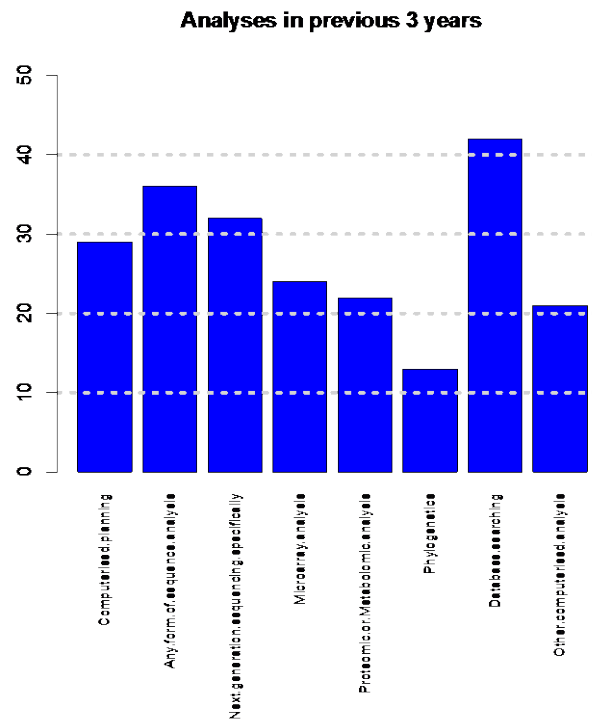


Figure 1. The y-axis indicates the number of University of Auckland research groups undertaking specific types of genomic and bioinformatic work. The x-axis categories correspond to the eight categories listed in full in Section 1 above. Note that individual research groups can have undertaken multiple types of work, and that the category labelled “Any form of sequence analysis” is referring to any form of bioinformatic analysis of sequence data, not to the genomic steps involved in Sanger sequencing or next generation sequencing.

24 research groups had conducted microarray analysis in the previous 3 years – there still appeared to high demand for this type of analysis during that time. 32 groups had undertaken next generation sequencing and 22 groups undertook proteomics/metabolomics work in this period.

We then identified whether specific combinations of genomic and bioinformatics activity were commonly undertaken by single groups. This is shown in Figure 2.

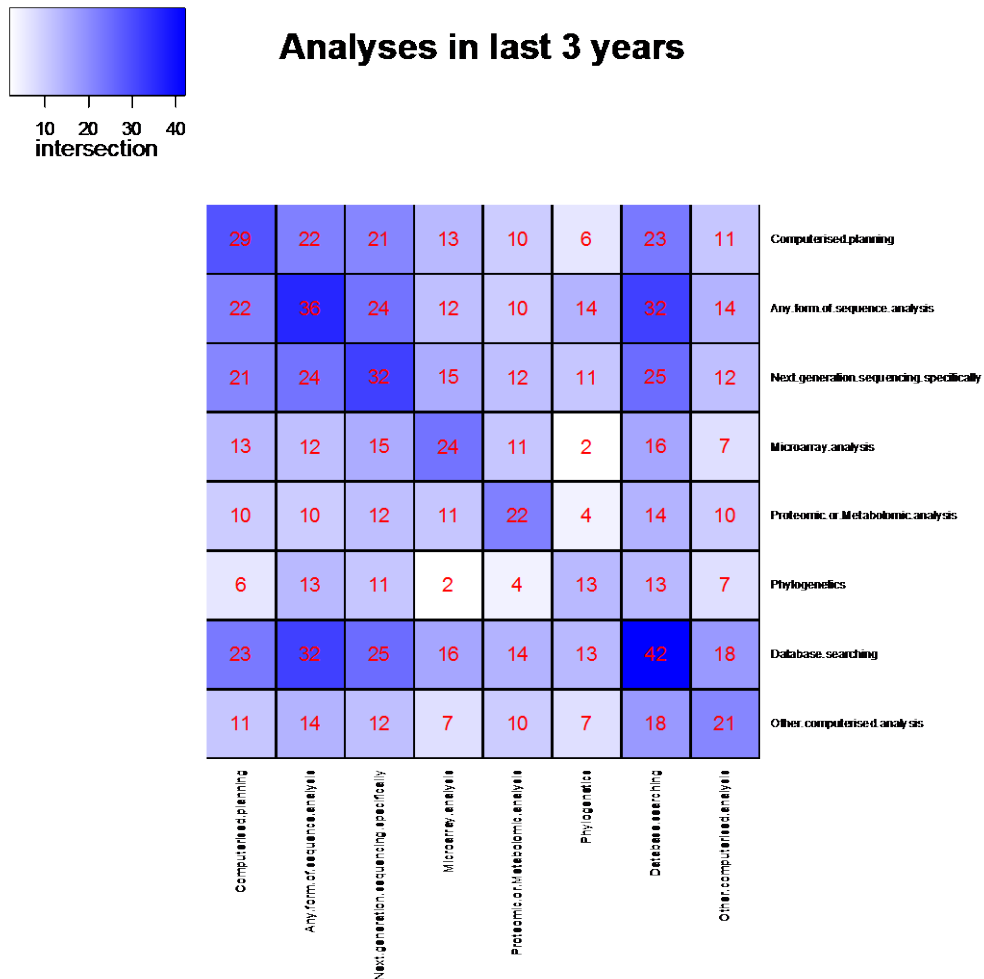


Figure 2 is a heat map showing the combinations of genomic and bioinformatic activities undertaken in the last 3 years within the same research groups. Each cell's colour and printed number indicates how many research groups have undertaken both the activity indicated by the x-axis label and the activity indicated by the y-axis label for that cell.

This suggests that research groups who undertake one form of genomic and bioinformatics activity are also likely to have undertaken additional forms of genomic and bioinformatics activity. For example, over 60% (15 out of 24) of the research groups that had undertaken microarray analysis had also undertaken next generation sequencing.

Figure 3 indicates the source of analysis of genomic data for by University of Auckland research groups over the last 3 years.

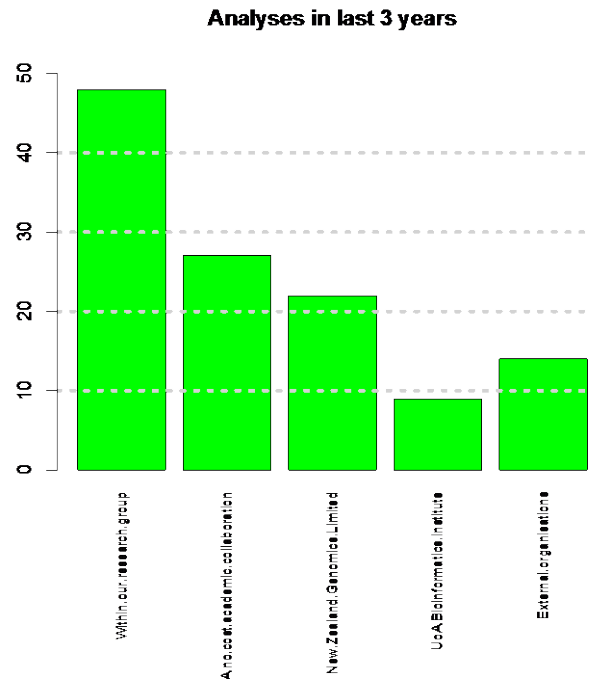


Figure 3. Total numbers (y-axis) of University of Auckland research groups using different sources of bioinformatic analysis (x-axis). “Within our own research group” indicates that the bioinformatics analysis was conducted solely within the research group. “UoA Bioinformatics Institute” indicates the analysis was conducted in the Bioinformatics Institute - this was either work that was agreed to be outside the remit of NZGL, or was undertaken before NZGL was active. “External organisations” indicates that the work was undertaken through a contract with non-NZGL external organisations such as bioinformatics consultants or overseas sequencing companies.

Figure 3 suggests that a high number of research groups (66%, 42/73) have been involved in some aspect of the analysis of their data. Note that this does not imply that these groups analysed complex sequence or microarray data from start to finish, rather it implies involvement in some aspect of the data analysis.

5. Anticipated activity over the next 3 years 2013-2016

Figure 4 is a Venn diagram showing the overlap of research groups who have conducted genomic/bioinformatics research in the previous 3 years, those that already have funding for genomic/bioinformatics research in the next 3 years, and those that intend to conduct genomic/bioinformatics research in the next 3 years but do not yet have funding for this.

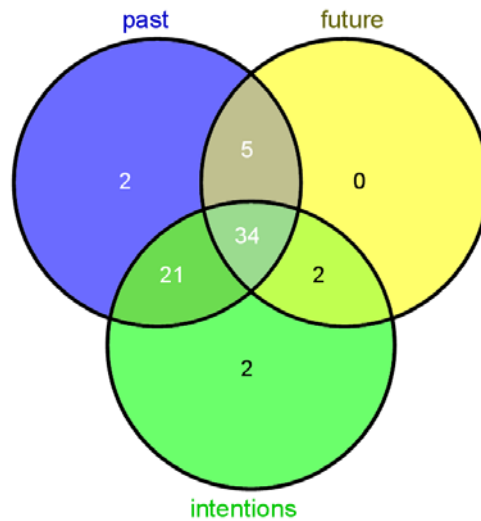


Figure 4. Venn diagram showing the overlap between genomic/bioinformatics research activities in the previous 3 years, funded activity in the future 3 years, and planned but not yet funded activity in the next 3 years.

Possibly due to ascertainment bias in the research groups who responded to the survey, almost all survey responders had previously undertaken genomics or bioinformatics research activities, and almost all responding research groups who intend to undertake genomic/bioinformatics research in the next 3 years have already done this type of work in the previous 3 years.

Figure 5 shows the number of research groups who already have funding for various types of genomic or bioinformatic research activity in the next 3 years. For example, 26, 6 and 12 research groups have confirmed funding over the next 3 years for next generation sequencing, microarray analysis and proteomics/metabolomics, respectively. Figure 6 shows the number of research groups who plan various types of genomic or bioinformatic research activity in the next 3 years but do not yet have funding for this. For example, 45, 18 and 25 research groups plan but do not yet have confirmed funding over the next 3 years for next generation sequencing, microarray analysis and proteomics/metabolomics, respectively.

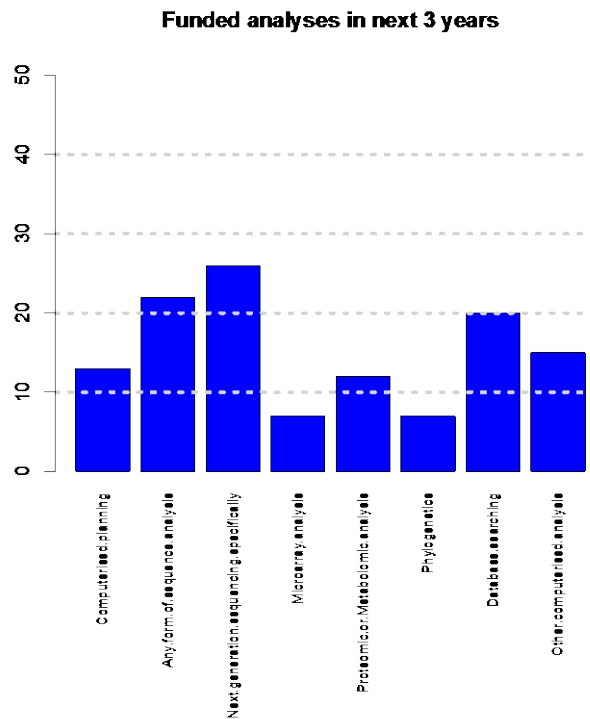


Figure 5. The y-axis indicates the number of University of Auckland research groups with funds to undertake specific types of genomic and bioinformatics work in the next 3 years. The x-axis categories correspond to the eight categories listed in full in Section 1 above.

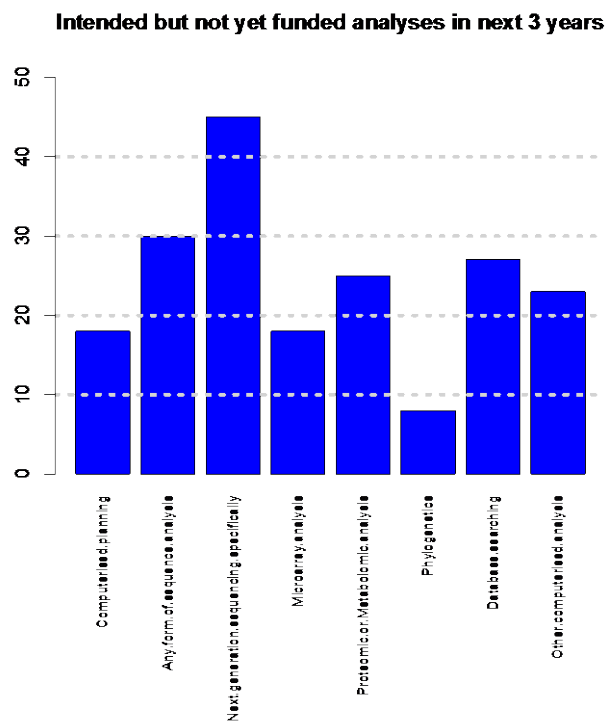


Figure 6. The y-axis indicates the number of University of Auckland research groups who plan to undertake specific types of genomic and bioinformatics work in the next 3 years but do not yet have confirmed funding for this.

These responses suggest that we should expect a healthy ongoing demand for genomics and bioinformatics activity in Auckland, and compared to the previous 3 years, an increase in next generation sequencing and proteomic/metabolomics work relative to microarray work.

The survey asked how research groups intend to undertake analysis of the genomic data they generate in the next 3 years. Figure 7 shows how research groups who already have committed funding intend to analyse their data in the next 3 years. Figure 8 shows how research groups who plan genomic/bioinformatic work but do not yet have committed funding intend to analyse their data in the next 3 years.

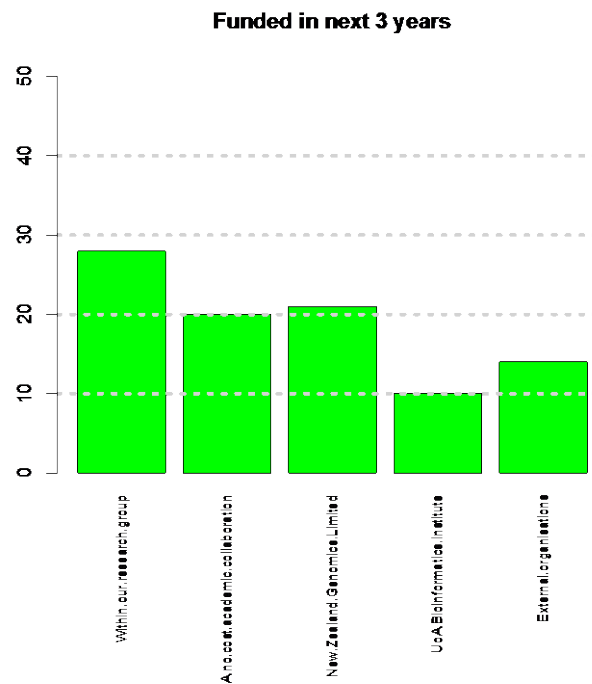


Figure 7. Total numbers (y-axis) of University of Auckland research groups planning to use different sources of bioinformatic analysis (x-axis) for the research they have funding for over the next 3 years.

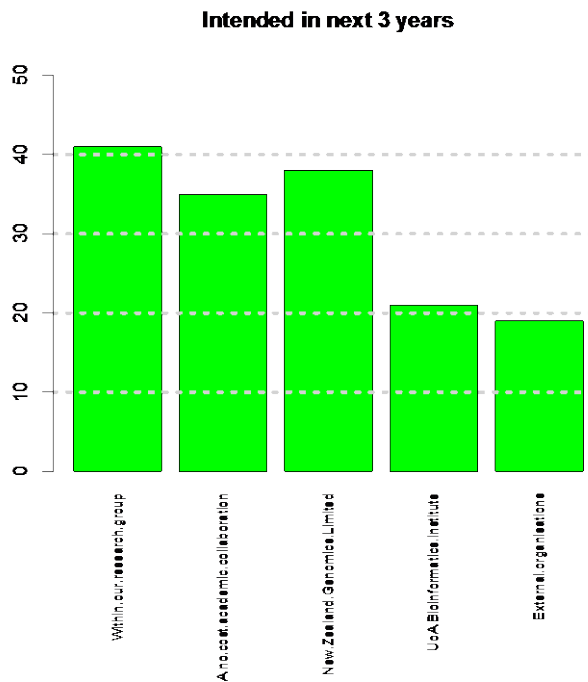


Figure 8. Total numbers (y-axis) of University of Auckland research groups planning to use different sources of bioinformatic analysis (x-axis) for the research they intend to conduct but do not yet have funding for over the next 3 years.

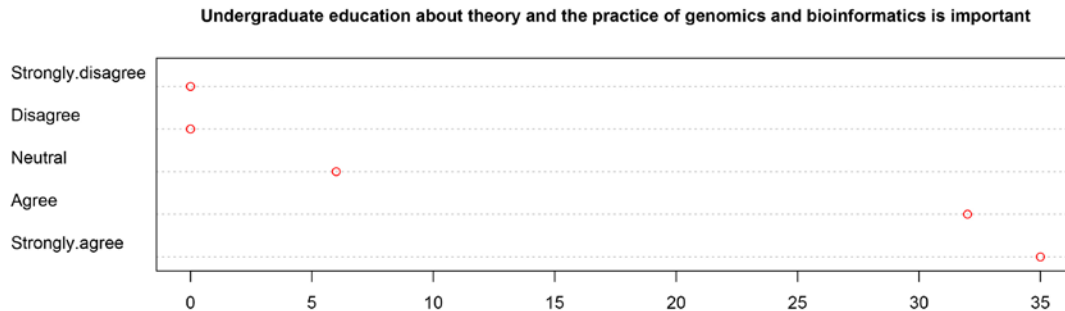
The survey then asked research groups about their competency in bioinformatics and how they wished to have their genomic data analysed. Responses suggest a significant opportunity for “on the job” teaching by Auckland bioinformaticians, to raise the technical capability of University of Auckland researchers in this field.

- For at least some of their work, 52% (38/73) of respondents would like to design their genomics experiments and analyse the genomics work they do / plan to do within their own laboratory, but with oversight from experienced bioinformaticians who can check their work, for a reasonable fee.
- For at least some of their work, 49% (36/73) would like to learn to analyse the genomics work they do / plan to do, by having experienced bioinformaticians teach them as they perform the work together with them, for a reasonable fee.

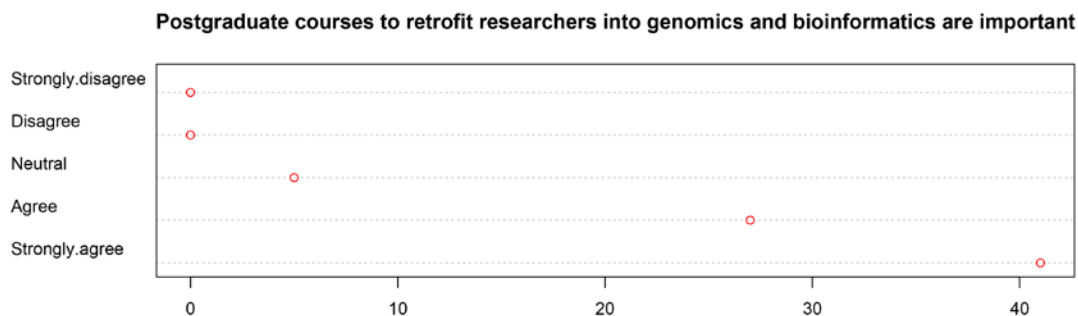
6. Education

The survey assessed attitudes about genomics and bioinformatics education in the University of Auckland.

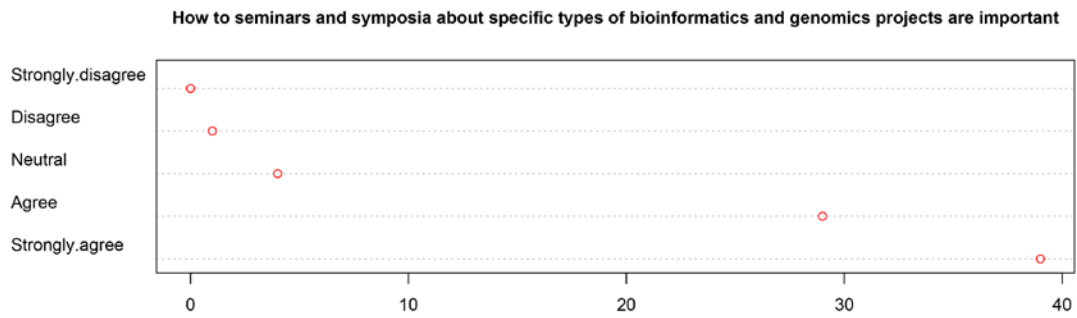
Respondents were first asked how much they agreed/disagreed with the statement that “undergraduate education about the theory and the practice of genomics and bioinformatics is important”. The number of respondents who indicated each level of agreement/disagreement is shown along the x-axis below.



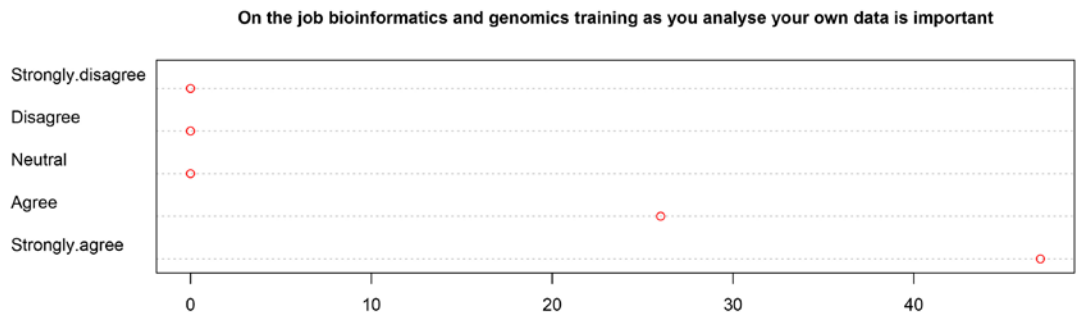
Respondents were asked how much they agreed/disagreed with the statement that “postgraduate courses to ‘retrofit’ researchers already trained in biology/medicine/computer sciences/statistics into genomics and bioinformatics specialists, capable of being an asset to an individual research group, are important”. The number of respondents who indicated each level of agreement/disagreement is shown along the x-axis below.



Respondents were asked how much they agreed/disagreed with the statement that “How to’ seminars and symposia about specific types of bioinformatics and genomics projects are important”. The number of respondents who indicated each level of agreement/disagreement is shown along the x-axis below.



Respondents were asked how much they agreed/disagreed with the statement that "On the job' bioinformatics and genomics training by skilled bioinformaticians able to assist you to analyse your own data is important". The number of respondents who indicated each level of agreement/disagreement is shown along the x-axis below.



The full text of the administered survey is attached on the following pages.

Answer questions you want to pre-fill, then click submit.

[Edit this form](#)

Bioinformatics at the University of Auckland

If you direct research projects related to biology, or biological information, please complete this 10-minute questionnaire and go to into the draw to win your choice of a 7" Android tablet or an iPad mini!

* Required



The Bioinformatics Institute

What we want to know

Please help us determine how genomics and/or bioinformatics research could be made easier for University of Auckland biological and biomedical researchers. The aim of this survey is to determine: (i) how much genomics and bioinformatics research is likely to occur in Auckland over the next three years, and (ii) how University of Auckland researchers would prefer to conduct this kind of work.

We wish to hear from each research group working in these areas within the University. Please communicate with your colleagues/collaborators to ensure that, wherever possible, research projects are not duplicated within survey responses.

About this survey

This survey is Auckland-specific - we hope it can identify the funding and support University of Auckland researchers need in the medium term to make genomics and bioinformatics research accessible, irrespective of whether this research is undertaken

- * directly through the University of Auckland Bioinformatics Institute,
- * through organisations we are affiliated with such as New Zealand Genomics Limited (NZGL),
- * or through external organisations such as overseas sequencing companies.

Another survey is concurrently being undertaken in parallel by our affiliated national genomics organisation NZGL in order to improve their services; we encourage you to also complete that survey.

If you complete the survey you will go into a draw to win your choice of a Samsung Tab2 7" 8GB Wifi Android tablet or an iPad mini. Please enter your name and email address in the appropriate fields if you wish to go into this draw.

About your participation

Your responses to this survey will be kept in confidence. No data will be able to be attributed to you. Identifying information will be used only for the purposes of the prize draw and will not be retained with survey responses. This survey is administered solely for evaluating services currently offered within the University and will not be used for research purposes.

Thank you very much from the Directors of the Bioinformatics Institute, Associate Professor Cris Print and Professor James Curran.

Your research - within the past three years

For this survey, we are interested in your experiences and plans in any of these areas:

- Computerised planning of cloning procedures, sequence alignment, PCR primer design, or protein motif prediction and visualization
- Microarray analysis
- Any form of Sanger (previous generation) DNA sequence analysis
- Any form of sequence analysis
- Proteomic or metabolomic analysis
- Phylogenetics
- Database searching for information about sequences, genes, gene sets, pathways, drugs or biomarkers
- Computerised analysis of any other biological information

1. Has your group been involved in any of the areas above within the last 3 years? *

- Yes
- No

Your research - within the past three years (continued)

1a. Which areas has your group has been involved with in the last 3 years? *

(Please check all that apply)

- Computerised planning of cloning procedures, sequence alignment, PCR primer design, or protein motif prediction and visualisation
- Microarray analysis
- Any form of next generation DNA or RNA sequencing
- Any form of sequence analysis
- Proteomic or Metabolomic analysis
- Phylogenetics
- Database searching for information about sequences, genes, gene sets, pathways, drugs or biomarkers
- Computerised analysis of any other biological information

1b. How have you performed the research above? *

(Please check all that apply)

- Solely within our research group
- By a no-cost academic collaboration with another research group
- By a contract directly with the University of Auckland Bioinformatics Institute

- By a contract with New Zealand Genomics Limited (NZGL)
- By a contract with external organisations such as bioinformatics consultants or overseas sequencing companies

Your research - confirmed funding for future work

For this survey, we are interested in your experiences and plans in any of these areas:

- Computerised planning of cloning procedures, sequence alignment, PCR primer design, or protein motif prediction and visualization
- Microarray analysis
- Any form of Sanger (previous generation) DNA sequence analysis
- Any form of sequence analysis
- Proteomic or metabolomic analysis
- Phylogenetics
- Database searching for information about sequences, genes, gene sets, pathways, drugs or biomarkers
- Computerised analysis of any other biological information

2. Does your group have ***confirmed*** funding to support research involving genomics and/or bioinformatics activities during the next 3 years? *

- Yes
- No

Your research - confirmed funding for future work (continued)

2a. Which areas does your group have ***confirmed*** funding to support within the next 3 years? *

(Please check all that apply)

- Computerised planning of cloning procedures, sequence alignment, PCR primer design, or protein motif prediction and visualisation
- Microarray analysis
- Any form of next generation DNA or RNA sequencing
- Any form of sequence analysis
- Proteomic or Metabolomic analysis
- Phylogenetics
- Database searching for information about sequences, genes, gene sets, pathways, drugs or biomarkers
- Computerised analysis of any other biological information

2b. How do you plan to perform your genomics and bioinformatics research? *

(Please check all that apply)

- Solely within our research group
- By a no-cost academic collaboration with another research group
- By a contract directly with the University of Auckland Bioinformatics Institute
- By a contract with New Zealand Genomics Limited (NZGL)
- By a contract with external organisations such as bioinformatics consultants or overseas sequencing companies

Your research - funding applications

For this survey, we are interested in your plans in any of these areas:

- Computerised planning of cloning procedures, sequence alignment, PCR primer design, or protein motif prediction and visualization
- Microarray analysis
- Any form of Sanger (previous generation) DNA sequence analysis
- Any form of sequence analysis
- Proteomic or metabolomic analysis
- Phylogenetics
- Database searching for information about sequences, genes, gene sets, pathways, drugs or biomarkers
- Computerised analysis of any other biological information

3. Has your research group applied for, or does it intend to apply for in the next 3 years, funding to support research in these areas? *

- Yes
- No

Your research - funding applications (continued)

3a. In which of these areas have you applied, or plan to apply, for funding in the next three years? *

(Please check all that apply)

- Computerised planning of cloning procedures, sequence alignment, PCR primer design, or protein motif prediction and visualisation
- Microarray analysis
- Any form of next generation DNA or RNA sequencing
- Any form of sequence analysis
- Proteomic or Metabolomic analysis
- Phylogenetics
- Database searching for information about sequences, genes, gene sets, pathways, drugs or biomarkers
- Computerised analysis of any other biological information

3b. How do you plan to perform your genomics and bioinformatics research? *

(Please check all that apply)

- Solely within our research group
- By a no-cost academic collaboration with another research group
- By a contract directly with the University of Auckland Bioinformatics Institute
- By a contract with New Zealand Genomics Limited (NZGL)
- By a contract with external organisations such as bioinformatics consultants or overseas sequencing companies

Your research group's expertise in genomics and bioinformatics research, and what assistance you need

4. How confident in genomic data analysis is your research group and what type of

assistance would help you?

(Please check all that apply)

- We can easily design experiments and analyse the genomics work we do / plan to do solely within our own laboratory, without assistance
- Ideally we would like to design our genomics experiments and analyse the genomics work we do / plan to do within our own laboratory ourselves, with oversight from experienced bioinformaticians who can check our work, for a reasonable fee to recover their costs
- We would like to learn to analyse the genomics work we do / plan to do, by having experienced bioinformaticians teach us as we perform the work together with them, for a reasonable fee to recover their costs
- We do not want to play any part in the analysis of data ourselves, and would prefer to contract this analysis out

How important is education in genomics and bioinformatics for the University of Auckland?

5. How much do you agree/disagree with the statements below?

Undergraduate education about theory and the practice of genomics and bioinformatics is important. *

- strongly agree
- agree
- neutral
- disagree
- strongly disagree

Postgraduate courses to "retrofit" researchers already trained in biology/medicine/computer sciences/statistics into genomics and bioinformatics specialists, capable of being an asset to an individual research group, are important. *

- strongly agree
- agree
- neutral
- disagree
- strongly disagree

"How to" seminars and symposia about specific types of bioinformatics and genomics projects are important. *

- strongly agree
- agree
- neutral
- disagree
- strongly disagree

"On the job" bioinformatics and genomics training by skilled bioinformaticians able to assist you to analyse your own data is important. *

- strongly agree
- agree
- neutral

- disagree
- strongly disagree

Other comments

Are there any other comments you would like to make about your research needs, the Bioinformatics Institute or any of the other aspects of this survey?

(You may leave this blank.)

Your details

Note these details will be separated from survey data and will only be used to contact you if you win the prize. We will not contact you regarding your survey responses.

What is your full name?

What is your email address?

If your entry wins our prize draw, what type of prize would you prefer? *

- Samsung Tab2 7" Wifi 8GB Android tablet
- iPad mini tablet

Submit

Never submit passwords through Google Forms.