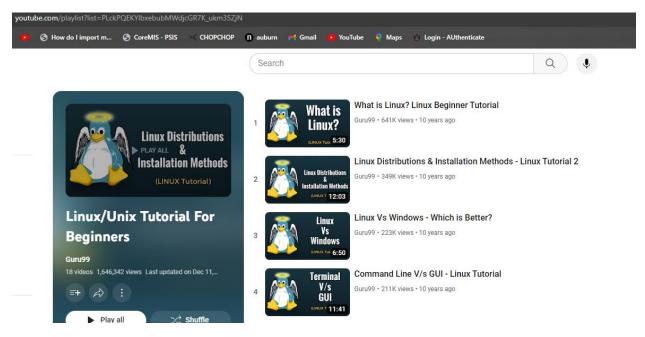


#### **CORE LESSONS**

Linux provides the foundation to handle big data. In this core unit, the basics of the Linux OS will be learned on one's own computer. Users will also learn to analyze and visualize big data via the statistical package, R.



https://www.cst.temple.edu/~robie/playbigdata/assets/pages/modules-main.html,



https://www.youtube.com/playlist?list=PLckPQEKYlbxebubMWdjcGR7K\_ukm35ZjN,



#### **Training Courses**



As part of its work with the Babraham Institute, the Bioinformatics group runs a regular series of training courses on many aspects of bioinformatics.

These courses are run regularly on the Babraham site but we are also able to come out and present them on other sites and also deliver them remotely. You can see the <u>list</u> options for running courses on your site.

You can also sign up to our mailing list to get the latest training news delivered direct to your inbox every couple of months.

Where possible we also aim to make the material from our courses publicly available so that anyone who wants to can download them for their own use.

Below is a list of the courses we currently run. Where they are available there is a link to the training manual and course exercises.

#### Core Bioinformatics Skills

D (tidunaraa) Cauraaa

#### https://www.bioinformatics.babraham.ac.uk/training.html,

# EVOLUTION AND GENOMICS Intensive and immersive training opportunities WORKSHOPS LEARNING PEOPLE APPLY INFORMA LEARNING

The Learning section of this website is where you will be able to locate the Learning Activities used during the Workshops. Please select a focus area from the list bel be taken to individual learning activities.

- UNIX Tutorial
- Genomics
- Phylogenetics
- Population and Speciation Genomics
- Population genetics
- Programming
- Workshop software installation

https://evomics.org/learning/,

#### Sed - An Introduction and Tutorial by Bruce Barnett



https://www.grymoire.com/Unix/Sed.html,

Reaboli I alli liere indus Caballero Article Index rays

#### AWK GTF! How to Analyze a Transcriptome Like a Pro - Part 1



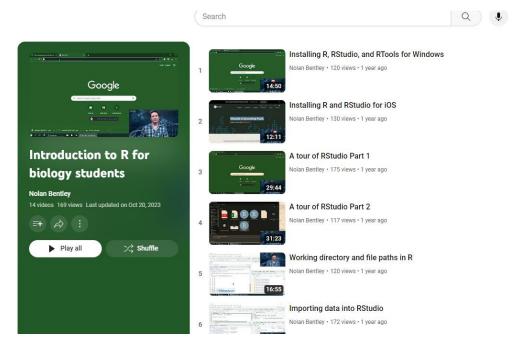
#### 16 September 2013

This post belongs to a 3-part series on AWK: Part 1 - Part 2 - Part 3

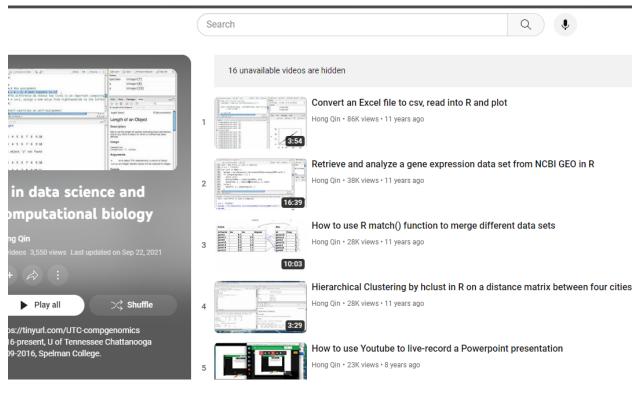
The goal of this tutorial is to show a few of the cool things that the Unix tool AWK can do with tabular data. We will focus on extracting useful information from a transcriptome—because bioinformatics is cool—, but AWK can do its wonders with any kind of text file.

The tutorial has been carefully designed to make it easy for you to play along. So feel free to copy and paste the commands in your Unix terminal.

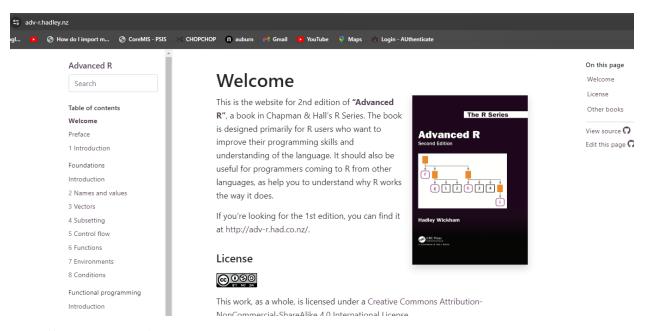
https://reasoniamhere.com/2013/09/16/awk-gtf-how-to-analyze-a-transcriptome-like-a-pro-part-1/,



https://www.youtube.com/playlist?list=PL1O4yAimiWhj6rxLgRLVOE76jXHGq0Vrf,



https://www.youtube.com/playlist?list=PLA54E692040796EA5,



#### https://adv-r.hadley.nz/,



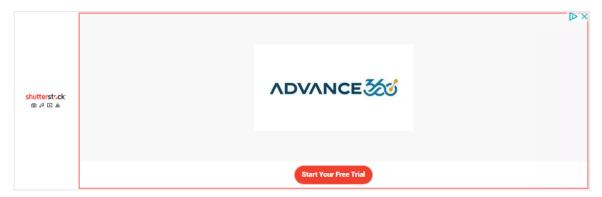
#### learn R

The statistical programming language R is becoming a popular means for analyzing data. But it's not always easy to use. We have a number of resources about learning and using R, including a several-part tutorial blog series.



https://www.theanalysisfactor.com/r/,

### Switching Between Long and Wide Formats in R



#### 26 September 2013

This is a basic tutorial in R for switching between the two most common data formats: wide and long. The example dataset we will use is made up of RT-PCR threshold cycle (Ct) values under two conditions (A and B), with two replicates each.

Download the file by running this in your command line:

https://reasoniamhere.com/2013/09/26/switching-between-long-and-wide-formats-in-r/,

https://sites.google.com/a/bioinformatics.ucr.edu/sites/system/errors/ProxiedWebspaceNotFound?host =manuals.bioinformatics.ucr.edu&webspace=bioinformatics-manuals

## >Computational Genomics

#### Course Summary and Objectives:

High-throughput sequencing technology has made it possible to obtain large scale genetic data sets for almost any organism, creating a need for computational tools and skill sets to process these data. While the bioinformatics workflows for processing raw data into SNPs are typically well delineated, the path for analyzing and interpreting the resulting SNP data set can be less clear. In this workshop, students learn about classical population genetics statistics that test the neutral theory of evolution, and then get hands-on experience writing their own R code to perform each analysis on a realistic sample SNP data set. Emphasis is placed on programming fundamentals and algorithm design: skills that extend beyond the specific calculations learned in class. At the end of the semester, each student completes an independent project that consists of running an analysis on their own, often using their own data, and presenting their findings to the class.

#### Intro to R basics

- Syllabus
- · R-tutorial
- · Overview of course structure
- Introduction to R syntax, data objects, indexing, and loops.

#### VCF Format and Finding Genotypes

- VCF Format Exercises
- Download Exercise Solution
- Basics of next-gen sequencing, Standard raw data pipelines to call SNPs and produce VCF files

#### Hardy-Weinberg Equilibrium

- Hardy-Weinberg Exercises
- Download Exercise Solution
- Review principle of HWE; calculating observed and expected frequencies; assumptions.

https://eacooper400.github.io/compGen8900.html,



Home Recent Issues Back Issues

#### Are Clusters Races? A Discussion of the Rhetorical Appropriation of Rosenberg et al.'s "Genetic Structure of Human Populations"

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Melissa Wills, Department of English, Voorhies Hall, One Shields Avenue, University of California, Davis, CA 95616, USA

EMAIL: MAWILLS@UCDAVIS.EDU

SUBJECT TERMS

Clusters

Genetics

Popular Science

Populations

https://quod.lib.umich.edu/cgi/t/text/text-

idx?cc=ptb;c=ptb;c=ptpbio;idno=6959004.0009.012;view=text;rgn=main;xc=1;g=ptpbiog,

#### An introduction to ggplot2

February 2015, by Sean C. Anderson

This page will help you teach yourself how to rapidly explore data with the ggplot2 R package. It was written as a self-study component for the FISH554 class at the University of Washington.

Work your way through this page. When you want to check your work, or if you get stuck on an exercise, just click on the button R source and you'll see the R source code that created a figure.

#### Learning objectives

By the end you should be able to:

- · Understand the basic grammar of ggplot2 (data, geoms, aesthetics, facets).
- · Make quick exploratory plots of your multidimensional data
- · Have an idea about how to start customizing ggplot2 figures.
- . Know how to find help on applot2 when you run into problems

#### ggplot2 for rapid data exploration

ggplot2 is an R package by Hadley Wickham and Winston Chang that implements Wilkinson's Grammar of Graphics. The emphasis of ggplot2 is on rapid exploration of data, and especially high-dimensional data. Think of base graphic functions as drawing with data (examples of base graphic functions are plot(), points(), and lines(). With base graphics, you have complete control over every pixel in a plot but it can take a lot of time and code to produce a plot.

Although ggplot2 can be fully customized, it reaches a point of diminishing returns. I tend to use ggplot2 and base graphics for what they excel at: ggplot2 for rapid data exploration and base graphics for polished and fully-customized plots for publication.

https://seananderson.ca/ggplot2-fish554/,

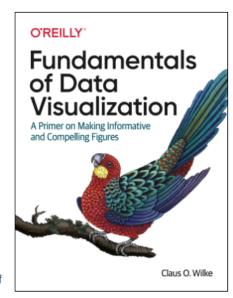
#### **Fundamentals of Data Visualization**

Claus O. Wilke

#### Welcome

This is the website for the book "Fundamentals of Data Visualization," published by O'Reilly Media, Inc. The website contains the complete author manuscript before final copyediting and other quality control. If you would like to order an official hardcopy or ebook, you can do so at various resellers, including Amazon, Barnes and Noble, Google Play, or Powells.

The book is meant as a guide to making visualizations that accurately reflect the data, tell a story, and look professional. It has grown out of my experience of working with students and postdocs in my laboratory on thousands of data visualizations. Over the years, I have noticed that the same issues arise over and over. I have attempted to collect my accumulated knowledge from these interactions in the form of this book



The entire book is written in R Markdown, using RStudio as my text editor and the bookdown package to

An introduction to ggpl
Learning objectives
ggplot2 for rapid data e
Basics of the grammar
Loading the data
Geoms
Aesthetics
Facets (small multiples
Customizing ggplot2
More examples
Some final notes

#### https://clauswilke.com/dataviz/,



The Inkscape community has produced a vast volume of tutorials over the years. At this writing more than 95% are made by Inkscape users, and scattered hither and yon across the internet. The only truly official tutorials are those packaged with the program, which you can find in the Help menu > Tutorials.

Here we want to make a collection of new official tutorials, officially-endorsed tutorials, and user-recommended tutorials, which have been provided by community members, and reviewed for content and presentation. Inkscape users can depend on them being of high quality.

#### Official Tutorials

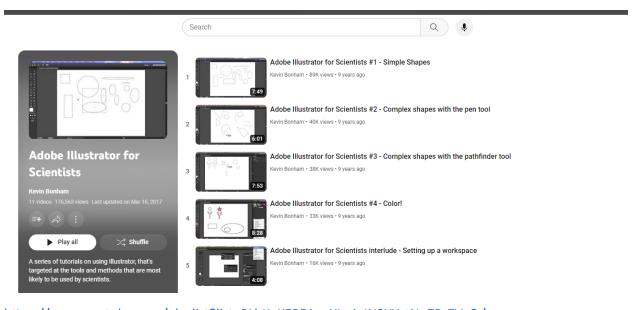
These are tutorials from the Inkscape project. In general, they provide the most basic or most essential information, which is needed by most Inkscape users, at some point. These are recommended for all users. There are three general categories.

#### Packaged with Inkscape

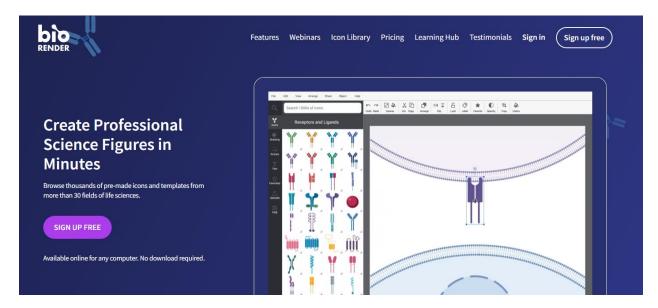
These tutorials are actually packed with Inkscape, where they are interactive. But we have them linked below as static copies. The first three are highly recommended for beginners, titled Basic, Shapes, and Advanced. (Don't worry, the one named Advanced isn't really. It's an introduction to the most basic elements of vector graphics (paths).) The others cover specific features, which you can use as needed.

- · Basic tutorial
- Shapes tutorial
- Advanced tutorial
- Bitmap Tracing tutorial
- Pixelart Tracing tutorial

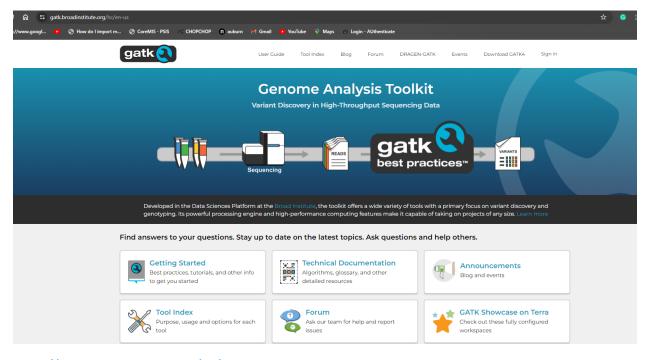
#### https://inkscape.org/learn/tutorials/,



https://www.youtube.com/playlist?list=PLhKpKEPEAauYlsyjnIN2YXztNo7BrZVxQ,\



https://auburn.instructure.com/courses/1518755/modules/items/27501315,



https://gatk.broadinstitute.org/hc/en-us,

#### computational genomics



#### **Case Studies**

This page contains a collection of Case Studies in Computational Genomics, mostly based on classic papers, and r Davis, University of Bristol and University of Milano.

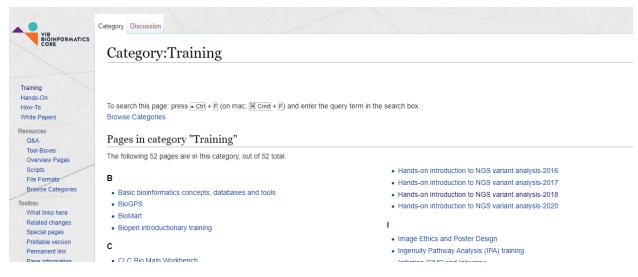
Currently most case studies are based on the use of Matlab, but we are planning to add examples of analysis using in hearing from you.

The current list (see the navigation menu on the left) includes analysis of sequence and expression data, and aims

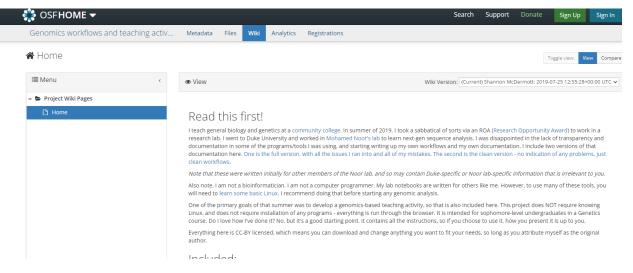
#### **CASE STUDIES**

Bird Flu
SARS
HIV
Neanderthal
Chlamydia
Evening Element

#### https://computationalgenomics.blogs.bristol.ac.uk/case studies,



https://wiki.bits.vib.be/index.php/Category:Training,



#### https://osf.io/unt8q/wiki/home/,



https://wiki.bits.vib.be/index.php/NGS\_data\_analysis,

These web pages have moved, as of 31 August 2023.

If you want to find:

The PHYLIP web pages, go here: https://phylipweb.github.io/phylip/

The LAMARC web pages, go here: https://lamarcweb.github.io/lamarcweb/

Joe Felsenstein's web pages, go here: https://felsenst.github.io/

Keep these addresses in mind, in case you need to go back to them. It will take search engines such as Google a while to realize That these are the main locations of those pages.

ance with University of Washington requirements for web sites hosted at the University: Privacy I

#### https://evolution.gs.washington.edu/module1/index.html,

Harvard FAS Informatics About Cores Employment Faq Software Tutorials Archives Search

#### Harvard FAS Tutorials and Training

FAS Informatics provides a number of training sessions on everything from basic Linux to transcript assembly.

Materials for training sessions, analysis tutorials, HOWTOs, and short help documents can be found below.

Be sure to check out the training available from Research Computing as well.

#### **RSEM** example on Odyssey

An example of quantifying RNA-seq expression with RSEM on Odyssey cluster

#### Short Introduction to bwa

This tutorial provides a basic overview of using bwa to align fastos to a reference genome

https://informatics.fas.harvard.edu/category/tutorials.html,

nature portfolio View all journals

nature > collection

Collection 09 May 2017

#### **Statistics for Biologists**

There is no disputing the importance of statistical analysis in biological research, but too often it is considered only after an experiment is c may be too late.

This collection highlights important statistical issues that biologists should be aware of and provides practical advice to help them improve work.

Nature Methods' Points of Significance column on statistics explains many key statistical and experimental design concepts. Other resour online plotting tool and links to statistics guides from other publishers.

Image Credit: Erin DeWalt

#### https://www.nature.com/collections/qghhqm,



### Springer has released 65 Machine Learning and Data books for free



https://towardsdatascience.com/springer-has-released-65-machine-learning-and-data-books-for-free-961f8181f189,

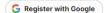


https://jse.amstat.org/jse data archive.htm,



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https://www.kaggle.com/,