

Fundamentals of R for Biological Scientists

Note: This workshop is hosted online.

Workshop intro summary

Handling large biological datasets is now a routine activity for researchers in the cancer and regenerative medicine fields. R is a popular scripting language that has become a common tool for managing biological datasets, however, the flexibility and power of R can be difficult to navigate for new users. To assist researchers, BioCanRx and the Stem Cell Network are partnering to provide a multi-session introductory workshop that will equip scientists with the fundamental knowledge to use R in their research. The workshop is intended for researchers who have little or no programming experience.

Who Should Attend?

This R workshop is designed for research trainees[‡] from the cancer immunotherapy and regenerative medicine fields who are looking to gain an understanding of the R scripting language and how it can be utilized for the analysis of biological datasets. Note: Spaces are limited and access costs for this training opportunity will be covered by BioCanRx/SCN for successful applicants who complete all components; a charge will be levied for applicants that do not complete the components or attend the sessions (see the Conditions section below for more details).

‡ For SCN: A research trainee is a graduate student, post-doc, research associate and/or technician currently working in the field of stem cells and regenerative medicine in a Canadian lab.

For BioCanRx: A research trainee (highly qualified personnel) is a graduate student, post-doc, research associate and/or technician currently working in the field of cancer immunotherapy in a Canadian lab.

Workshop Learning Objectives:

The proposed workshop will consist of four online classes presented weekly with small homework assignments. By the end of the workshop the attendees will have experience with, and a basic understanding of:

- The R programming language
- The RStudio Integrated Development Environment
- knitr markup and report generation
- The Cancer Genome Atlas Datasets (TCGA) through the TCGAbiolinks R library

The workshop content will be provided primarily as guided walkthroughs of RStudio notebooks, with time for participant interaction and questions. Notebooks will be provided to attendees and annotated in sufficient detail for attendees to run all the analyses content without further support required. Any supplemental slides will be provided as PowerPoint files. The workshop is not intended to provide comprehensive knowledge of any of the above topics, rather it is

intended to provide attendees with direct experience of the use of these tools and resources to enable further independent development.

Course topics/themes include:

Class 1: RStudio and the R Language

- Workshop outline and scope
- Rstudio introduction
- Project environments and source control
- R language basics

Class 2: Data Frames, Libraries, Loading and Saving Data

- R language basics (continued)
- R libraries
- Knitr and report generation
- Loading and Saving files
- Writing a simple program

Class 3: Accessing Cancer Experimental Data using TCGAbiolinks

- TCGA overview; projects and data types available
- The TCGAbiolinks R library
- Downloading experimental data (Lung Adenocarcinoma RNASeq, Tumor and Normal read counts)
- Clinical Data
- Experimental Data

Class 4: Data analysis and Visualization

- Fold change analysis of RNASeq count data.
- Volcano plots
- PCA plots
- Heatmaps
- Gene Ontology Enrichment analysis and visualization

The workshop content is developed and presented by [Gareth Palidwor and the team at the Ottawa Bioinformatics Core Facility](#).

Workshop Format and Dates:

This virtual workshop comprises of four 60 to 90-minute sessions, that will run weekly on September 7, 14, 21, and 28, 2022 at 2:00 p.m. ET (11:00 a.m. PT).

Workshop Location: Hosted online. A link to the online sessions will be provided to successful applicants.

Application Deadline: Monday, July 25, 2022 by 5 p.m. (sender's time).

Application Procedure & Registration Fees:

Due to the interactive nature of this training event, spaces for this online workshop are limited; all those interested in participating must [submit a completed application form](#) to attend the Fundamentals of R for Biological Scientists workshop by Monday, July 25, 2022 by 5 p.m. (sender's time). Selected applicants will be notified by August 12, 2022.

Conditions:

- Application deadline is **5 p.m. (sender's time) on Monday, July 25, 2022**.
- Spaces are limited for this important training opportunity. BioCanRx/SCN will cover the registration costs (paid directly to the organizers) of this event for applicants from their networks who attend all sessions and complete all elements of the online content in this training event within the designated period. **For applicants that fail to attend all four sessions or complete the course content, a fee of \$500 will be charged** to their supervisor to cover the costs associated with delivering this training event.

Eligibility:

- (For SCN HQP) Applicants must be a SCN trainee / highly qualified personnel (HQP) (i.e. a graduate student, post-doc, research associate and/or technician) currently working in the field of stem cells/regenerative medicine in a Canadian lab. Non-academic applicants are welcome to apply, however academic applicants are prioritized. A \$500 fee will apply to all non-academic applicants; or
- (For BioCanRx HQP) Applicants must be a BioCanRx trainee / highly qualified personnel (HQP) (i.e. a graduate student, post-doc, research associate and/or technician) currently working in the field of cancer immunotherapy in a Canadian lab. Preference will be given to HQP working in the labs of currently or previously funded BioCanRx Network Investigators. Non-academic applicants are welcome to apply, however academic applicants are prioritized. A \$500 fee will apply to all non-academic applicants.
- If you're unsure whether you are a SCN HQP, please email Ellie Arnold at earnold@stemcellnetwork.ca for confirmation.
- If you're unsure whether you are a BioCanRx HQP, please email Sarah Ivanco at sivanco@biocanrx.com for confirmation.
- Applicants must clearly demonstrate that they will apply the techniques learned in the course to their own regenerative medicine/cancer immunotherapy research project within one year.

Workshop Requirements:

Participants must have a computer with a microphone (and optionally a camera) which is able to run R, and a high-speed internet connection. Participants will also need to download free software tools before attending the workshop and will be advised of what software is required

following their registration in the workshop. A second monitor or screen will be required to enable participants to simultaneously use the software tools and view the workshop video stream.

Application Procedure:

1. [Apply at this link](#) by Monday, July 25, 2022.
2. In addition to completing the application form, a full letter of support will be required from your current supervisor detailing how your participation in the Fundamentals of R for Biological Scientists workshop will benefit your research and the lab's stem cell research program as a whole.

For SCN Trainees: Letters should be e-mailed by supervisors directly to Ellie Arnold, earnold@stemcellnetwork.ca at the same time you submit your application online.

For BioCanRx HQP: Letters should be e-mailed by supervisors directly to Sarah Ivanco, sivanco@biocanrx.com at the same time you submit your application online.

A confirmation email will be sent within 24 hours of SCN/BioCanRx receiving the submitted support letter. If a confirmation email is NOT received from SCN/BioCanRx within 24 hours of submission it is the responsibility of the applicant to contact SCN/BioCanRx and ensure that all application materials have been received by SCN/BioCanRx.

3. The BioCanRx/SCN Training & Education Committees will review all complete applications, and applicants will be informed of the competition outcome by August 12, 2022.

Reporting and Communication Requirements:

By accepting to attend this workshop, the recipient agrees to provide a report describing the value of the training and networking opportunities made available through the award. This information will be used at BioCanRx/SCN's discretion on its website, newsletters and for the purpose of reporting to their funding agencies. By registering for this workshop, attendees also accept to have their pictures taken during workshop and used in materials as described above. Please note that expense reimbursement will be processed only once the completed report is received.

Questions:

For further information about this workshop or for application related enquiries, please contact Ellie Arnold at earnold@stemcellnetwork.ca or Sarah Ivanco at sivanco@biocanrx.com.