

## Free online courses in Bioinformatics

Statistical learning (a great introduction by famous authors):

[https://www.youtube.com/watch?v=5N9V07Eifg&list=PL0g0ngHtcqbPTlZzRHA2ocOZqB1D\\_qZ5V](https://www.youtube.com/watch?v=5N9V07Eifg&list=PL0g0ngHtcqbPTlZzRHA2ocOZqB1D_qZ5V)

Khan academy offers many free courses, e.g.: <https://www.khanacademy.org/math/statistics-probability>

EMBL has a collection of courses online (with a focus on computational biology analyses):

<https://www.ebi.ac.uk/training/online/course/embo-practical-course-analysis-high-throughput-seq/differential-expression-rna-seq>

Along the same lines (starts with basic concepts and then it gets more complicated; also provides R code): <http://genomicsclass.github.io/book/>

Coding (general concepts, different programming languages, guided examples):

- <https://www.codecademy.com> (for example: R <https://www.codecademy.com/learn/learn-r>, python: <https://www.codecademy.com/learn/learn-python-3>)

Coursera is a great site with many online courses (<https://coursera.org>). Some even have guided exercises and offer the possibility to get a certification after the completion of the course. I took this course for Machine Learning (very easy to follow, it's good for beginners and also has some exercises in matlab or octave (open source)) (<https://coursera.org/learn/machine-learning>)

These blogs are a quick read and great for understanding how different parameters affect tSNE and UMAP projections:

- UMAP: <https://pair-code.github.io/understanding-umap/>
- tSNE: <https://distill.pub/2016/misread-tsne/>

Differential expression analysis tools and examples:

- <https://bioconductor.org/packages/release/bioc/vignettes/edgeR/inst/doc/edgeRUsersGuide.pdf>
- understanding interactions: [http://genomicsclass.github.io/book/pages/interactions\\_and\\_contrasts.html](http://genomicsclass.github.io/book/pages/interactions_and_contrasts.html)

Single cell analysis tools and guided examples:

- <https://satijalab.org/seurat/>
- <https://icb-scanpy.readthedocs-hosted.com/en/stable/tutorials.html>

Web Seminars of Swiss Institute of Bioinformatics

<https://www.youtube.com/playlist?list=PLoCxWrRWjqB1JUCntI4X09ezmOtKx1Gke>

Darren Wilkinson's blog (quite computational)

<https://darrenjw.wordpress.com/2010/01/30/yet-another-introduction-to-r-and-bioconductor>

### Learn R

#install RStudio locally, or use the free RStudio Cloud: <https://rstudio.cloud/>

- Basic intro: <https://www.codecademy.com/learn/learn-r>
- Interactive R learning with swirl: <https://swirlstats.com/students.html>
- Examples of main concepts: <https://www.datamentor.io/r-programming/#tutorial>
- R intro video: <https://www.youtube.com/watch?v=V8eKsto3Ug>
- Full stats intro: <https://stat545.com/index.html>
- The "tidyverse" is a godsend for biologists <https://www.tidyverse.org/>
- R Data Science book (lots of tidyverse): <https://r4ds.had.co.nz/>

- Stat545 (also lots of tidyverse): <https://stat545.com/>
- R Graphics Cookbook: <https://r-graphics.org/>
- Advanced: stats learning (incl. free book): <http://faculty.marshall.usc.edu/gareth-james/ISL/>
- Advanced: statistical rethinking: [https://github.com/rmcelreath/statrethinking\\_winter2019](https://github.com/rmcelreath/statrethinking_winter2019)

### Learn Python

- Python everything: <https://chrisalbon.com/>
- Basics: [https://www.learnpython.org/en/Hello%2C\\_World%21](https://www.learnpython.org/en/Hello%2C_World%21)
- Learning Biopython with coronavirus: <https://github.com/chris-rands/biopython-coronavirus>

### Command line:

- > Beginner's guide for bash terminal: <https://www.youtube.com/watch?v=oxuRxtO2Ag>
- Introduction to Linux: <https://www.edx.org/course/introduction-to-linux>
- Intro to Linux: <https://www.guru99.com/introduction-linux.html>

### Data carpentry lessons: <https://datacarpentry.org/lessons/>

- Genomics overview: <https://datacarpentry.org/genomics-workshop/>
- Command line intro for genomics: <https://datacarpentry.org/shell-genomics/>
- Project organization genomics: <https://datacarpentry.org/organization-genomics/>

### Software carpentry lessons: <https://software-carpentry.org/lessons/>

- R intro: <http://swcarpentry.github.io/r-novice-inflammation/>

### General tutorial/workshop/book collections:

- > Shirley Liu STAT115 Harvard/Dana-Farber (last video in playlist is first to watch): <https://www.youtube.com/playlist?list=PLeB-DIq-v6tY3QLdQBA7rbw4a7fK9mLpv>
- Rosalind Learning Through Problem Solving: <http://rosalind.info/problems/locations/>
- Rosalind list of University Bioinfo Courses: <http://rosalind.info/courses/>
- Data Science: <http://rafalab.github.io/pages/teaching.html>
- Bioinformatics courses from SLU: <https://www.hadriengourle.com/tutorials/>
- Bioinformatics tutorials Ijaz lab: <http://userweb.eng.gla.ac.uk/umer.ijaz/#bioinformatics>
- Bioconductor talks/intros/workshops: <https://www.bioconductor.org/help/course-materials/>
- RMarkdown intro: <https://ourcodingclub.github.io/tutorials/rmarkdown/>
- <https://kbroman.org/pages/tutorials.html>
- Bioinformatics Book Pevsner lab: <http://www.bioinfbook.org/>
- YaleDHLab workshops: <https://github.com/YaleDHLab/lab-workshops>
- UMich Exploratory Data Analysis for Health (videos): <https://kdpsingh.lab.medicine.umich.edu/lhs-610>
- Command line intro: <https://github.com/YaleDHLab/lab-workshops/tree/master/command-line>
- Jupyter Notebook workshop machine learning: <https://github.com/YaleDHLab/lab-workshops/blob/master/machine-learning/machine-learning.ipynb>
- Fundamentals of data visualization: <https://serialmentor.com/dataviz/index.html>
- Data visualization intro: [https://columbiaviz.github.io/2018f\\_w4995/](https://columbiaviz.github.io/2018f_w4995/)

### Data analytics:

- <http://cecileane.github.io/computingtools/>
- Population genomics book: <https://github.com/cooplabs/popgen-notes/releases/tag/v1.1>
- Single-cell RNA-seq collection: <https://osca.bioconductor.org/learning-r-and-more.html>
- old 2011 EBI course: <https://www.ebi.ac.uk/training/online/course/embo-practical-course-analysis-high-throughput-seq/introduction-r-and-bioconductor>
- Notes on data science and machine learning <https://chrisalbon.com/>