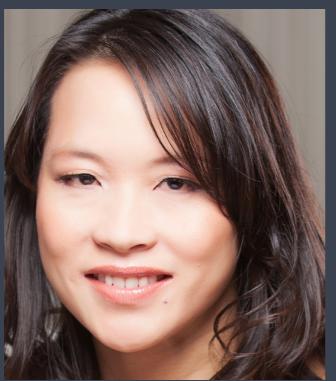


# Introduction to R

Harvard Chan Bioinformatics Core

<https://tinyurl.com/intro-to-r-1-5>

Sponsored by HMS (TnT) and HSCI



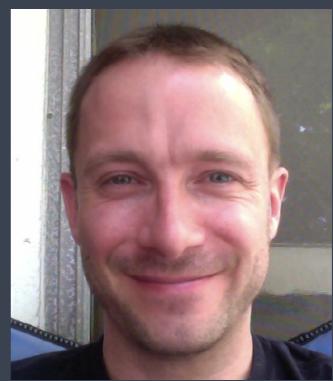
Shannan Ho Sui  
*Director*



John Hutchinson  
*Associate Director*



Victor Barrera



Rory Kirchner



Meeta Mistry



Mary Piper



Radhika Khetani  
*Training Director*



James Billingsley



Ilya Sytchev



Zhu Zuo



Sergey Naumenko

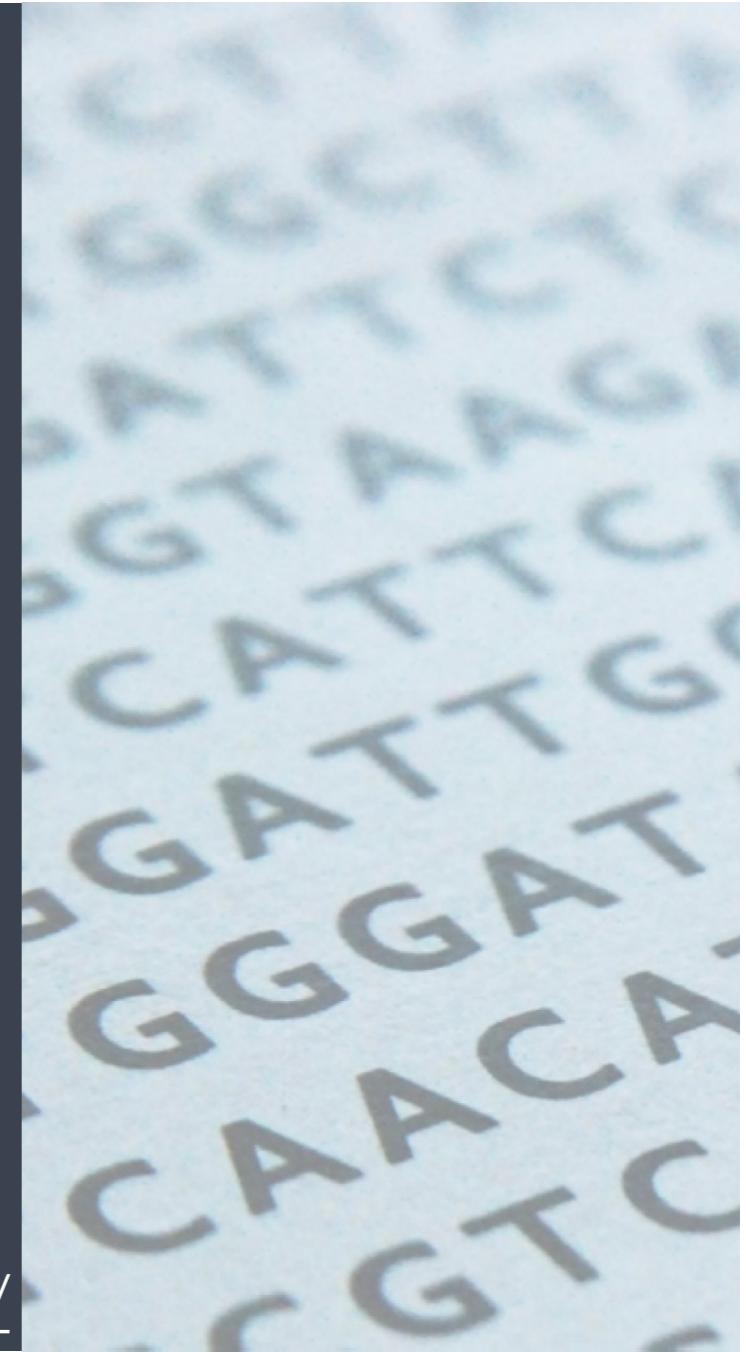


Peter Kraft  
*Faculty Advisor*

# Consulting

- RNA-seq analysis: bulk, single cell, small RNA
- ChIP-seq and ATAC-seq analysis
- Genome-wide methylation
- WGS, resequencing, exome-seq and CNV studies
- QC & analysis of gene expression arrays
- Functional enrichment analysis
- Grant support

<http://bioinformatics.sph.harvard.edu/>

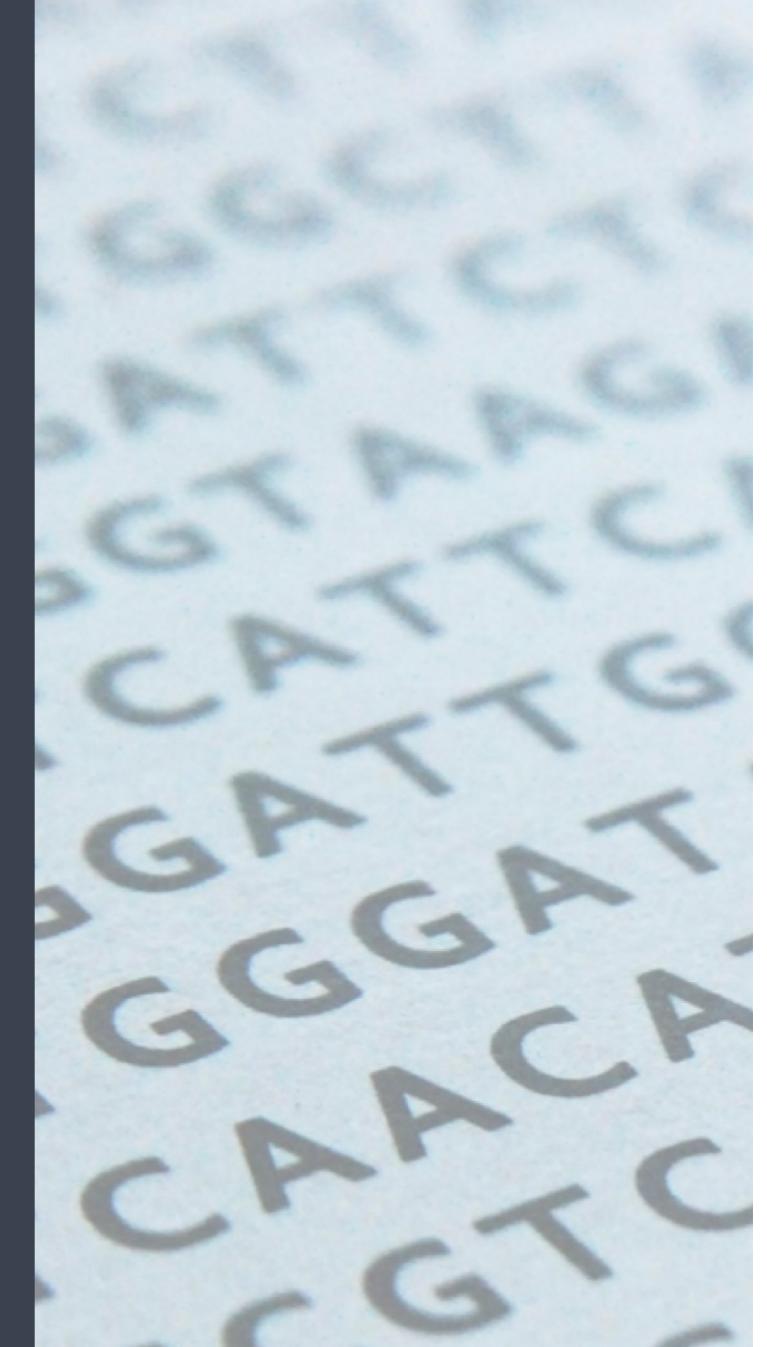


# Training

- 1 to 2 day “short” workshops on introductory, intermediate and advanced topics related to NGS data analysis

*Schedule:* <http://bioinformatics.sph.harvard.edu/training/>

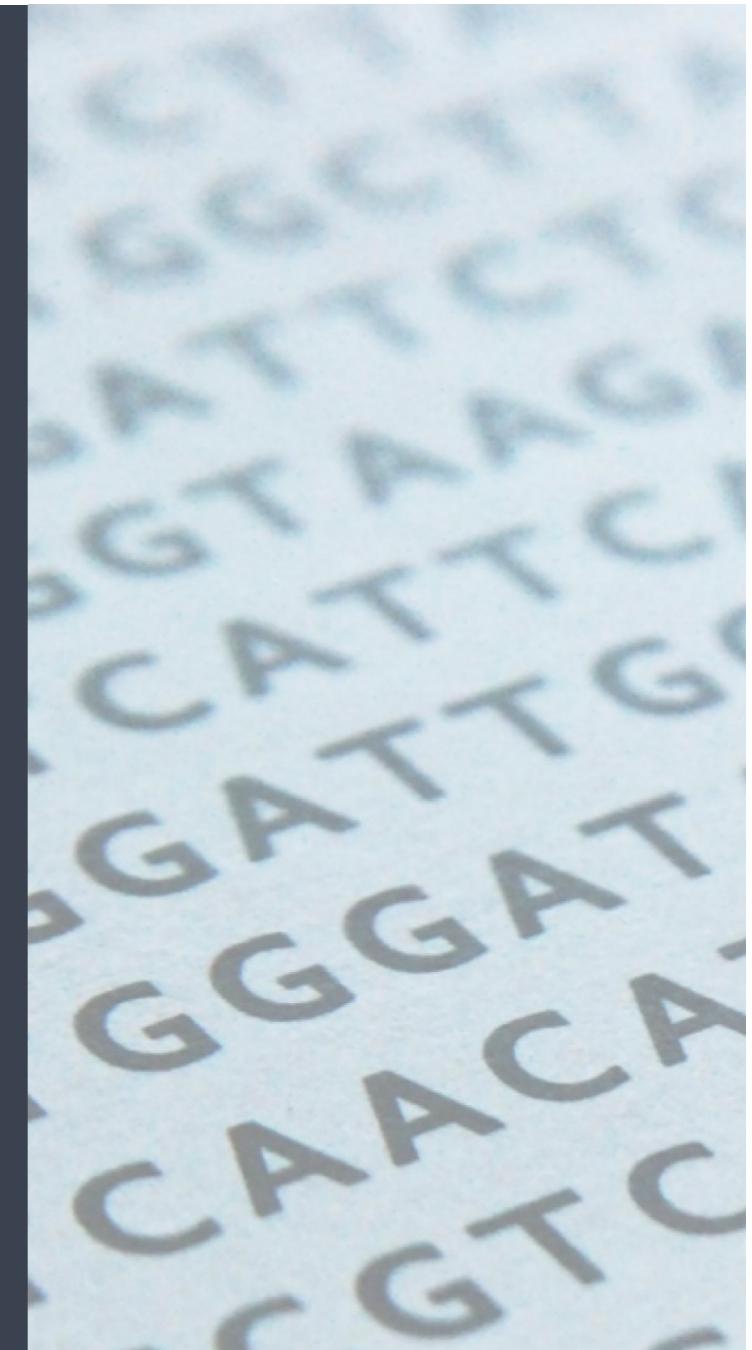
*Training materials:* <https://hbctraining.github.io/main/>



# “Short” workshops divided into 2 categories

1. Basic Data Skills: No prior programming knowledge needed and no prerequisites
  2. Advanced Topics: Analysis of high-throughput sequencing (NGS) data: Certain “Basic” workshops required as prerequisites

Any participants wanting to take an advanced workshop will have to have taken the appropriate basic workshop(s) within the past 6 months.

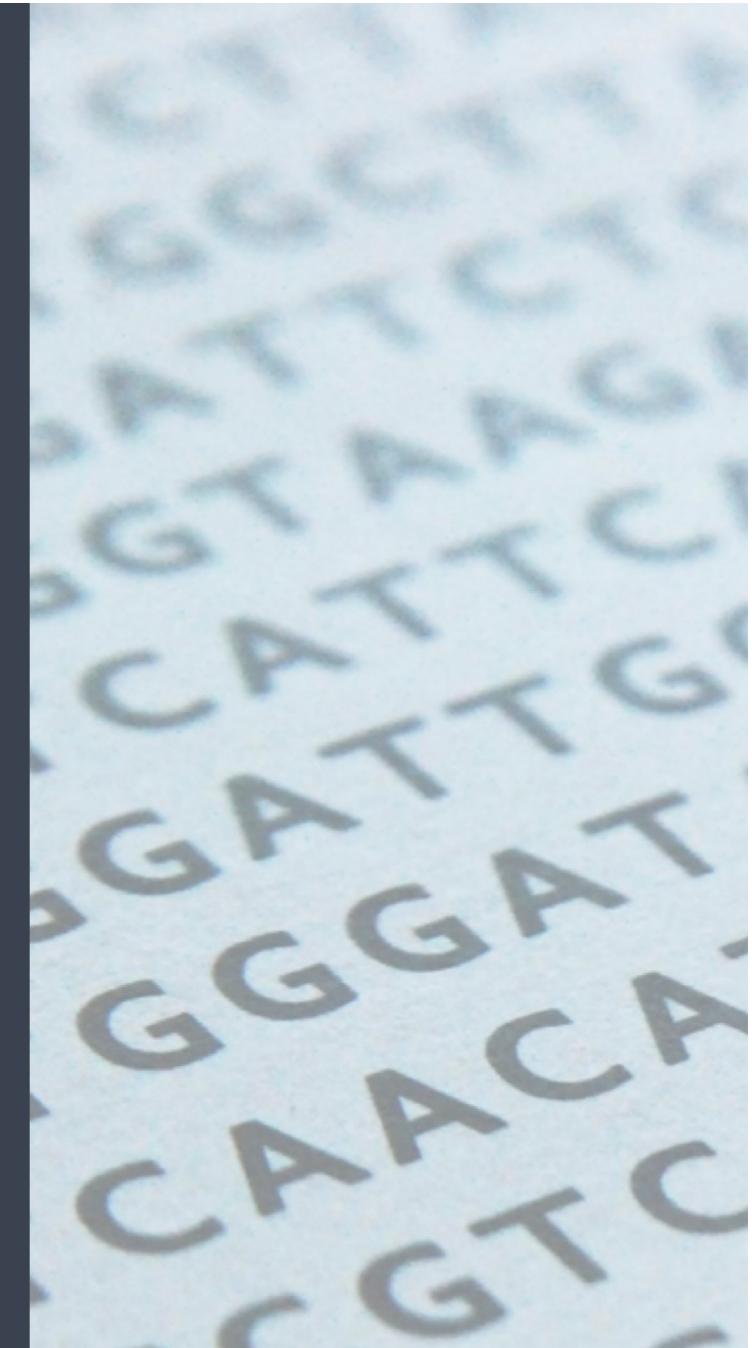


# Training

- 1 to 2 day “short” workshops on introductory, intermediate and advanced topics related to NGS data analysis
  - In-depth “long” courses (8- or 12-day formats)

*Schedule:* <http://bioinformatics.sph.harvard.edu/training/>

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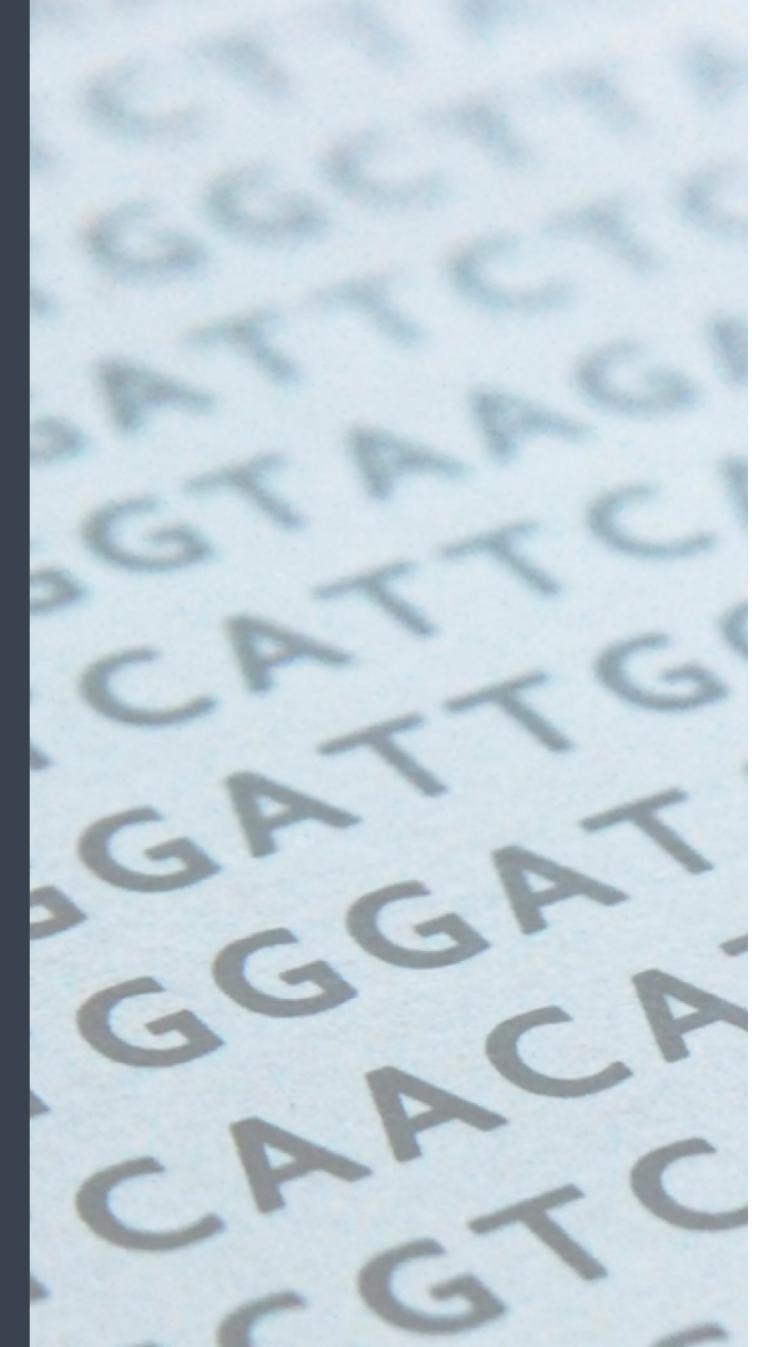


# Training

- 1 to 2 day “short” workshops on introductory, intermediate and advanced topics related to NGS data analysis
- In-depth “long” courses (8- or 12-day formats)
- Monthly, 2-3 hour, hands-on and free workshops on “Current Topics in Bioinformatics”

*Schedule:* <http://bioinformatics.sph.harvard.edu/training/>

*Training materials:* <https://hbctraining.github.io/main/>





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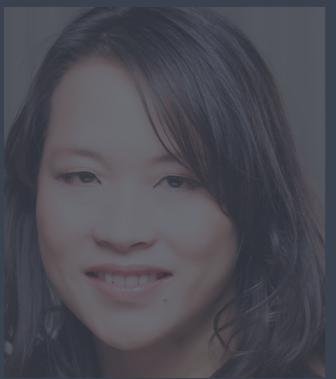
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# Class Introductions!



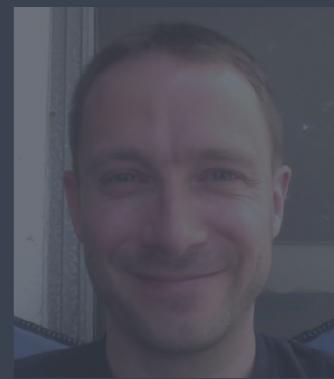
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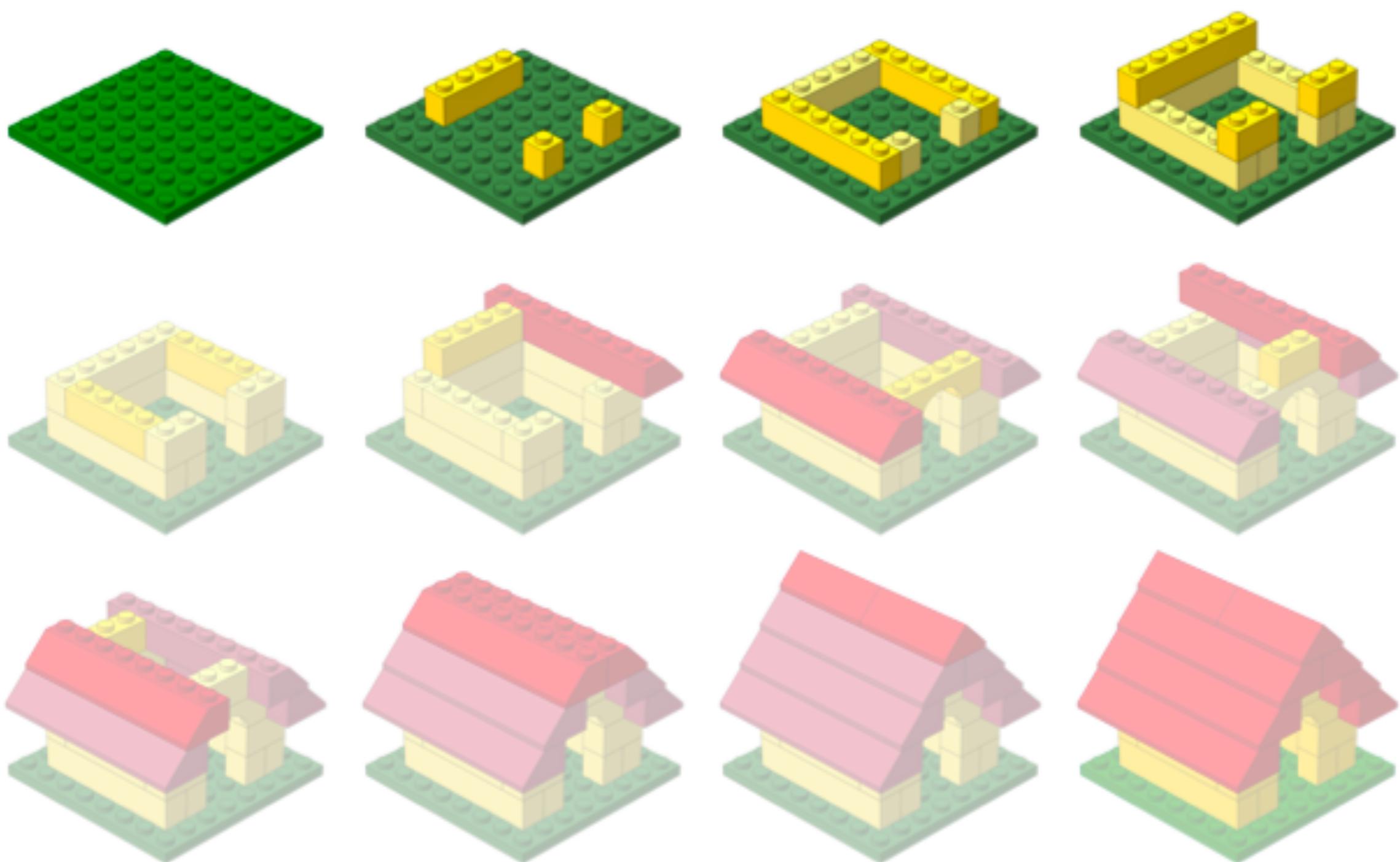


**Sergey Naumenko**



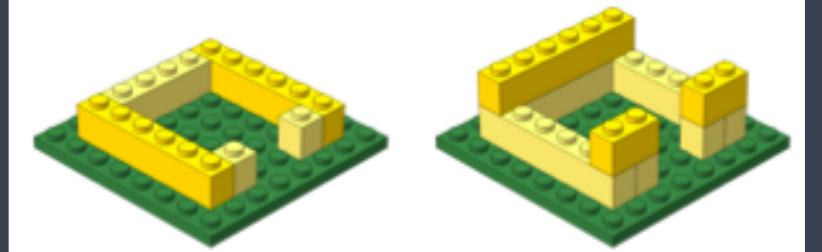
**Peter Kraft**  
*Faculty Advisor*

# Workshop Scope...



# Learning R

# Workshop Scope



- ✓ Comfortably use RStudio (a graphical interface for R)
- ✓ Fluently interact with R using RStudio
- ✓ Become familiar with R syntax
- ✓ Understand data structures in R
- ✓ Inspect and manipulate data structures
- ✓ Install packages and use functions in R
- ✓ Visualize data using *ggplot2*

# Logistics

# Course webpage (wiki)

<https://tinyurl.com/intro-to-r-1-5>

# Course materials online



## Introduction to R

[View on GitHub](#)

Approximate time: 70 min

### Learning Objectives

- Employ variables in R.
- Describe the various data types used in R.
- Construct data structures to store data.

### The R syntax

Now that we know how to talk with R via the script editor or the console, we want to use R for something more than adding numbers. To do this, we need to know more about the R syntax.

Below is an example script highlighting the many different “parts of speech” for R (syntax):

- the **comments** `#` and how they are used to document function and its content
- **variables and functions**
- the **assignment operator** `<-`

# The 2 Window problem...

The screenshot shows the RStudio interface. The top bar displays the path: ~/Dropbox (HBC)/HBC Team Folder (1)/Teaching/Intro-to-R - RStudio. The left pane contains an R script named "Intro-to-R.R" with the following code:

```
351
352 animals[4, 2] <- "Gray"
353
354 animals$color <- factor(animals$color)
355 animals$new2 <- c(1,2,3)
356
357 vector1 <- c(6:11)
358 data.frame(animals[, 1:2], vector1, animals[, 3:4])
359
360
362:1 (Top Level) ▾
```

The console window below shows the R environment:

```
Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

[Workspace loaded from ~/Dropbox (HBC)/HBC Team Folder (1)/Teaching/Intro-to-R/.RData]

>
```

The right pane shows the Global Environment and a file browser:

Name	Size	Modified
..		
.RData	5.8 MB	May 3, 2018, 1:40
.Rhistory	17.4 KB	Nov 15, 2018, 1:2
data		
de_sleuth.R	2.6 KB	Oct 10, 2018, 10:0
figures		
Intro-to-R.R	11.9 KB	May 1, 2018, 3:31

A code block in the bottom left shows:

```
rownames(metadata)

metadata[c("sample10", "sample12"),]
```

The text "Selecting using indices with logical operators" is displayed above the explanatory text.

With dataframes, similar to vectors, we can use logical vectors for specific columns in the dataframe to select only the rows in a dataframe with TRUE values at the same position or index as in the logical vector. We can then use the logical vector to return all of the rows in a dataframe where those values are TRUE.

# Odds and Ends

- ❖ Name tags: Tent Cards
- ❖ Post-its
- ❖ Phones on vibrate/silent
- ❖ Bathrooms

# Contact us!

*HBC training team:* [hbctraining@hsph.harvard.edu](mailto:hbctraining@hsph.harvard.edu)

*HBC consulting:* [bioinformatics@hsph.harvard.edu](mailto:bioinformatics@hsph.harvard.edu)

Twitter

[@bioinfocore](https://twitter.com/bioinfocore)